Course Title: Concrete Technology
[As per Choice Based Credit System (CBCS) scheme] SEMESTER – IV

Subject Code	15CV44	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03

CREDITS – 04

Course objectives: This course will enable students to:

1. Recognize the importance of material characteristics and their contributions to strength development in Concrete
2. Proportion ingredients of Concrete to arrive at most desirable mechanical properties of Concrete.
3. Ascertain and measure engineering properties of concrete in fresh and hardened state which meet the requirement of real time structures.

Contents	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module-1: Concrete Ingredients		
Cement – Cement manufacturing process, steps to red uce carbon footprint, chemical composition and their importance, hydration of cement, types of cement. Testing of cement. Fine aggregate: Functions, requirement, Alternatives to River sand, M-sand introduction and manufacturing. Coarse aggregate: Importance of size, shape and texture. Grading and blending of aggregate. Testing on aggregate, requirement. Recycled aggregates Water – qualities of water. Chemical admixtures – plasticizers, accelerators, r etarders and air entraining agents. Mineral admixtures – Pozzolanic and cementitious ma terials, Fly ash, GGBS, silica fumes, Metakaolin and rice husk ash.	10 Hours	L1, L2, L3
Module -2: Fresh Concrete		
Workability-factors affecting workability. Measurement of workability–slump, Compaction factor and Vee-Bee Consistometer tests, flow tests. Segregation and bleeding. Process of manufacturing of concrete- Batching, Mixing, Transporting, Placing and Compaction. Curing – Methods of curing – Water curing, membrane curing, steam curing, accelerated curing, self-curing. Good and Bad practices of making and using fresh concrete and Effect of heat of hydration during mass concreting at project sites.	10 Hours	L1, L2, L3
Module -3: Hardened Concrete		
Factors influencing strength, W/C ratio, gel/space ratio, Maturity concept, Testing of hardened concrete, Creep –facto rs affecting creep. Shrinkage of concrete – plastic shrinking an d drying shrinkage, Factors affecting shrinkage. Definition and significance of durability. Internal and external factors influencing durability, Mechanisms- Sulphate attack – chloride attack, carb onation, freezing and thawing. Corrosion, Durability requirements as per	10 Hours	L1, L2, L3

IS-456, Insitu testing of concrete- Penetration and pull out test, rebound hammer test, ultrasonic pulse velocity, core extraction – Principal, applications and limitations.		
Module -4: Concrete Mix Proportioning		
Concept of Mix Design with and without admixtures, variables in proportioning and Exposure conditions, Selection criteria of ingredients used for mix design, Procedure of mix proportioning. Numerical Examples of Mix Proportioning using IS-10262	10 Hours	L1, L2, L3, L4
Module -5: Special Concretes		
RMC- manufacture and requirement as per QCI-RMCPCS, properties, advantages and disadvantages. Self-Compacting concrete- concept, materials, tests, properties, application and typical mix Fiber reinforced concrete - Fibers types, properties, application of FRC. Light weight concrete-material properties and types. Typical light weight concrete mix and applications	10 hours	L1, L2, L3, L4

Course Outcomes:

After studying this course, students will be able to:

CO1: Relate material characteristics and their influence on microstructure of concrete. (L2,L3)(PO1)

CO 2: Distinguish concrete behaviour based on its fresh and hardened properties. [L2, L4] (PO1, PO2)

CO 3: Illustrate proportioning of different types of concrete mixes for required fresh and hardened properties using professional codes. [L3] (PO1, PO2, PO3)

Program Objectives (as per NBA):

- Engineering Knowledge (PO1)
- Problem Analysis (PO2)
- Design / development of solutions (PO3)

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. Neville A.M. “Properties of Concrete”-4th Ed., Long man.
2. M.S. Shetty, Concrete Technology - Theory and Practice Published by S. Chand and Company, New Delhi.
3. Kumar Mehta. P and Paulo J.M. Monteiro “Concrete-Mi crostructure, Property and Materials”, 4th Edition, McGraw Hill Education, 201 4
4. A.R. Santha Kumar, “Concrete Technology”, Oxford Un iversity Press, New Delhi (New Edition)

Reference Books:

1. M L Gambir, “Concrete Technology”, McGraw Hill Educ ation, 2014.
2. N. V. Nayak, A. K. Jain Handbook on Advanced Concrete Technology, ISBN: 978-81-8487-186-9
3. Job Thomas, “Concrete Technology”, CENGAGE Learning , 2015
4. IS 4926 (2003): Code of Practice Ready-Mixed Concrete [CED 2: Cement and Concrete]

5. Criteria for RMC Production Control, Basic Level Certification for Production Control of Ready Mixed Concrete-BMTPC
6. Specification and Guidelines for Self-Compacting Concrete, EFNARC, Association House

Course Title: Design of RC Structural Elements

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER:V

Subject Code	15CV51	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03
	CREDITS – 04	**Total Marks-100**	

Course objectives: This course will enable students to

1. Identify, formulate and solve engineering problems of RC elements subjected to different kinds of loading. 2.

Follow a procedural knowledge in designing various structural RC elements.

3. Impart the culture of following the codes for strength, serviceability and durability as an ethics.
4. Provide knowledge in analysis and design of RC elements for the success in competitive examinations.

Modules	**Teaching Hours**	**Revised Bloom's Taxonomy (RBT) Level**
Module -1		
Introduction to Limit State Design and Serviceability: Introduction to working stress method, Difference between Working stress and Limit State Method of design, Modular Ratio and Factor of Safety. Philosophy and principle of limit state design with assumptions. Partial Safety factors, Characteristic load and strength. Stress block parameters, concept of balanced section, under reinforced and over reinforced section. Limiting deflection, short term deflection, long term deflection, Calculation of deflection of singly reinforced beam only. Cracking in reinforced concrete members, calculation of crack width of singly reinforced beam. Side face reinforcement, slender limits of beams for stability.	12 hours	L_1, L_2
Module -2		
Limit State Analysis of Beams: Analysis of singly reinforced, doubly reinforced and flanged beams for flexure and shear	8 Hours	L_2, L_4
Module -3		
Limit State Design of Beams: Design of singly and doubly reinforced beams, Design of flanged beams for shear, design for combined bending and torsion as per IS-456	10 Hours	L_2, L_4
Module -4		
Limit State Design of Slabs and Stairs: Introduction to one way and two way slabs, Design of cantilever, simply supported and one way continuous slab. Design of two way slabs for different boundary conditions. Design of dog legged and open well staircases. Importance of bond, anchorage length and lap length.	10 Hours	L_2, L_4

Module -5		
Limit State Deign of Columns and Footings: Analysis and design of short axially loaded RC column. Design of columns with uniaxial and biaxial moments, Design concepts of the footings. Design of Rectangular and square column footings with axial load and also for axial load & moment	10 Hours	L_2, L_4

Course outcomes: After studying this course, students will be able to:

1. understand the design philosophy and principles
2. solve engineering problems of RC elements subjected to flexure, shear and torsion
3. demonstrate the procedural knowledge in designs of RC structural elements such as slabs, columns and footings
4. owns professional and ethical responsibility

Program Objectives:

- Engineering knowledge
- Problem analysis
- Interpretation of data

Question paper pattern:

- The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks
- There will be two full questions (with a maximum of three subdivisions, if necessary) from each module.
- Each full question shall cover the topics as a module
- The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.
- The designs are as per IS-456 and SP (16) relevant charts to be provided in the question paper

Text Books:

1. Unnikrishnan Pillai and Devdas Menon, " **Reinforced Concrete Design"** , McGraw Hill, New Delhi
2. Subramanian, " **Design of Concrete Structures"** , Oxford university Press
3. H J Shah, **"Reinforced Concrete Vol. 1 (Elementary Reinforced Concrete)"** , Charotar Publishing House Pvt. Ltd.

Reference Books:

1. P C Varghese, "Limit State design of reinforced con crete" , PHI, New Delhi
2. W H Mosley, R Husle, J H Bungey, "Reinforced Concre te Design", MacMillan Education, Palgrave publisher s
3. Kong and Evans, "Reinforced and Pre-Stressed Concre te", Springer Publications
4. A W Beeby and Narayan R S, "Introduction to Design for Civil Engineers", CRC Press
5. Robert Park and Thomas Paulay, "Reinforced Concrete Structures", John Wiley & Sons, Inc.

Course Title: Railways, Harbour, Tunneling and Airports

Professional Elective-1

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER:V

Subject Code	15CV552	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03
	CREDITS – 03	**Total Marks-100**	

Course Objectives: This course will enable students to

1. Understand the history and development, role of railways, railway planning and development based on essential criteria's.
2. Learn different types of structural components, engineering properties of the materials, to calculate the material quantities required for construction
3. Understand various aspects of geometric elements, points and crossings, significance of maintenance of tracks.
4. Design and plan airport layout, design facilities required for runway, taxiway and impart knowledge about visual aids
5. Apply design features of tunnels, harbours, dock and necessary navigational aids; also expose them to various methods of tunneling and tunnel accessories.

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1		
Railway Planning: Significance of Road, Rail, Air and Water transports – Coordination of all modes to achieve sustainability – Elements of permanent way – Rails, Sleepers, Ballast, rail fixtures and faste nings, – Track Stress, coning of wheels, creep in rails, defects in rails – Route al ignment surveys, conventional and modern methods- – Soil suitability analysis – G eometric design of railways, gradient, super elevation, widening of gauge on curves- Points and Crossings.	8 hours	L1,L2,L3
Module -2		
Railway Construction and Maintenance: Earthwork – Stabilization of track on poor soil, Calculation of Materials required for track laying – Construction and maintenance of tracks – Modern methods of construct ion & maintenance – Railway stations and yards and passenger amenities- Urban rail – Infrastructure for Metro, Mono and underground railways.	8 Hours	L2, L3
Module -3		

Harbour and Tunnel Engineering: Definition of Basic Terms: Planning and Design of Harbours: Requirements, Classification, Location and Design Principles – Harbour Layout and Terminal Facilities , Coastal Structures, Inland Water Transport – Wave action on Coastal Structures and Coastal Protection Works. Tunneling: Introduction, size and shape of the tunnel, tunneling methods in soils, tunnel lining, tunnel drainage and ventilation.	8 Hours	L1,L2,L3
Module -4		
Airport Planning: Air transport characteristics, airport classification, air port planning: objectives, components, layout characteristics, socio-economic characteristics of the catchment area, criteria for airport site selection and ICAO stipulations, typical airport layouts, Parking and circulation area.	8 Hours	L1,L2,L3
Module -5		
Airport Design : Runway Design: Orientation, Wind Rose Diagram, Runway length, Problems on basic and Actual Length, Geometric design of runways, Configuration and Pavement Design Principles, Elements of Taxiway Design, Airport Zones, Passenger Facilities and Services, Runway and Taxiway Markings and lighting.	8 Hours	L1,L2,L3

Course Outcomes: After studying this course, students will be able to:

1. Acquires capability of choosing alignment and also design geometric aspects of railway system, runway, taxiway.
2. Suggest and estimate the material quantity required for laying a railway track and also will be able to determine the hauling capacity of a locomotive.
3. Develop layout plan of airport, harbor, dock and will be able relate the gained knowledge to identify required type of visual and/or navigational aids for the same.
4. Apply the knowledge gained to conduct surveying, understand the tunneling activities.

Program Objectives:

- Engineering knowledge
- Problem analysis
- Interpretation of data

Question Paper Pattern:

- The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks
- There will be two full questions (with a maximum of three subdivisions, if necessary) from each module.
- Each full question shall cover the topics as a module
- The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Text Books:

1. Saxena Subhash C and Satyapal Arora, “A Course in R ailway Engineering”, Dhanpat Rai and Sons, Delhi,
2. Satish Chandra and Agarwal M.M, “Railway Engineerin g”, 2nd Edition, Oxford University Press, New Delhi ,
3. Khanna S K, Arora M G and Jain S S, “Airport Planni ng and Design”, Nemchand and Brothers, Roorkee,
4. C Venkatramaiah, “ Transportation Engineering”, Vol ume II: Railways, Airports, Docks and Harbours, Bridges and

Tunnels, Universities Press

5. Bindra S P, “A Course in Docks and Harbour Engineer ing”, Dhanpat Rai and Sons, New Delhi,

Reference Books:

1. Oza.H.P. and Oza.G.H., “A course in Docks & Harbour Engineering”. Charotar Publishing Co.,
2. Mundrey J.S. “A course in Railway Track Engineering ”. Tata McGraw Hill,
3. Srinivasan R. Harbour, “Dock and Tunnel Engineering ”, 26th Edition 2013

Course Title: Masonry Structures

Professional Elective-1

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER:V

Subject Code	15CV553	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03
CREDITS – 03		**Total Marks-100**	

Course Objectives: This course will enable students to

1. Understand properties of masonry units, strength and factors affecting strength.
2. Understand design criteria of various types of wall subjected to different load system.
3. Impart the culture of following the codes for strength, serviceability and durability as an ethics.
4. Provide knowledge in analysis and design of masonry elements for the success in competitive examinations.

Modules	**Teaching Hours**	**Revised Bloom’s Taxonomy (RBT) Level**
Module -1		
Masonry Units, Materials, types and masonry construction: Bricks, Stone and Block masonry units- strength, modulus of elasticity and water absorption of masonry materials – classification and properties o f mortars. Defects and Errors in masonry construction – cracks in masonry, types, reason for cracking, methods of avoiding cracks. **Strength and Stability:** Strength and stability of axially loaded masonry walls, effect of unit strength, mortar strength, joint thickness, rate of absorption, effect of curing, effect of ageing, workmanship. Compressive strength formulae based on elastic theory and empirical formulae.	8 hours	L1,L2,L3
Module -2		
Permissible stresses: Types of walls, permissible compressive stress, stress reduction and shape modification factors, increase in permissible stresses for eccentric vertical and lateral load, permissible tensile stress and shear stresses. **Design Considerations:** Effective height of walls and columns, openings in walls, effective length, effective thickness, slenderness ratio, eccentricity, load dispersion, arching action in lintels. Problems on design considerations for solid walls, cavity walls, wall with pillars.	8 Hours	L1,L2,L3

Module -3		
Load considerations and design of Masonry subjected to axial loads: Design criteria, design examples of walls under UDL, solid walls, cavity walls, solid wall supported at the ends by cross wall, walls with piers.	8 Hours	L1,L2,L3
Module -4		
Design of walls subjected to concentrated axial loads: Solid walls, cavity walls, solid wall supported at the ends by cross wall, walls with piers, design of wall with openings. **Design of walls subjected to eccentric loads**: Design criteria – stress distribution under eccentric loads – problems on eccentrically l oaded solid walls, cavity walls, walls with piers.	8 Hours	L2,L3,L4,L5
Module -5		
Design of Laterally and transversely loaded walls: Design criteria, design of solid wall under wind loading, design of shear wall – design of compound walls. Introduction to reinforced brick masonry, lintels and slabs. **In-filled frames**: Types – modes of failures – design criteria of ma sonry retaining walls.	8 Hours	L2,L3,L4,L5

Course Outcomes: After studying this course, students will be able to:

1. Explain engineering properties and uses of masonry units, defects and crack in masonry and its remedial measures.
2. Summarize various formulae's for finding compressive strength of masonry units.
3. Explain permissible stresses and design criteria as per IS: 1905 and SP-20.
4. Design different types of masonry walls for different load considerations.

Program Objectives:

- Engineering knowledge
- Problem analysis
- Interpretation of data

Question Paper Pattern:

- The question paper will have Ten questions, each full question carrying 16 marks.
- There will be two full questions (with a maximum three sub divisions, if necessary) from each module.
- Each full question shall cover the topics under a module.
- The students shall answer Five full questions selecting one full question from each module.
- If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.
- Use of **IS 1905–1987** "Code of practice for structural use of un-reinfor ced masonry" may be permitted.

Text Books:

1. Henry, A.W., " **Structural Masonry"** , Macmillan Education Ltd., 1990.

2. Dayaratnam P, **"Brick and Reinforced Brick Structures",** Oxford & IBH, 1987.

3. M. L. Gambhir, " **Building and Construction Materials",** Mc Graw Hill education Pvt. Ltd.

Course Title: Traffic Engineering **Open Elective-1** [As per Choice Based Credit System (CBCS) scheme] SEMESTER:V			
Subject Code	15CV561	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03
CREDITS – 03		**Total Marks-100**	

Course Objectives: This course will enable students to

1. Understand fundamental knowledge of traffic engineering, scope and its importance.
2. describe basic techniques for collecting and analysing traffic data, diagnosing problems, designing appropriate remedial treatment, and assessing its effectiveness.
3. Apply probabilistic and queuing theory techniques for the analysis of traffic flow situations and emphasis the interaction of flow efficiency and traffic safety.

4. understand and analyse traffic issues including safety, planning, design, operation and control. 5.

Apply intelligent transport system and its applications in the present traffic scenario.

Modules	**Teaching Hours**	**Revised Bloom's Taxonomy (RBT) Level**
Module -1		
Traffic Planning and Characteristics: Road Characteristics-Road user characteristics, PIEV theory, Vehicle Performance characteristics, Fundamentals of Traffic Flow, Urban Traffic problems in India, Integrated planning of town, country, regional and all urban infrastructures, Sustainable approach- land use & transport and modal integration.	8 hours	L1,L2,L3
Module -2		
Traffic Surveys: Traffic Surveys- Speed, journey time and delay surveys, Vehicles Volume Survey including non-motorized transports, Methods and interpretation, Origin Destination Survey, Methods and presentation, Parking Survey, Accident analyses-Methods, interpretation and presentation, Statistical applications in traffic studies and traffic forecasting, Level of service- Concept,	8 Hours	L1,L2,L3,L4,L5

applications and significance.		
Module -3		
Traffic Design and Visual Aids: Intersection Design- channelization, Rotary intersection design, Signal design, Coordination of signals, Grade separation, Traffic signs including VMS and road markings, Significant roles of traffic control personnel, Networking pedestrian facilities & cycle tracks.	8 Hours	L1,L2,L3,L4
Module -4		
Traffic Safety and Environment: Road accidents, Causes, effect, prevention, and cost, Street lighting, Traffic and environment hazards, Air and Noise Pollution, causes, abatement measures, Promotion and integration of public transportation, Promotion of non-motorized transport.	8 Hours	L1,L2,L3
Module -5		
Traffic Management: Area Traffic Management System, Traffic System Management (TSM) with IRC standards, Traffic Regulatory Measures, Travel Demand Management (TDM), Direct and indirect methods, Congestion and parking pricing, All segregation methods- Coordination among different agencies, Intelligent Transport System for traffic management, enforcement and education.	8 Hours	L1,L2,L3,L4

Course outcomes: After studying this course, students will be able to:

1. Understand the human factors and vehicular factors in traffic engineering design.
2. Conduct different types of traffic surveys and analysis of collected data using statistical concepts.
3. Use an appropriate traffic flow theory and to comprehend the capacity & signalized intersection analysis.
4. Understand the basic knowledge of Intelligent Transportation System.

Program Objectives:

- Engineering knowledge
- Problem analysis
- Interpretation of data

Question Paper Pattern:

- The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks
- There will be two full questions (with a maximum of three subdivisions, if necessary) from each module.
- Each full question shall cover the topics as a module
- The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Text Books:

1. Kadiyali.L.R. **"Traffic Engineering and Transport Planning** ", Khanna Publishers, Delhi, 2013
2. S K Khanna and CEG Justo and A Veeraragavan, **"Highway Engineering** ", Nem Chand and Bros.
3. Indian Roads Congress (IRC) Specifications: Guidelines and Special Publications on Traffic Planning and

Management.

4. Salter. R.I and Hounsell N.B, " **Highway Traffic Analysis and design**", Macmillan Press Ltd.1996.

Reference Books:

1. Fred L. Mannering, Scott S. Washburn and Walter P.Kilareski, Principles of Highway Engineering and Traffic Analysis, Wiley India Pvt. Ltd., New Delhi, 2011
2. Garber and Hoel, "Principles of Traffic and Highway Engineering", CENGAGE Learning, New Delhi, 2010
3. SP:43-1994, IRC Specification, "Guidelines on Low-c ost Traffic Management Techniques" for Urban Areas, 1994
4. John E Tyworth, "Traffic Management Planning, Opera tions and control", Addison Wesly Publishing Compan y, 1996
5. Hobbs.F.D. "Traffic Planning and Engineering", Univ ersity of Brimingham, Peragamon Press Ltd, 2005

Course Title: Remote Sensing and GIS Open Elective 1 [As per Choice Based Credit System (CBCS) scheme] SEMESTER:V			
Subject Code	15CV563	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03
CREDITS – 03		**Total Marks-100**	

Course Objectives: This course will enable students to

1. Understand the basic concepts of remote sensing
2. Analyze satellite imagery and extract the required units.
3. Extract the GIS data and prepare the thematic maps
4. Use the thematic maps for various applications

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1		
Remote Sensing: Basic concept of Remote sensing, Data and Information, Remote sensing data collection, Remote sensing advantages & Limitations, Remote Sensing process. Electromagnetic Spectrum, Energy interactions with atmosphere and with earth surface features (soil, water, and vegetation), Resolution, image registration and Image and False color composite, elements of visual interpretation techniques.	8 hours	L1, L2,L3
Module -2		
Remote Sensing Platforms and Sensors: Indian Satellites and Sensors characteristics, Remote Sensing Platforms, Sensors and Properties of Digital Data, Data Formats: Introduction, platforms- IRS, Landsat, SPOT, Cartosat, Ikonos, Envisat etc. sensors, sensor resolutions (spatial, spectral, radiometric and	8 Hours	L2,L3,L4

temporal). Basics of digital image processing- introduction to digital data, systematic errors(Scan Skew, Mirror-Scan Velocity, Panoramic Distortion, Platform Velocity , Earth Rotation) and non-systematic [random] errors(Altitude, Attitude), Image enhancements(Gray Level Thresholding, level slicing, contrast stretching),image filtering.		
Module -3		
Geographic Information System: Introduction to GIS; components of a GIS; Geographically Referenced Data, Spatial Data- Attribute data-Joining Spatial and attribute data, GIS Operations: Spatial Data Input – Attribute data Management, Geographic coordinate System, Datum; Map Projections: Types of Map Projections, Projected coordinate Systems. UTM Zones.	8 Hours	L2,L3,L4
Module -4		
Data Models: Vector data model: Representation of simple features – Topology and its importance; coverage and its data structure, Shape file; Relational Database, Raster Data Model: Elements of the Raster data model, Types of Raster Data, Raster Data Structure, Data conversion.	8 Hours	L3,L4,L5
Module -5		
Integrated Applications of Remote sensing and GIS: Applications in land use land cover analysis, change detection, water resources, urban planning, environmental planning, Natural resource management and Traffic management. Location Based Services And Its Applications.	8 Hours	L3,L4,L5,L6

Course outcomes: After studying this course, students will be able to:

1. Collect data and delineate various elements from the satellite imagery using their spectral signature.
2. Analyze different features of ground information to create raster or vector data.
3. Perform digital classification and create different thematic maps for solving specific problems
4. Make decision based on the GIS analysis on thematic maps.

Program Objectives:

- Engineering knowledge
- Problem analysis
- Interpretation of data

Question paper pattern:

- The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks
- There will be two full questions (with a maximum of three subdivisions, if necessary) from each module.
- Each full question shall cover the topics as a module
- The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Text Books:

1. Narayan Panigrahi, **"Geographical Information Science** ", ISBN 10: 8173716285 / ISBN 13: 9788173716287, University Press 2008.
2. Basudeb Bhatta, **"Remote sensing and GIS"** , ISBN:9780198072393, Oxford University Press 2011
3. Kang – Tsurg Chang, **"Introduction to Geographic Information System".** Tata McGraw Hill Eduction Private Limited 2015.
4. Lillesand, Kiefer, Chipman, "Remote Sensing and Ima ge Interpretation", Wiley 2011.

Reference Books:

1. Chor Pang Lo and Albert K.W Yeung, "Concepts & Tech niques of GIS", PHI, 2006
2. John R. Jensen, "Remote sensing of the environment" , An earth resources perspective – 2nd edition – by Pearson Education 2007.

- Anji Reddy M., "Remote sensing and Geograperhical i nformation system", B.S. Publications 2008.
- Peter A. Burrough, Rachael A. McDonnell, and Christopher D. Lloyd, "Principals of Geo physical Informa tion system", Oxford Publications 2004.
- S Kumar, "Basics of remote sensing & GIS", Laxmi pu blications 2005.

Course Title: Geotechnical Engineering Lab

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER: V

Subject Code	15CVL57	IA Marks	20
Number of Lecture Hours/Week	03 (1hr tutorial + 2hr laboratory)	Exam Marks	80
Total Number of Lecture Hours	42	Exam Hours	03
CREDITS – 02		**Total Marks-100**	

Course Objectives: Provide students with a basic understanding

- To carry out laboratory tests and to identify soil as per IS codal procedures
- To perform laboratory tests to determine index properties of soil
- To perform tests to determine shear strength and consolidation characteristics of soils

Modules	**Teaching Hours**	**Revised Bloom's Taxonomy (RBT) Level**
1. Visual soil classification. Water content determination by oven drying method and infrared moisture method. Specific gravity test (pycnometer and density bottle method).	**6 Hours**	**L1, L2**
2. Grain size analysis i. Sieve analysis ii. Hydrometer analysis	**3 Hours**	**L1, L2**
3. In-situ density tests i. Core-cutter method ii. Sand replacement method	**3 Hours**	**L1, L2**

4. Consistency limits i. Liquid limit test (by Casagrande's and cone penetration method) ii. Plastic limit test iii. Shrinkage limit test	**3 Hours**	**L1, L2**
5. Standard compaction test (light and heavy compaction)	**3 Hours**	**L1, L2**
6. Co-efficient of permeability test i. Constant head test ii. Variable head test	**3 Hours**	**L1, L2**
7. Shear strength tests i. Unconfined compression test ii. Direct shear test iii. Triaxial test (undrained unconsolidated)	**9 Hours**	**L1, L2**
8. Consolidation test : Determination of compression index and co-efficient of consolidation	**3 Hours**	**L1, L2**
9. Laboratory vane shear test	**3 Hours**	**L1, L2**
10. Demonstration of Swell pressure test, Standard penetration test and boring equipment	**6 Hours**	**L1, L2**

Course Outcomes: Students will be able to conduct appropriate laboratory/field experiments and interpret the results to determine

1. Physical and index properties of the soil
2. Classify based on index properties and field identification
3. To determine OMC and MDD, plan and assess field compaction program
4. Shear strength and consolidation parameters to assess strength and deformation characteristics
5. In-situ shear strength characteristics (SPT- Demonstration)

Reference Books:

1. Punmia B C, Soil Mechanics and Foundation Engineering- (2017), 16th Edition, Laxmi Publications co., New Delhi.
2. Lambe T.W., "Soil Testing for Engineers", Wiley Eastern Ltd., New Delhi.
3. Head K.H., "Manual of Soil Laboratory Testing" Vol. I, II, III, Princeton Press
4. Bowles J.E., "Engineering Properties of Soil and Their Measurements",- McGraw Hill Book Co. New York.
5. Relevant BIS Codes of Practice: 2720(Part-3/Sec. 1) – 1987; IS 2720 (Part – 2)- 1973; IS 2720 (Part – 4) – 1985; IS 2720 (Part – 5) – 1985; IS 2720 (Part – 6) – 1972; IS 2720 (Part – 7) – 1980; IS 2720 (Part – 8) – 1983; IS 2720 (Part – 17) – 1986; IS 2720 (Part - 10) – 1973; IS 2720 (Part – 13) – 1986; IS2720 (Part 11) – 1971; IS2720 (Part 15) – 1986; IS 2720 (Part 30) – 1987; IS 2720 (Part 14) – 1977; IS 2720 (Part – 14) – 1983; IS 2720 (Part – 28) – 1974; IS 2720 (Part – 29) – 1966, IS 2720 (Part-60) 1965.

<table>
<tr><td colspan="4" align="center">Course Title: Concrete and Highway Materials Laboratory
[As per Choice Based Credit System (CBCS) scheme]
SEMESTER: V</td></tr>
<tr><td>Subject Code</td><td>15CVL58</td><td>IA Marks</td><td>20</td></tr>
<tr><td>Number of Lecture Hours/Week</td><td>03 (1hr tutorial + 2hr laboratory)</td><td>Exam Marks</td><td>80</td></tr>
<tr><td>Total Number of Lecture Hours</td><td>42</td><td>Exam Hours</td><td>03</td></tr>
<tr><td colspan="2" align="right">CREDITS – 02</td><td colspan="2" align="center">Total Marks-100</td></tr>
<tr><td colspan="4">Course objectives:
• To learn the principles and procedures of testing Concrete and Highway materials and to get hands on experience by conducting the tests and evolving inferences.</td></tr>
</table>

<table>
<tr><td align="center">Modules</td><td>Teaching Hours</td><td>Revised Bloom's Taxonomy (RBT) Level</td></tr>
<tr><td colspan="3">Part A: Concrete Lab</td></tr>
<tr><td>1. Tests on Cement:
a. Normal Consistency
b. setting time
c. compressive strength
d. fineness by air permeability test
e. specific gravity</td><td align="center">6 Hours</td><td>L1, L2</td></tr>
<tr><td>2. Tests on Concrete:
a. Design of concrete mix as per IS-10262
b. Tests on fresh concrete:
i. slump,
ii. compaction factor and
iii. Vee Bee test
c. Tests on hardened concrete:</td><td align="center">9 Hours</td><td>L2,L3</td></tr>
</table>

i. compressive strength test, ii. split tensile strength test, iii. flexural strength test d. NDT tests by rebound hammer and pulse velocity test.		
3. Tests on Self Compacting Concrete: a. Design of self compacting concrete, b. slump flow test, c. V-funnel test, d. J-Ring test, e. U Box test and f. L Box test	**3 Hours**	L2,L3
Part B: High way materials Lab		
1. Tests on Aggregates a. Aggregate Crushing value b. Los Angeles abrasion test c. Aggregate impact test d. Aggregate shape tests (combined index and angularity number)	**3 Hours**	**L1, L2**
2. Tests on Bituminous Materials a. Penetration test b. Ductility test c. Softening point test d. Specific gravity test e. Viscosity test by tar viscometer f. Bituminous Mix Design by Marshall Method (Demonstration only)	**9 Hours**	**L1, L2,L3**
3. Tests on Soil a. Wet sieve analysis b. CBR test	**6 Hours**	**L1, L2**

Course outcomes: After studying this course, students will be able to:
1. Conduct appropriate laboratory experiments and interpret the results
2. Determine the quality and suitability of cement
3. Design appropriate concrete mix
4. Determine strength and quality of concrete
5. Test the road aggregates and bitumen for their suitability as road material.
6. Test the soil for its suitability as sub grade soil for pavements.

Reference Books:

1. M.L.Gambir, **"Concrete Manual",** Danpat Rai and sons, New Delhi
2. Shetty M.S, **"Concrete Technology"** , S. Chand & Co. Ltd, New Delhi.
3. Mehta P.K, **"Properties of Concrete",** Tata McGraw Hill Publications, New Delhi.
4. Neville AM, **"Properties of Concrete",** ELBS Publications, London.
5. Relevant BIS codes.
6. S K Khanna, C E G Justo and A Veeraragavan, **"Highway Materials Testing Laboratory Manual** ", Nem Chand Bros, Roorkee
7. L R Kadiyali, **"Highway Engineering** ", Khanna Publishers, New Delhi

8. Relevant IRC Codes
9. Specifications for Roads and Bridges-MoRT&H, IRC, New Delhi

Course Title: Construction Management and Entrepreneurship
As per Choice Based Credit System (CBCS) scheme]
SEMESTER:VI

Subject Code	15CV61	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03
CREDITS –04		**Total Marks - 100**	

Course Objectives: This course will enable students to

1. Understand the concept of planning, scheduling, cost and quality control, safety during construction, organization and use of project information necessary for construction project.
2. Inculcate Human values to grow as responsible human beings with proper personality.
3. Keep up ethical conduct and discharge professional duties.

Modules	**Teaching Hours**	**Revised Bloom's Taxonomy (RBT) Level**
Module -1		
Management: Characteristics of management, functions of management, importance and purpose of planning process, types of plans **Construction Project Formulation:** Introduction to construction management, project organization, management functions, management styles **Construction Planning and Scheduling:** Introduction, types of project plans, work breakdown structure, Grant Chart, preparation of network diagram- event and activity based and its critical path-critical path method, concept of activity on arrow and activity on node.	10 hours	L1,L2,L3
Module -2		
Resource Management: Basic concepts of resource management, class of labour, Wages & statutory requirement, Labour Production rate or Productivity, Factors affecting labour output or productivity. **Construction Equipments:** classification of construction equipment, estimation of productivity for: excavator, dozer, compactors, graders and dumpers. Estimation of ownership cost, operational and maintenance cost of construction equipments. Selection of construction equipment and basic concept on equipment maintenance **Materials:** material management functions, inventory management.	10 Hours	L1,L2,L3
Module -3		
Construction Quality , safety and Human Values: Construction quality process, inspection, quality control and quality assurance, cost of quality, ISO standards. Introduction to concept of Total Quality Management **HSE:** Introduction to concepts of HSE as applicable to Construction. Importance of safety in construction , Safety measures to be taken during Excavation , Explosives , drilling and blasting , hot bituminous works , scaffolds / platforms / ladder , form work and equipment operation. Storage of materials. Safety through legislation, safety campaign. Insurances. **Ethics :** Morals, values and ethics, integrity, trustworthiness , work ethics, need of engineering ethics, Professional Duties, Professional and Individual Rights, Confidential and Proprietary Information, Conflict of Interest Confidentiality, Gifts and Bribes, Price Fixing, Whistle Blowing.	10 Hours	L1,L2,L3
Module -4		
Introduction to engineering economy : Principles of engineering economics, concept on Micro and macro analysis, problem solving and decision making. **Interest and time value of money:** concept of simple and compound interest, interest formula for: single payment, equal payment and uniform gradient series. Nominal and effective interest rates, deferred annuities, capitalized cost. **Comparison of alternatives :** Present worth, annual equivalent , capitalized and rate of return methods , Minimum Cost analysis and break even analysis	10 Hours	L1,L2,L3

Module -5		
Entrepreneurship: Evolution of the concept, functions of an entrepreneur, concepts of entrepreneurship, stages in entrepreneurial process, different sources of finance for entrepreneur, central and state level financial institutions. **Micro, Small & Medium Enterprises (MSME):** definition, characteristics, objectives, scope, role of MSME in economic development, advantages of MSME, Introduction to different schemes: TECKSOK, KIADB, KSSIDC, DIC, Single Window Agency: SISI, NSIC, SIDBI, KSFC **Business Planning Process:** Business planning process, marketing plan, financial plan, project report and feasibility study, guidelines for preparation of model project report for starting a new venture. Introduction to international entrepreneurship opportunities , entry into international business , exporting , direct foreign investment , venture capital	10 Hours	L1,L2,L3

Course Outcomes: After studying this course, students will be able to:

1. Understand the construction management process.
2. Understand and solve variety of issues that are encountered by every professional in discharging professional duties.
3. Fulfill the professional obligations effectively with global outlook

Program Objectives:

- Engineering knowledge
- Problem analysis
- Interpretation of data

Question Paper Pattern:

- The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks
- There will be two full questions (with a maximum of three subdivisions, if necessary) from each module.
- Each full question shall cover the topics as a module
- The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Text Books:

1. P C Tripathi and P N Reddy, "Principles of Management", Tata McGraw-Hill Education
2. Chitkara, K.K, "Construction Project Management: Planning Scheduling and Control", Tata McGraw-Hill Publishing Company, New Delhi.
3. Poornima M. Charantimath , "Entrepreneurship Development and Small Business Enterprise", Dorling Kindersley (India) Pvt. Ltd., Licensees of Pearson Education
4. Dr. U.K. Shrivastava "Construction Planning and Management", Galgotia publications Pvt. Ltd. New Delhi.
5. Bureau of Indian standards – IS 7272 (Part-1)- 1974 : Recommendations for labour output constant for building works :

Reference Books:

1. Robert L Peurifoy, Clifford J. Schexnayder, Aviad Shapira, Robert Schmitt, "Construction Planning, Equipment, and Methods (Civil Engineering), McGraw-Hill Education
2. Harold Koontz, Heinz Weihrich, "Essentials of Management: An International, Innovation, and Leadership perspective", T.M.H. Edition, New Delhi
3. Frank Harris, Ronald McCaffer with Francis Edum-Fotwe, " Modern Construction Management", Wiley-Blackwell
4. Mike Martin, Roland Schinzinger, "Ethics in Engineering", McGraw-Hill Education
5. Chris Hendrickson and Tung Au, "Project Management for Construction - Fundamentals Concepts for Owners, Engineers, Architects and Builders", Prentice Hall, Pitsburgh
6. James L.Riggs , David D. Bedworth , Sabah U. Randhawa " Engineerng Economics" 4 ed tata Mc Graw hill.
7. S.C Sharma –"Construction Equipments and its management" – Khanna publishers

Course Title: Design of Steel Structural Elements
As per Choice Based Credit System (CBCS) scheme]
SEMESTER:VI

Subject Code	15CV62	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03
CREDITS –04		**Total Marks- 100**	

Course Objectives: This course will enable students to

1. Understand advantages and disadvantages of steel structures, steel code provisions, and plastic behaviour of structural steel.
2. Learn Bolted connections and Welded connections.
3. Design of compression members, built-up columns and columns splices.
4. Design of tension members, simple slab base and gusseted base.
5. Design of laterally supported and un-supported steel beams.

Modules	**Teaching Hours**	**Revised Bloom's Taxonomy (RBT) Level**
Module -1		
Introduction: Advantages and Disadvantages of Steel Structures, Limit state method Limit State of Strength, Structural Stability, Serviceability Limit states, Failure Criteria of steel, Design Consideration, Loading and load combinations, IS code provisions, Specification and Section classification. **Plastic Behaviour of Structural Steel:** Introduction, Plastic theory, Plastic Hinge Concept, Plastic collapse load, load factor, Shape factor, Theorem of plastic collapse, Methods of Plastic analysis, Plastic analysis of Continuous Beams.	10 hours	L1,L2,L3
Module -2		
Bolted Connections: Introduction, Types of Bolts, Behaviour of bolted joints, Design of High Strength friction Grip(HSFG) bolts, Design of Simple bolted Connections (Lap and Butt joints) **Welded Connections:** Introduction, Types and properties of welds, Effective areas of welds, Weld Defects, Simple welded joints for truss member, Advantages and Disadvantages of Bolted and Welded Connections.	10 Hours	L1,L2,L3
Module -3		
Design of Compression Members: Introduction, Failure modes, Behaviour of compression members, Sections used for compression members, Effective length of compression members, Design of compression members and built up Compression members, Design of Laced and Battened Systems.	10 Hours	L1,L2,L3
Module -4		
Design of Tension Members: Introduction, Types of Tension members, Slenderness ratio, Modes of Failure, Factors affecting the strength of tension members, Design of Tension members and Lug angles, Splices, Gussets. **Design of Column Bases:** Design of Simple Slab Base and Gusseted Base.	10 Hours	L1,L2,L3
Module -5		
Design of Beams: Introduction, Beam types, Lateral Stability of beams, factors affecting lateral stability, Behaviour of Beams in Bending, Design strength of laterally supported beams in Bending, Design of Laterally unsupported Beams [No Numerical Problems], Shear Strength of Steel Beams. Beam to Beam Connections, Beam to Column Connection and Column Splices [No Numerical Problems]	10 Hours	L1,L2,L3

Course Outcomes: After studying this course, students will be able to:

1. Possess a knowledge of Steel Structures Advantages and Disadvantages of Steel structures, steel code provisions and plastic behaviour of structural steel
2. Understand the Concept of Bolted and Welded connections.
3. Understand the Concept of Design of compression members, built-up columns and columns splices.
4. Understand the Concept of Design of tension members, simple slab base and gusseted base.
5. Understand the Concept of Design of laterally supported and un-supported steel beams.

Program Objectives:

Engineering knowledge
Problem analysis
Interpretation of data

Question Paper Pattern:

The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks
There will be two full questions (with a maximum of three subdivisions, if necessary) from each module.
Each full question shall cover the topics as a module

The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Text Books:

1. N Subramanian., "Design of Steel Structures" (2016), Oxford University Press, New Delhi.
2. Duggal S K., "Limit State Method of Design of Steel Structures", Tata McGraw Hill, New Delhi

Reference Books:

1. Dayarathnam P, "Design of Steel Structures", S Chand and Company Ltd., New Delhi.
2. Kazim S M A and Jindal R S, "Design of Steel Structures", Prentice Hall of India, New Delhi.
3. IS 800-2007: General Construction in Steel Code Practice (Third revision), Bureau of Indian Standards, New Delhi.

Course Title: Alternative Building Materials
As per Choice Based Credit System (CBCS) scheme]
SEMESTER:VI

Subject Code	15CV653	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03
	CREDITS –03	**Total Marks- 100**	

Course objectives: This Course will enable students to:
1. understand environmental issues due to building materials and the energy consumption in manufacturing building materials
2. study the various masonry blocks, masonry mortar and structural behavior of masonry under compression.
3. Study the alternative building materials in the present context.
4. understand the alternative building technologies which are followed in present construction field.

Modules	**Teaching Hours**	**Revised Bloom's Taxonomy (RBT) Level**
Module -1		
Introduction: Energy in building materials, Environmental issues concerned to building materials, Embodied energy and life-cycle energy, Global warming and construction industry, Green concepts in buildings, Green building ratings – IGBC and LEED manuals – mandatory requirements, Rainwater harvesting & solar passive architecture. Environmental friendly and cost effective building technologies, Requirements for buildings of different climatic regions	8 hours	L1,L2,L3
Module -2		
Elements of Structural Masonry : Elements of Structural Masonry, Masonry materials, requirements of masonry units' characteristics of bricks, stones, clay blocks, concrete blocks, stone boulders, laterite Blocks, Fal- G blocks and Stabilized mud block. Manufacture of stabilized blocks. **Structural Masonry Mortars:** Mortars, cementations materials, sand, natural & manufactured, types of mortars, classification of mortars as per BIS, characteristics and requirements of mortar, selection of mortar. Uses of masonry, masonry bonding, Compressive strength of masonry elements, Factors affecting compressive strength, Strength of Prisms/wallets and walls, Effect of brick bond on strength, Bond strength of masonry: Flexure and shear, Elastic properties of masonry materials and masonry, Design of masonry compression elements subjected to axial load.	8 Hours	L1,L2,L3
Module -3		
Alternative Building Materials: Lime, Pozzolana cements, Raw materials, Manufacturing process, Properties and uses. Fibers- metal and synthetic, Properties and applications. Fiber reinforced plastics, Matrix materials, Fibers organic and synthetic, Properties and applications. Building materials from agro and industrial wastes ,Types of agro wastes, Types of industrial and mine wastes, Properties and applications. Masonry blocks using industrial wastes. Construction and demolition wastes	8 Hours	L1,L2,L3
Module -4		
Alternative Building Technologies: Use of arches in foundation, alternatives for wall constructions, composite masonry, confined masonry, cavity walls, rammed earth, Ferro cement and ferroconcrete building components, Materials and specifications, Properties, Construction methods, Applications. Top down construction, Mivan Construction Technique. **Alternative Roofing Systems:** Concepts, Filler slabs, Composite beam panel roofs, Masonry vaults and domes	8 Hours	L1,L2,L3
Module -5		

Equipment for Production of Alternative Materials: Machines for manufacture of concrete, Equipments for production of stabilized blocks, Moulds and methods of production of precast elements, Cost concepts in buildings, Cost saving techniques in planning, design and construction, Cost analysis: Case studies using alternatives.	8 Hours	L1,L2,L3

Course Outcomes: After studying this course, students will be able to:

1. Solve the problems of Environmental issues concerned to building materials and cost effective building technologies;
2. Suggest appropriate type of masonry unit and mortar for civil engineering constructions; also they are able to Design Structural Masonry Elements under Axial Compression.
3. Analyse different alternative building materials which will be suitable for specific climate and in an environmentally sustainable manner. Also capable of suggesting suitable agro and industrial wastes as a building material.
4. Recommend various types of alternative building materials and technologies and design a energy efficient building by considering local climatic condition and building material.

Program Objectives:

Engineering knowledge
Problem analysis
Interpretation of data

Question paper pattern:

The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks
There will be two full questions (with a maximum of three subdivisions, if necessary) from each module.
Each full question shall cover the topics as a module

The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Text Books:

1. KS Jagadish, BV Venkatarama Reddy and KS Nanjunda Rao, “Alternative Building Materials and Technologies”, New Age International pub.
2. Arnold W Hendry, “Structural Masonry”, Macmillan Publishers

Reference Books:

1. RJS Spence and DJ Cook, “Building Materials in Developing Countries”, Wiley pub.
2. LEED India, Green Building Rating System, IGBC pub.
3. IGBC Green Homes Rating System, CII pub.
4. Relevant IS Codes.

Course Title: Software Application Lab
As per Choice Based Credit System (CBCS) scheme]
SEMESTER:VI

Subject Code	15CVL67	IA Marks	20
Number of Lecture Hours/Week	1I+2P	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03
CREDITS –02		**Total Marks- 100**	

Course objectives: This course will enable students to
1. Use industry standard software in a professional set up.
2. understand the elements of finite element modeling, specification of loads and boundary condition, performing analysis and interpretation of results for final design
3. Develop customized automation tools

Modules	**Teaching Hours**	**Revised Bloom's Taxonomy (RBT) Level**
Module -1		
Use of civil engineering softwares: Use of softwares for: 1. Analysis of plane trusses, continuous beams, portal frames 2. 3D analysis of multistoried frame structures	18 hours	L1,L2,L3
Module -2		
1. **Project Management- Exercise on Project planning and scheduling of a building project using any project management software:** a. Understanding basic features of Project management software b. Constructing Project: create WBS, Activities, and tasks and Computation Time using Excel spread sheet and transferring the same to Project management software. c. Identification of Predecessor and Successor activities with constrain d. Constructing Network diagram (AON Diagram) and analyzing for Critical path, Critical activities and Other non Critical paths, Project duration, Floats. e. Study on various View options available f. Basic understanding about Resource Creation and allocation g. Understanding about Splitting the activity, Linking multiple activity, assigning Constrains, Merging Multiple projects, Creating Baseline Project (9hrs) **1. GIS applications using open source software:** a. To create shape files for point, line and polygon features with a map as reference. b. To create decision maps for specific purpose. (3hrs)	12 hours	L1,L2,L3
Module -3		
Use of EXCEL spread sheets: Design of singly reinforced and doubly reinforced rectangular beams, design of one way and two way slabs, computation of earthwork, Design of horizontal curve by offset method, Design of super elevation	10 Hours	L1,L2,L3

Course Outcomes: After studying this course, students will be able to:

use software skills in a professional set up to automate the work and thereby reduce cycle time for completion of the work

Program Objectives:
- Engineering knowledge
- Problem analysis
- Interpretation of data

Question paper pattern:
- The question paper will have 3 modules comprising of 6 questions.
- There will be two full questions (with a maximum of three subdivisions, if necessary) from each module.
- Each full question shall cover the topics as a module
- Module-1: 40 Marks, Module-2: 20 Marks, Module-3: 20 Marks
- The students shall answer three full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Reference Books: Training manuals and User manuals and Relevant course reference books

Course Title: Design of RCC and Steel Structures
As per Choice Based Credit System (CBCS) scheme]
SEMESTER:VII

Subject Code	15CV72	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03
CREDITS –04		**Total Marks- 100**	

Course objectives: This course will enable students to

1. Provide basic knowledge in the areas of limit state method and concept of design of RC and Steel structures
2. Identify, formulate and solve engineering problems in RC and Steel Structures
3. Give procedural knowledge to design a system, component or process as per needs and specifications of RC Structures like Retaining wall, Footing, Water tanks, Portal Frames and Steel Structures like Roof Truss, Plate Girder and Gantry Girder.
4. Imbibe the culture of professional and ethical responsibilities by following codal provisions in the analysis, design of RC and Steel Structures.
5. Provide factual knowledge on analysis and design of RC Structural elements, who can participate and succeed in competitive examinations.

Modules	**Teaching Hours**	**Revised Bloom's Taxonomy (RBT) Level**
Module -1		
Footings: Design of rectangular slab type combined footing. Retaining Walls: Design of cantilever Retaining wall and counter fort retaining wall. Water Tanks: Design of circular water tanks resting on ground (Rigid and Flexible base). Design of rectangular water tanks resting on ground. **As per IS: 3370 (Part IV)** Design of portal frames with fixed and hinged based supports.	25 hours	L1,L2,L3
Module -2		
Roof Truss: Design of roof truss for different cases of loading, forces in members to given. Plate Girder: Design of welded plate girder with intermediate stiffener, bearing stiffener and necessary checks Gantry Girder: Design of gantry girder with all necessary checks	25 Hours	L1,L2,L3

Course Outcomes: After studying this course, students will be able to:

Students will acquire the basic knowledge in design of RCC and Steel Structures.

Students will have the ability to follow design procedures as per codal provisions and skills to arrive at structurally safe RC and Steel members.

Program Objectives:

Engineering knowledge
Problem analysis
Interpretation of data

Question Paper Pattern:

Two questions shall be asked from each module. There can be maximum of three subdivisions in each question, if necessary.
One full question should be answered from each module.
Each question carries 40 marks.
Code books – IS 456, IS 800, IS 3370 (Part IV), SP (6) – Steel Tables, shall be referred for designing
The above charts shall be provided during examinations

Text Books:

1. N Krishna Raju, **"Structural Design and Drawing of Reinforced Concrete and Steel"**, University Press
2. Subramanian N, **"Design of Steel Structures"**, Oxford university Press, New Delhi
3. K S Duggal, **"Design of Steel Structures"**, Tata McGraw Hill, New Delhi

Reference Books:

1. Charles E Salman, Johnson & Mathas, **"Steel Structure Design and Behaviour"**, Pearson Publications
2. Nether Cot, et.al, **"Behaviour and Design of Steel Structures to EC -III"**, CRC Press
3. P C Verghese, **"Limit State Design of Reinforced Concrete"**, PHI Publications, New Delhi
4. S N Sinha, **"Reinforced Concrete Design"**, McGraw Hill Publication

Course Title: Design Concept of Building Services
As per Choice Based Credit System (CBCS) scheme]
SEMESTER:VII

Subject Code	15CV743	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03
	CREDITS –03	**Total Marks- 100**	

Course Objectives: This course will enable students to

1. learn the importance of sanitation, domestic water supply, plumbing and fire services
2. Understand the concepts of heat, ventilation and air conditioning
3. Develop technical and practical knowledge in Building Services.

Modules	**Teaching Hours**	**Revised Bloom's Taxonomy (RBT) Level**
Module -1		
Water Supply, Drainage and Solid Waste Disposal: Water requirements for different types of buildings, simple method of removal of impurities, water saving practices and their potential Service connection from mains, sump and storage tank, types and sizes of pipes, special installation in multistoried buildings. Material, types of fixtures and fitting for a contemporary bathroom– taps –quarter turn, half turn, ceramic, foam flow etc, hot water mixer, hand shower Rainwater harvesting to include roof top harvesting, type of spouts, sizes of rainwater pipes and typical detail of a water harvesting pit Principles of drainage, surface drainage, shape and sizes of drains and sewers, storm water over flow chambers, methods of laying and construction of sewers Approaches for solid waste management, Solid wastes collection and removal from buildings. On-site processing and disposal methods	8 hours	L1,L2
Module -2		
Heat Ventilation and Air Conditioning (HVAC): Behaviour of heat propagation, thermal insulating materials and their co-efficient of thermal conductivity. General methods of thermal insulation: Thermal insulation of roofs, exposed walls. Ventilation: Definition and necessity, system of ventilation. Principles of air conditioning, Air cooling, Different systems of ducting and distribution, Essentials of air-conditioning system.	8 Hours	L1,L2
Module -3		
Electrical and Fire Fighting Services: Electrical systems, Basics of electricity, single/Three phase supply, protective devices in electrical installation, Earthing for safety, Types of earthing, ISI Specifications. Electrical installations in buildings, Types of wires, Wiring systems and their choice , planning electrical wiring for building, Main and distribution boards, Principles of illumination, Classification of buildings based on occupancy, causes of fire and spread of fire, Standard fire, Fire fighting, protection and fire resistance, Firefighting equipment and different methods of fighting fire., means of escape, alarms, etc., Combustibility of materials, Structural elements and fire resistance, Fire escape routes and elements, planning and design. Wet risers, dry risers, sprinklers, heat detector, smoke detectors, fire dampers, fire doors, etc. Provisions of NBC.	8 Hours	L1,L2,L3
Module -4		
Plumbing and Fire Fighting Layout of Simple Buildings: Application of above studies in preparing layout and details - Plumbing layout of residential and public buildings, Fire fighting layout, Reflected ceiling plan of smoke detectors / sprinklers, etc.	8 Hours	L2,L3

Module -5		
Engineering Services: engineering services in a building as a system, Lifts, escalators, cold and hot water systems, waste water systems and electrical systems. Pumps and Machineries: Reciprocating, Centrifugal, Deep well, Submersible, Automatic pumps, Sewerage pumps, Compressors, Vacuum pump – their selection, installation and maintenance – Hot water boilers – Classification and types of lifts, lift codes, rules structural provision: escalators, their uses, types and sizes, safety norms to be adopted – Social features required for physically handicapped and elderly, DC/AC motors, Generators, **Building Maintenance**: Preventive and protective maintenance, Scheduled and contingency maintenance planning, M.I.S. for building maintenance. Maintenance standards. Economic maintenance decisions.	8 Hours	L1,L2,L3

Course Outcomes: After studying this course, students will be able to:

1. Describe the basics of house plumbing and waste water collection and disposal.
2. Discuss the safety and guidelines with respect to fire safety.
3. Describe the issues with respect to quantity of water, rain water harvesting and roof top harvesting.
4. Understand and implement the requirements of thermal comfort in buildings

Program Objectives:

Engineering knowledge
Problem analysis
Interpretation of data

Question paper pattern:

The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks
There will be two full questions (with a maximum of three subdivisions, if necessary) from each module.
Each full question shall cover the topics as a module

The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

REFERENCE BOOKS

1. National Building Code
2. Charangith shah, Water supply and sanitary engineering, Galgotia publishers.
3. Kamala & DL Kanth Rao, Environmental Engineering, Tata McGraw Hill publishing co. Ltd.
4. Technical teachers Training Institute (Madras), Environmental Engineering, Tata McGraw Hill publishing Co. Ltd.
5. M.David Egan, Concepts in Building Fire Safety.
6. O.H.Koenigsberger, “Manual of Tropical Housing and Building”, Longman Group United Kingdom
7. V.K.Jain, Fire Safety In Building 2edition, New Age International Publishers
8. E.G.Butcher, Smoke control in Fire-safety Design.
9. E.R.Ambrose, Heat pumps and Electric Heating, John and Wiley and Sons Inc, New York
10. Handbook for Building Engineers in Metric systems, NBC, New Delhi

STRUCTURAL ENGINEERING LAB-1 [As per Choice Based Credit System (CBCS) scheme] SEMESTER – I			
Subject Code	**16CSEL16**	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	42	Exam Hours	03
CREDITS – 02			

Course objectives:
The objective of this course is to make students to learn principles of design of experiments, To investigate the performance of structural elements. To evaluate the different testing methods and equipments.

Modules	Teaching Hours	RBT Level
1. Testing of beams for deflection, flexure and shear *-12 Hrs* 2. Experiments on Concrete, including Mix design *-12 Hrs* 3. Experiments on vibration of multi storey frame models for Natural frequency and modes. *-12 Hrs* 4. Use of Non destructive testing (NDT) equipments – Rebound hammer, Ultra sonic pulse velocity meter and Profometer *-06 Hrs*	**42**	**L_1, L_2, L_3, L_4, L_5, L_6**

Course outcomes:
On completion of this course, students are able to:

- Achieve Knowledge of design and development of experimenting skills.
- Understand the principles of design of experiments
- Design and develop analytical skills.
- Summarize the testing methods and equipments.

EARTHQUAKE RESISTANT STRUCTURES
[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – II

Subject Code	16CSE22	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03

CREDITS – 04

Course objectives:
The objective of this course is to make students to learn principles of engineering seismology, To design the reinforced concrete buildings for earthquake resistance. To evaluate the seismic response of the structures

Modules	Teaching Hours	RBT Level
Module -1		
Introduction to engineering seismology, Geological and tectonic features of India, Origin and propagation of seismic waves, characteristics of earthquake and its quantification – Magnitude and Intensity scales, seismic instruments. Earthquake Hazards in India, Earthquake Risk Evaluation and Mitigation. Structural behavior under gravity and seismic loads, Lateral load resisting structural systems, Requirements of efficient earthquake resistant structural system, damping devises, base isolation systems.	**10 Hours**	**L_1, L_2**
Module -2		
The Response history and strong motion characteristics. Response Spectrum – elastic and inelastic response spectra, tripartite (D-V-A) response spectrum, use of response spectrum in earthquake resistant design. Computation of seismic forces in multi-storied buildings – using procedures (Equivalent lateral force and dynamic analysis) as per IS-1893.	**10 Hours**	**L_2, L_3, L_4, L_5**
Module -3		
Structural Configuration for earthquake resistant design, Concept of plan irregularities and vertical irregularities, Soft storey, Torsion in buildings. Design provisions for these in IS-1893. Effect of infill masonry walls on frames, modeling concepts of infill masonry walls. Behaviour of masonry buildings during	**10 Hours**	**L_2, L_4, L_5**

earthquakes, failure patterns, strength of masonry in shear and flexure, Slenderness concept of masonry walls, concepts for earthquake resistant masonry buildings – codal provisions.		
Module -4		
Design of Reinforced concrete buildings for earthquake resistance-Load combinations, Ductility and energy absorption in buildings. Confinement of concrete for ductility, design of columns and beams for ductility, ductile detailing provisions as per IS-1893. Structural behavior, design and ductile detailing of shear walls.	**10 Hours**	**L_2, L_4, L_5**
Module -5		
Seismic response control concepts – Seismic demand, seismic capacity, Overview of linear and nonlinear procedures of seismic analysis. Performance Based Seismic Engineering methodology, Seismic evaluation and retrofitting of structures.	**10 Hours**	**L_2, L_5, L_6**

Course outcomes:
On completion of this course, students are able to:

- Achieve Knowledge of design and development of problem solving skills.
- Understand the principles of engineering seismology
- Design and develop analytical skills.
- Summarize the Seismic evaluation and retrofitting of structures.
- Understand the concepts of earthquake resistance of reinforced concrete buildings.

Question paper pattern:
- The question paper will have ten questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

REFERENCE BOOKS:

1. Dynamics of Structures – Theory and Application to Earthquake Engineering- 2nd ed. – Anil K. Chopra, Pearson Education.
2. Earthquake Resistant Design of Building Structures, Vinod Hosur, WILEY (india)
3. Earthquake Resistant Design of Structures, Duggal, Oxford University Press
4. Earthquake resistant design of structures - Pankaj Agarwal, Manish Shrikande - PHI India
5. IS – 1893 (Part I): 2002, IS – 13920: 1993, IS – 4326: 1993, IS-13828: 1993
6. Design of Earthquake Resistant Buildings, Minoru Wakabayashi, McGraw Hill Pub.
7. Seismic Design of Reinforced Concrete and Masonry Buildings, T Paulay and M J N Priestley, John Wiley and Sons

FINITE ELEMENT METHOD OF ANALYSIS

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – II

Subject Code	16CSE23	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03

CREDITS – 04

Course objectives:
The objective of this course is to make students to learn principles of Analysis of Stress and Strain, To apply the Finite Element Method for the analysis of one and two dimensional problems. To evaluate the stress and strain parameters and their inter relations of the continuum.

Modules	**Teaching Hours**	**RBT Level**
Module -1		
Basic concepts of elasticity – Kinematic and Static variables for various types of structural problems – approximate method of structural analysis – Rayleigh – Ritz method – Finite difference method – Finite element method. Variation method and minimization of Energy approach of element formulation. Principles of finite element method – advantages & disadvantages – Finite element procedure. Finite elements used for one, two & three dimensional problems – Element aspect ratio – mesh refinement vs. higher order elements – Numbering of nodes to minimize band width.	**10 Hours**	**L_1, L_2**
Module -2		
Nodal displacement parameters – Convergence criterion – Compatibility requirements – Geometric invariance – Shape function – Polynomial form of displacement function. Generalized and Natural coordinates – Lagrangian interpolation function – shape functions for one, two & three dimensional elements.	**10 Hours**	**L_1, L_2, L_4, L_5**
Module -3		
Isoparametric elements, Internal nodes and higher order elements, Serendipity and Lagrangian family of Finite Elements, Sub-parametric and Super-parametric elements, Condensation of internal nodes, Jacobian transformation Matrix. Development of strain-displacement matrix and stiffness matrix, consistent load vector, numerical integration.	**10 Hours**	**L_1, L_2, L_4, L_5**

Module -4		
Application of Finite Element Method for the analysis of one & two dimensional problems, Analysis of simple beams and plane trusses, Application to plane stress / strain / axisymmetric problems using CST & Quadrilateral Elements	**10 Hours**	**L_1, L_2, L_3, L_4, L_5**
Module -5		
Application to Plates & Shells, Choice of displacement function (C^0, C^1 and C^2 type), Techniques for Non – linear Analysis.	**10 Hours**	**L_1, L_2**

Course outcomes:
On completion of this course, students are able to:

- Achieve Knowledge of design and development of problem solving skills.
- Understand the principles of stress-strain behaviour of continuum
- Design and develop analytical skills.
- Describe the state of stress in a continuum
- Understand the concepts of elasticity and plasticity.

Question paper pattern:
- The question paper will have ten questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

REFERENCE BOOKS:

1. Krishnamoorthy C S, “Finite Element Analysis”- Tata McGraw Hill
2. Desai C and Abel J F, “Introduction to the Finite Element Method”- East West Press Pvt. Ltd., 1972
3. Bathe K J, “Finite Element Procedures in Engineering Analysis”- Prentice Hall
4. Rajasekaran. S, “Finite Element Analysis in Engineering Design”-Wheeler Publishing
5. Cook R D, Malkan D S & Plesta M.E, “Concepts and Application of Finite Element Analysis” - 3rd Edition, John Wiley and Sons Inc., 1989
6. Shames I H and Dym C J, “Energy and Finite Element Methods in Structural Mechanics”- McGraw Hill, New York, 1985

DESIGN CONCEPTS OF SUBSTRUCTURES

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – II

Subject Code	16CSE24	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03

CREDITS – 04

Course objectives:
The objective of this course is to make students to learn principles of subsoil exploration, To design the sub structures. To evaluate the soil shear strength parameters.

Modules	Teaching Hours	RBT Level
Module -1		
Introduction, Site investigation, In-situ testing of soils, Subsoil exploration, Classification of foundations systems. General requirement of foundations, Selection of foundations, Computations of Loads, Design concepts.	**10 Hours**	**L_2, L_4, L_5**
Module -2		
Concept of soil shear strength parameters, Settlement analysis of footings, Shallow foundations in clay, Shallow foundation in sand & C-Φ soils, Footings on layered soils and sloping ground, Design for Eccentric or Moment Loads.	**10 Hours**	**L_2, L_4, L_5**
Module -3		
Types of rafts, bearing capacity & settlements of raft foundation, Rigid methods, Flexible methods, soil-structure interaction, different methods of modeling the soil. Combined footings (rectangular & trapezoidal), strap footings & wall footings, Raft – super structure interaction effects & general concepts of structural design, Basement slabs	**10 Hours**	**L_2, L_4, L_5**
Module -4		
Deep Foundations: Load Transfer in Deep Foundations, Types of Deep Foundations, Ultimate bearing capacity of different types of piles in different soil conditions, Laterally loaded piles, tension piles & batter piles, Pile groups: Bearing capacity, settlement, uplift capacity, load distribution between piles, Proportioning and design concepts of piles.	**10 Hours**	**L_2, L_3, L_4, L_5**
Module -5		
Types of caissons, Analysis of well foundations,	**10 Hours**	**L_2, L_3, L_4,**

Design principles, Well construction and sinking. Foundations for tower structures: Introduction, Forces on tower foundations, Selection of foundation type, Stability and design considerations, Ring foundations – general concepts.		L_5

Course outcomes:

On completion of this course, students are able to:

- Achieve Knowledge of design and development of problem solving skills.
- Understand the principles of subsoil exploration
- Design and develop analytical skills.
- Identify and evaluate the soil shear strength parameters.
- Understand the concepts of Settlement analysis.

IMPORTANT NOTE:

Only design principles of all type footings as per relevant BIS codes are to be covered, design of RC elements need not be

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

REFERENCE BOOKS:

1. Swami Saran – "**Analysis & Design of Substructures**"- Oxford & IBH Pub. Co. Pvt. Ltd., 1998.
2. Nainan P Kurian – "**Design of Foundation Systems**"- Narosa Publishing House, 1992.
3. R.B. Peck, W.E. Hanson & T.H. Thornburn – "**Foundation Engineering"-** Wiley Eastern Ltd.,Second Edition, 1984.
4. J.E. Bowles – "**Foundation Analysis and Design**"- McGraw-Hill Int. Editions, Fifth Ed., 1996.
5. W.C. Teng – "**Foundation Design"-** Prentice Hall of India Pvt. Ltd., 1983.
6. Bureau of Indian Standards:IS-1498, IS-1892, IS-1904, IS-6403, IS-8009, IS-2950, IS-11089, IS-11233, IS-2911 and all other relevant codes

STRUCTURAL ENGINEERING LAB-II [As per Choice Based Credit System (CBCS) scheme] SEMESTER – II			
Subject Code	16CSEL26	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	42	Exam Hours	03
CREDITS – 02			

Course objectives:

The objective of this course is to make students to learn principles of design of experiments, To investigate the performance of structural elements. To evaluate the different testing methods and equipments

Modules	Teaching Hours	RBT Level
1. Static and Dynamic analysis and design of Multistory Building structures using software (ETABS / STAADPRO) 2. Design of RCC and Steel Tall structures using software (ETABS / STAADPRO) 3. Analysis of folded plates and shells using software. 4. Preparation of EXCEL sheets for structural design.	**42 Hours**	**L_1, L_2, L_3, L_4, L_5, L_6**

Course outcomes:

On completion of this course, students are able to:

- Achieve Knowledge of design and development of programming skills.
- Understand the principles of structural analysis and design
- Design and develop analytical skills.
- Summarize the performance of structures for static and dynamic forces.

DESIGN OF CONCRETE BRIDGES
[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – IV

Subject Code	16CSE 41	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03

CREDITS – 04

Course objectives:

The objective of this course is to make students to learn principles of Structural Design, To design different types of structures and to detail the structures. To evaluate performance of the structures.

Modules	Teaching Hours	RBT Level
Module -1		
Introduction: Historical Developments, Site Selection for Bridges, Classification of Bridges Forces on Bridges. Bridge substructures: Abutments, piers and wing walls Balanced Cantilever Bridge: Introduction and proportioning of components, Design of simply supported portion and design of cantilever portion, design of articulation	**10 Hours**	**L_1, L_2, L_3, L_4**
Module -2		
Box Culvert: Different Loading Cases IRC Class AA Tracked, Wheeled and Class A Loading, working out the worst combination of loading, Moment Distribution, Calculation of BM & SF, Structural Design of Slab Culvert, with Reinforcement Details.	**10 Hours**	**L_2, L_3, L_4**
Module -3		
T Beam Bridge Slab Design: Proportioning of Components Analysis of interior Slab & Cantilever Slab Using IRC Class AA Tracked, Wheeled Class A Loading, Structural Design of Slab, with Reinforcement Detail. T Beam Bridge Cross Girder Design: Analysis of Cross Girder for Dead Load & Live Load Using IRC Class AA Tracked, Wheeled Class A Loading A Loads, Structural Design of Beam, with Reinforcement Detail.	**10 Hours**	**L_2, L_3, L_4**
Module -4		
T Beam Bridge Main Girder Design: Analysis of Main Girder for Dead Load & Live Load Using IRC Class AA Tracked, Wheeled Class A Loading Using COURBON'S Method, Analysis of Main Girder Using HENDRY-JAEGER and MORICE-LITTLE Method for IRC Class AA Tracked vehicle only, BM & SF for	**10 Hours**	**L_2, L_3, L_4**

different loads, Structural Design of Main Girder With Reinforcement Details		
Module -5		
PSC Bridges: Introduction to Pre and Post Tensioning, Proportioning of Components, Analysis and Structural Design of Slab, Analysis of Main Girder using COURBON's Method for IRC Class AA tracked vehicle, Calculation of pre-stressing force, cable profile and calculation of stresses, Design of End block and detailing of main girder	**10 Hours**	**L_1, L_2, L_3, L_4**

Course outcomes:

On completion of this course, students are able to:

- Achieve Knowledge of design and development of problem solving skills.
- Understand the principles of optimization.
- Design and develop analytical skills.
- Summarize the Linear, Non-linear and Geometric Programming
- Understands the concept of Dynamic programming

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

REFERENCE BOOKS:

1. "Essentials of Bridge Engineering"- D Johnson Victor, Oxford & IBH Publishing Co New Delhi
2. "Design of Bridges"- N Krishna Raju, Oxford & IBH Publishing Co New Delhi
3. "Principles and Practice of Bridge Engineering"- S P Bindra Dhanpat Rai & Sons New Delhi
4. IRC 6 – 1966 "Standard Specifications And Code Of Practice For Road Bridges"- Section II Loads and Stresses, The Indian Road Congress New Delhi
5. IRC 21 – 1966 "Standard Specifications And Code Of Practice For Road Bridges"-Section III Cement Concrete (Plain and reinforced) The Indian Road Congress New Delhi
6. IS 456 – 2000 "Indian Standard Plain and Reinforced Concrete Code of Practice"- (Fourth Revision) BIS New Delhi
7. IS 1343 – "Indian Standard Prestressed Concrete Code of Practice"- BIS New Delhi
8. Raina V.K., "Concrete Bridge Practice"- Tata McGraw Hill
9. Bakht B & Jaeggar, "Bridge Analysis Simplified"- McGraw Hill
10. Ponnuswamy. S, "Bridge Engineering"- Tata McGraw Hill.
11. Derrick Beckett, "An Introduction to Structural Design of Concrete Bridges"- Surrey University Press

DESIGN OF MASONRY STRUCTURES [As per Choice Based Credit System (CBCS) scheme] SEMESTER – IV			
Subject Code	16CSE 424	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03
CREDITS – 03			

Course objectives:
The objective of this course is to make students to learn performance of masonry structures, To design the masonry structures for earthquake resistance. To evaluate the strength and stability of the masonry structures.

Modules	Teaching Hours	RBT Level
Module -1		
Introduction, Masonry units, materials and types: History of masonry Characteristics of Brick, stone, clay block, concrete block, stabilized mud block masonry units – strength, modulus of elasticity and water absorption. Masonry materials – Classification and properties of mortars, selection of mortars.	**8 Hours**	**L_1, L_2**
Module -2		
Strength of Masonry in Compression: Behaviour of Masonry under compression, strength and elastic properties, influence of masonry unit and mortar characteristics, effect of masonry unit height on compressive strength, influence of masonry bonding patterns on strength, prediction of strength of masonry in Indian context, Failure theories of masonry under compression. Effects of slenderness and eccentricity, effect of rate of absorption, effect of curing, effect of ageing, workmanship on compressive strength	**8 Hours**	**L_1, L_2, L_4**
Module -3		
Flexural and shear bond, flexural strength and shear strength: Bond between masonry unit and mortar, tests for determining flexural and shear bond strengths, factors affecting bond strength, effect of bond strength on compressive strength, orthotropic strength properties of masonry in flexure, shear strength of masonry, test procedures for evaluating flexural and shear strength	**8 Hours**	**L_1, L_2, L_4**

Module -4		
Design of load bearing masonry buildings: Permissible compressive stress, stress reduction and shape reduction factors, increase in permissible stresses for eccentric vertical and lateral loads, permissible tensile and shear stresses, Effective height of walls and columns, opening in walls, effective length, effective thickness, slenderness ratio, eccentricity, load dispersion, arching action, lintels; Wall carrying axial load, eccentric load with different eccentricity ratios, wall with openings, freestanding wall; Design of load bearing masonry for buildings up to 3 to 8 storeys using BIS codal provisions	**8 Hours**	**L_1, L_2, L_3, L_4**
Module -5		
Earthquake resistant masonry buildings: Behaviour of masonry during earthquakes, concepts and design procedure for earthquake resistant masonry, BIS codal provisions. Masonry arches, domes and vaults: Components and classification of masonry arches, domes and vaults, historical buildings, construction procedure	**8 Hours**	**L_1, L_2, L_4**

Course outcomes:

On completion of this course, students are able to:

- Achieve Knowledge of design and development of problem solving skills.
- Understand the principles of design and construction of masonry structures
- Design and develop analytical skills.
- Summarize the masonry Characteristics.
- Evaluate the strength and stability of the masonry structures.

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

REFERENCE BOOKS:

1. Hendry A.W., “Structural masonry”- Macmillan Education Ltd., 2^{nd} edition
2. Sinha B.P & Davis S.R., “Design of Masonry structures”- E & FN Spon
3. Dayaratnam P, “Brick and Reinforced Brick Structures”- Oxford & IBH
4. Curtin, “Design of Reinforced and Prestressed Masonry”- Thomas Telford
5. Sven Sahlin, “Structural Masonry”-Prentice Hall
6. Jagadish K S, Venkatarama Reddy B V and Nanjunda Rao K S, “Alternative Building Materials and Technologies”-New Age International, New Delhi & Bangalore
7. IS 1905, BIS, New Delhi.
8. SP20(S&T),New Delhi

SOFTWARE ENGINEERING

[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2016 -2017)
SEMESTER – IV

Subject Code	15CS42	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03

CREDITS – 04

Course objectives: This course will enable students to

- Outline software engineering principles and activities involved in building large software programs.
- Identify ethical and professional issues and explain why they are of concern to software engineers.
- Describe the process of requirements gathering, requirements classification, requirements specification and requirements validation.
- Differentiate system models, use UML diagrams and apply design patterns.
- Discuss the distinctions between validation testing and defect testing.
- Recognize the importance of software maintenance and describe the intricacies involved in software evolution.
- Apply estimation techniques, schedule project activities and compute pricing.
- Identify software quality parameters and quantify software using measurements and metrics.
- List software quality standards and outline the practices involved.
- Recognize the need for agile software development, describe agile methods, apply agile practices and plan for agility.

Module 1	Teaching Hours
Introduction: Software Crisis, Need for Software Engineering. Professional Software Development, Software Engineering Ethics. Case Studies. **Software Processes**: Models: Waterfall Model **(Sec 2.1.1)**, Incremental Model **(Sec 2.1.2)** and Spiral Model **(Sec 2.1.3)**. Process activities. **Requirements Engineering**: Requirements Engineering Processes **(Chap 4)**. Requirements Elicitation and Analysis **(Sec 4.5).** Functional and non-functional requirements **(Sec 4.1)**. The software Requirements Document **(Sec 4.2)**. Requirements Specification **(Sec 4.3)**. Requirements validation **(Sec 4.6)**. Requirements Management **(Sec 4.7)**.	**12 Hours**
Module 2	
System Models: Context models **(Sec 5.1)**. Interaction models **(Sec 5.2)**. Structural models **(Sec 5.3)**. Behavioral models **(Sec 5.4)**. Model-driven engineering **(Sec 5.5)**. **Design and Implementation**: Introduction to RUP **(Sec 2.4)**, Design Principles **(Chap 17)**. Object-Oriented design using the UML **(Sec 7.1)**. Design patterns **(Sec 7.2)**. Implementation issues **(Sec 7.3)**. Open source development **(Sec 7.4)**.	**11 Hours**
Module 3	
Software Testing: Development testing **(Sec 8.1)**, Test-driven development **(Sec 8.2)**, Release testing **(Sec 8.3)**, User testing **(Sec 8.4)**. Test Automation **(Page no 42, 70,212, 231,444,695)**. **Software Evolution**: Evolution processes **(Sec 9.1)**. Program evolution dynamics **(Sec 9.2)**. Software maintenance **(Sec 9.3)**. Legacy system management **(Sec 9.4)**.	**9 Hours**

Module 4	
Project Planning: Software pricing **(Sec 23.1)**. Plan-driven development **(Sec 23.2)**. Project scheduling **(Sec 23.3)**: Estimation techniques **(Sec 23.5)**. **Quality management**: Software quality **(Sec 24.1)**. Reviews and inspections **(Sec 24.3)**. Software measurement and metrics **(Sec 24.4)**. Software standards **(Sec 24.2)**	**10 Hours**
Module 5	
Agile Software Development: Coping with Change **(Sec 2.3)**, The Agile Manifesto: Values and Principles. Agile methods: SCRUM (Ref "**The SCRUM Primer, Ver 2.0**") and Extreme Programming **(Sec 3.3)**. Plan-driven and agile development **(Sec 3.2)**. Agile project management **(Sec 3.4),** Scaling agile methods **(Sec 3.5)**:	**8 Hours**

Course Outcomes: After studying this course, students will be able to:

- Design a software system, component, or process to meet desired needs within realistic constraints.
- Assess professional and ethical responsibility
- Function on multi-disciplinary teams
- Use the techniques, skills, and modern engineering tools necessary for engineering practice
- Analyze, design, implement, verify, validate, implement, apply, and maintain software systems or parts of software systems.

Graduate Attributes

- Project Management and Finance
- Conduct Investigations of Complex Problems
- Modern Tool Usage
- Ethics

Question paper pattern:

The question paper will have ten questions.
There will be 2 questions from each module.
Each question will have questions covering all the topics under a module.
The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. Ian Sommerville: Software Engineering, 9th Edition, Pearson Education, 2012.

(Listed topics only from Chapters 1,2,3,4, 5, 7, 8, 9, 23, and 24)

2. The SCRUM Primer, Ver 2.0, http://www.goodagile.com/scrumprimer/scrumprimer20.pdf

Reference Books:

1. Roger S. Pressman: Software Engineering-A Practitioners approach, 7th Edition, Tata McGraw Hill.
2. Pankaj Jalote: An Integrated Approach to Software Engineering, Wiley India

Web Reference for eBooks on Agile:

1. http://agilemanifesto.org/
2. http://www.jamesshore.com/Agile-Book/

COMPUTER NETWORKS [As per Choice Based Credit System (CBCS) scheme] (Effective from the academic year 2016 -2017) SEMESTER – V			
Subject Code	15CS52	IA Marks	20
Number of Lecture Hours/Week	4	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03
CREDITS – 04			

Course objectives: This course will enable students to

- Demonstration of application layer protocols
- Discuss transport layer services and understand UDP and TCP protocols
- Explain routers, IP and Routing Algorithms in network layer
- Disseminate the Wireless and Mobile Networks covering IEEE 802.11 Standard
- Illustrate concepts of Multimedia Networking, Security and Network Management

Module – 1	**Teaching Hours**
Application Layer: Principles of Network Applications: Network Application Architectures, Processes Communicating, Transport Services Available to Applications, Transport Services Provided by the Internet, Application-Layer Protocols. The Web and HTTP: Overview of HTTP, Non-persistent and Persistent Connections, HTTP Message Format, User-Server Interaction: Cookies, Web Caching, The Conditional GET, File Transfer: FTP Commands & Replies, Electronic Mail in the Internet: SMTP, Comparison with HTTP, Mail Message Format, Mail Access Protocols, DNS; The Internet's Directory Service: Services Provided by DNS, Overview of How DNS Works, DNS Records and Messages, Peer-to-Peer Applications: P2P File Distribution, Distributed Hash Tables, Socket Programming: creating Network Applications: Socket Programming with UDP, Socket Programming with TCP. **T1: Chap 2**	**10 Hours**
Module – 2	
Transport Layer : Introduction and Transport-Layer Services: Relationship Between Transport and Network Layers, Overview of the Transport Layer in the Internet, Multiplexing and Demultiplexing: Connectionless Transport: UDP,UDP Segment Structure, UDP Checksum, Principles of Reliable Data Transfer: Building a Reliable Data Transfer Protocol, Pipelined Reliable Data Transfer Protocols, Go-Back-N, Selective repeat, Connection-Oriented Transport TCP: The TCP Connection, TCP Segment Structure, Round-Trip Time Estimation and Timeout, Reliable Data Transfer, Flow Control, TCP Connection Management, Principles of Congestion Control: The Causes and the Costs of Congestion, Approaches to Congestion Control, Network-assisted congestion-control example, ATM ABR Congestion control, TCP Congestion Control: Fairness. **T1: Chap 3**	**10 Hours**
Module – 3	
The Network layer: What's Inside a Router?: Input Processing, Switching, Output Processing, Where Does Queuing Occur? Routing control plane, IPv6,A Brief foray into IP Security, Routing Algorithms: The Link-State (LS) Routing Algorithm, The Distance-Vector (DV) Routing Algorithm, Hierarchical Routing,	**10 Hours**

Routing in the Internet, Intra-AS Routing in the Internet: RIP, Intra-AS Routing in the Internet: OSPF, Inter/AS Routing: BGP, Broadcast Routing Algorithms and Multicast. **T1: Chap 4: 4.3-4.7**	
Module – 4	
Wireless and Mobile Networks: Cellular Internet Access: An Overview of Cellular Network Architecture, 3G Cellular Data Networks: Extending the Internet to Cellular subscribers, On to 4G:LTE,Mobility management: Principles, Addressing, Routing to a mobile node, Mobile IP, Managing mobility in cellular Networks, Routing calls to a Mobile user, Handoffs in GSM, Wireless and Mobility: Impact on Higher-layer protocols. **T1: Chap: 6 : 6.4-6.8**	**10 Hours**
Module – 5	
Multimedia Networking: Properties of video, properties of Audio, Types of multimedia Network Applications, Streaming stored video: UDP Streaming, HTTP Streaming, Adaptive streaming and DASH, content distribution Networks, case studies: : Netflix, You Tube and Kankan. **Network Support for Multimedia:** Dimensioning Best-Effort Networks, Providing Multiple Classes of Service, Diffserv, Per-Connection Quality-of-Service (QoS) Guarantees: Resource Reservation and Call Admission **T1: Chap: 7: 7.1,7.2,7.5**	**10 Hours**
Course outcomes: The students should be able to:	
• Explain principles of application layer protocols • Recognize transport layer services and infer UDP and TCP protocols • Classify routers, IP and Routing Algorithms in network layer • Understand the Wireless and Mobile Networks covering IEEE 802.11 Standard • Describe Multimedia Networking and Network Management	
Question paper pattern: The question paper will have TEN questions. There will be TWO questions from each module. Each question will have questions covering all the topics under a module. The students will have to answer FIVE full questions, selecting ONE full question from each module.	
Text Books:	
1. James F Kurose and Keith W Ross, Computer Networking, A Top-Down Approach, Sixth edition, Pearson,2017 .	
Reference Books:	
1. Behrouz A Forouzan, Data and Communications and Networking, Fifth Edition, McGraw Hill, Indian Edition 2. Larry L Peterson and Brusce S Davie, Computer Networks, fifth edition, ELSEVIER 3. Andrew S Tanenbaum, Computer Networks, fifth edition, Pearson 4. Mayank Dave, Computer Networks, Second edition, Cengage Learning	

DATABASE MANAGEMENT SYSTEM [As per Choice Based Credit System (CBCS) scheme] (Effective from the academic year 2016 -2017) SEMESTER – V			
Subject Code	15CS53	IA Marks	20
Number of Lecture Hours/Week	4	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03
CREDITS – 04			

Course objectives: This course will enable students to

- Provide a strong foundation in database concepts, technology, and practice.
- Practice SQL programming through a variety of database problems.
- Demonstrate the use of concurrency and transactions in database
- Design and build database applications for real world problems.

Module – 1	**Teaching Hours**
Introduction to Databases: Introduction, Characteristics of database approach, Advantages of using the DBMS approach, History of database applications. **Overview of Database Languages and Architectures:** Data Models, Schemas, and Instances. Three schema architecture and data independence, database languages, and interfaces, The Database System environment. **Conceptual Data Modelling using Entities and Relationships:** Entity types, Entity sets, attributes, roles, and structural constraints, Weak entity types, ER diagrams, examples, Specialization and Generalization. **Textbook 1:Ch 1.1 to 1.8, 2.1 to 2.6, 3.1 to 3.10**	**10 Hours**
Module – 2	
Relational Model: Relational Model Concepts, Relational Model Constraints and relational database schemas, Update operations, transactions, and dealing with constraint violations. **Relational Algebra:** Unary and Binary relational operations, additional relational operations (aggregate, grouping, etc.) Examples of Queries in relational algebra. **Mapping Conceptual Design into a Logical Design:** Relational Database Design using ER-to-Relational mapping. **SQL:** SQL data definition and data types, specifying constraints in SQL, retrieval queries in SQL, INSERT, DELETE, and UPDATE statements in SQL, Additional features of SQL. **Textbook 1: Ch4.1 to 4.5, 5.1 to 5.3, 6.1 to 6.5, 8.1; Textbook 2: 3.5**	**10 Hours**
Module – 3	
SQL : Advances Queries: More complex SQL retrieval queries, Specifying constraints as assertions and action triggers, Views in SQL, Schema change statements in SQL. **Database Application Development:** Accessing databases from applications, An introduction to JDBC, JDBC classes and interfaces, SQLJ, Stored procedures, Case study: The internet Bookshop. **Internet Applications:** The three-Tier application architecture, The presentation layer, The Middle Tier **Textbook 1: Ch7.1 to 7.4; Textbook 2: 6.1 to 6.6, 7.5 to 7.7.**	**10 Hours**
Module – 4	
Normalization: Database Design Theory – Introduction to Normalization using Functional and Multivalued Dependencies: Informal design guidelines for relation schema, Functional Dependencies, Normal Forms based on Primary Keys, Second and Third Normal Forms, Boyce-Codd Normal Form, Multivalued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal	**10 Hours**

Form. **Normalization Algorithms:** Inference Rules, Equivalence, and Minimal Cover, Properties of Relational Decompositions, Algorithms for Relational Database Schema Design, Nulls, Dangling tuples, and alternate Relational Designs, Further discussion of Multivalued dependencies and 4NF, Other dependencies and Normal Forms **Textbook 1: Ch14.1 to 14.7, 15.1 to 15.6**	
Module – 5	
Transaction Processing: Introduction to Transaction Processing, Transaction and System concepts, Desirable properties of Transactions, Characterizing schedules based on recoverability, Characterizing schedules based on Serializability, Transaction support in SQL. **Concurrency Control in Databases:** Two-phase locking techniques for Concurrency control, Concurrency control based on Timestamp ordering, Multiversion Concurrency control techniques, Validation Concurrency control techniques, Granularity of Data items and Multiple Granularity Locking. **Introduction to Database Recovery Protocols:** Recovery Concepts, NO-UNDO/REDO recovery based on Deferred update, Recovery techniques based on immediate update, Shadow paging, Database backup and recovery from catastrophic failures **Textbook 1: 20.1 to 20.6, 21.1 to 21.7, 22.1 to 22.4, 22.7.**	**10 Hours**

Course outcomes: The students should be able to:

- Identify, analyze and define database objects, enforce integrity constraints on a database using RDBMS.
- Use Structured Query Language (SQL) for database manipulation.
- Design and build simple database systems
- Develop application to interact with databases.

Question paper pattern:

The question paper will have TEN questions.
There will be TWO questions from each module.
Each question will have questions covering all the topics under a module.
The students will have to answer FIVE full questions, selecting ONE full question from each module.

Text Books:

1. Fundamentals of Database Systems, Ramez Elmasri and Shamkant B. Navathe, 7th Edition, 2017, Pearson.
2. Database management systems, Ramakrishnan, and Gehrke, 3rd Edition, 2014, McGraw Hill

Reference Books:

1. Silberschatz Korth and Sudharshan, Database System Concepts, 6th Edition, Mc-GrawHill, 2013.
2. Coronel, Morris, and Rob, Database Principles Fundamentals of Design, Implementation and Management, Cengage Learning 2012.

OBJECT ORIENTED MODELING AND DESIGN
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2016 -2017)
SEMESTER – V

Subject Code	15CS551	IA Marks	20
Number of Lecture Hours/Week	3	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 03

Course objectives: This course will enable students to

- Describe the concepts involved in Object-Oriented modelling and their benefits.
- Demonstrate concept of use-case model, sequence model and state chart model for a given problem.
- Explain the facets of the unified process approach to design and build a Software system.
- Translate the requirements into implementation for Object Oriented design.
- Choose an appropriate design pattern to facilitate development procedure.

Module – 1	Teaching Hours
Introduction, Modelling Concepts and Class Modelling: What is Object orientation? What is OO development? OO Themes; Evidence for usefulness of OO development; OO modelling history. Modelling as Design technique: Modelling; abstraction; The Three models. Class Modelling: Object and Class Concept; Link and associations concepts; Generalization and Inheritance; A sample class model; Navigation of class models; Advanced Class Modelling, Advanced object and class concepts; Association ends; N-ary associations; Aggregation; Abstract classes; Multiple inheritance; Metadata; Reification; Constraints; Derived Data; Packages. **Text Book-1: Ch 1, 2, 3 and 4**	**8 Hours**
Module – 2	
UseCase Modelling and Detailed Requirements: Overview; Detailed object-oriented Requirements definitions; System Processes-A use case/Scenario view; Identifying Input and outputs-The System sequence diagram; Identifying Object Behaviour-The state chart Diagram; Integrated Object-oriented Models. **Text Book-2:Chapter- 6:Page 210 to 250**	**8 Hours**
Module – 3	
Process Overview, System Conception and Domain Analysis: Process Overview: Development stages; Development life Cycle; System Conception: Devising a system concept; elaborating a concept; preparing a problem statement. Domain Analysis: Overview of analysis; Domain Class model: Domain state model; Domain interaction model; Iterating the analysis. **Text Book-1:Chapter- 10,11,and 12**	**8 Hours**
Module – 4	
Use case Realization :The Design Discipline within up iterations: Object Oriented Design-The Bridge between Requirements and Implementation; Design Classes and Design within Class Diagrams; Interaction Diagrams-Realizing Use Case and defining methods; Designing with Communication Diagrams; Updating the Design Class Diagram; Package Diagrams-Structuring the Major Components; Implementation Issues for Three-Layer Design. **Text Book-2: Chapter 8: page 292 to 346**	**8 Hours**

Module – 5	
Design Patterns: Introduction; what is a design pattern?, Describing design patterns, the catalogue of design patterns, Organizing the catalogue, How design patterns solve design problems, how to select a design patterns, how to use a design pattern; Creational patterns: prototype and singleton (only); structural patterns adaptor and proxy (only). **Text Book-3: Ch-1: 1.1, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8,Ch-3,Ch-4.**	**8 Hours**

Course outcomes: The students should be able to:

- Describe the concepts of object-oriented and basic class modelling.
- Draw class diagrams, sequence diagrams and interaction diagrams to solve problems.
- Choose and apply a befitting design pattern for the given problem.

Question paper pattern:

The question paper will have TEN questions.

There will be TWO questions from each module.

Each question will have questions covering all the topics under a module.

The students will have to answer FIVE full questions, selecting ONE full question from each module.

Text Books:

1. Michael Blaha, James Rumbaugh: Object Oriented Modelling and Design with UML,2nd Edition, Pearson Education,2005
2. Satzinger, Jackson and Burd: Object-Oriented Analysis & Design with the Unified Process, Cengage Learning, 2005.
3. Erich Gamma, Richard Helm, Ralph Johnson and john Vlissides: Design Patterns – Elements of Reusable Object-Oriented Software,
   Pearson Education,2007.

Reference Books:

1. Grady Booch et. al.: Object-Oriented Analysis and Design with Applications,3rd Edition,Pearson Education,2007.
2. 2.Frank Buschmann, RegineMeunier, Hans Rohnert, Peter Sommerlad, Michel Stal: Pattern –Oriented Software Architecture. A system of patterns , Volume 1, John Wiley and Sons.2007.
3. 3. Booch, Jacobson, Rambaugh : Object-Oriented Analysis and Design with Applications, 3rd edition, pearson, Reprint 2013

<table>
<tr><td colspan="4">INTRODUCTION TO SOFTWARE TESTING
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2016 -2017)
SEMESTER – V</td></tr>
<tr><td>Subject Code</td><td>15CS552</td><td>IA Marks</td><td>20</td></tr>
<tr><td>Number of Lecture Hours/Week</td><td>3</td><td>Exam Marks</td><td>80</td></tr>
<tr><td>Total Number of Lecture Hours</td><td>40</td><td>Exam Hours</td><td>03</td></tr>
<tr><td colspan="4">CREDITS – 03</td></tr>
</table>

Course objectives: This course will enable students to

- Differentiate the various testing techniques.
- Analyze the problem and derive suitable test cases.
- Apply suitable technique for designing of flow graph.
- Explain the need for planning and monitoring a process.

<table>
<tr><td>Module – 1</td><td>Teaching Hours</td></tr>
<tr><td>Basics of Software Testing: Basic definitions, Software Quality , Requirements, Behaviour and Correctness, Correctness versus Reliability, Testing and Debugging, Test cases, Insights from a Venn diagram, Identifying test cases, Test-generation Strategies, Test Metrics, Error and fault taxonomies , Levels of testing, Testing and Verification, Static Testing.
Textbook 3: Ch 1:1.2 - 1.5, 3; Textbook 1: Ch 1</td><td>8 Hours</td></tr>
<tr><td colspan="2">Module – 2</td></tr>
<tr><td>Problem Statements: Generalized pseudo code, the triangle problem, the NextDate function, the commission problem, the SATM (Simple Automatic Teller Machine) problem, the currency converter, Saturn windshield wiper
Functional Testing: Boundary value analysis, Robustness testing, Worst-case testing, Robust Worst testing for triangle problem, NextDate problem and commission problem, Equivalence classes, Equivalence test cases for the triangle problem, NextDate function, and the commission problem, Guidelines and observations, Decision tables, Test cases for the triangle problem, NextDate function, and the commission problem, Guidelines and observations.
Textbook 1: Ch 2, 5, 6 & 7, Textbook 2: Ch 3</td><td>8 Hours</td></tr>
<tr><td colspan="2">Module – 3</td></tr>
<tr><td>Fault Based Testing: Overview, Assumptions in fault based testing, Mutation analysis, Fault-based adequacy criteria, Variations on mutation analysis. Structural Testing: Overview, Statement testing, Branch testing, Condition testing, Path testing: DD paths, Test coverage metrics, Basis path testing, guidelines and observations, Data –Flow testing: Definition-Use testing, Slice-based testing, Guidelines and observations.
T2:Chapter 16, 12 T1:Chapter 9 & 10</td><td>8 Hours</td></tr>
<tr><td colspan="2">Module – 4</td></tr>
<tr><td>Test Execution: Overview of test execution, from test case specification to test cases, Scaffolding, Generic versus specific scaffolding, Test oracles, Self-checks as oracles, Capture and replay Process Framework :Basic principles: Sensitivity, redundancy, restriction, partition, visibility, Feedback, the quality process, Planning and monitoring, Quality goals, Dependability properties ,Analysis Testing, Improving the process, Organizational factors.
Planning and Monitoring the Process: Quality and process, Test and analysis strategies and plans, Risk planning, monitoring the process, Improving the</td><td>8 Hours</td></tr>
</table>

process, the quality team. **T2: Chapter 17, 20.**	
Module – 5	
Integration and Component-Based Software Testing: Overview, Integration testing strategies, Testing components and assemblies. System, Acceptance and Regression Testing: Overview, System testing, Acceptance testing, Usability, Regression testing, Regression test selection techniques, Test case prioritization and selective execution. **Levels of Testing, Integration Testing:** Traditional view of testing levels, Alternative life-cycle models, The SATM system, Separating integration and system testing, A closer look at the SATM system, Decomposition-based, call graph-based, Path-based integrations**.** **T2: Chapter 21 & 22, T1 : Chapter 12 & 13**	**8 Hours**

Course outcomes: The students should be able to:

- Derive test cases for any given problem
- Compare the different testing techniques
- Classify the problem into suitable testing model
- Apply the appropriate technique for the design of flow graph.
- Create appropriate document for the software artefact.

Question paper pattern:

The question paper will have TEN questions.
There will be TWO questions from each module.
Each question will have questions covering all the topics under a module.
The students will have to answer FIVE full questions, selecting ONE full question from each module.

Text Books:

1. Paul C. Jorgensen: Software Testing, A Craftsman's Approach, 3rd Edition, Auerbach Publications, 2008.
2. Mauro Pezze, Michal Young: Software Testing and Analysis – Process, Principles and Techniques, Wiley India, 2009.
3. Aditya P Mathur: Foundations of Software Testing, Pearson Education, 2008.

Reference Books:

1. Software testing Principles and Practices – Gopalaswamy Ramesh, Srinivasan Desikan, 2 nd Edition, Pearson, 2007.
2. Software Testing – Ron Patton, 2nd edition, Pearson Education, 2004.
3. The Craft of Software Testing – Brian Marrick, Pearson Education, 1995.
4. Anirban Basu, Software Quality Assurance, Testing and Metrics, PHI, 2015
5. Naresh Chauhan, Software Testing, Oxford University press.

ADVANCED JAVA AND J2EE
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2016 -2017)
SEMESTER – V

Subject Code	15CS553	IA Marks	20
Number of Lecture Hours/Week	3	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 03

Course objectives: This course will enable students to

- Identify the need for advanced Java concepts like Enumerations and Collections
- Construct client-server applications using Java socket API
- Make use of JDBC to access database through Java Programs
- Adapt servlets to build server side programs
- Demonstrate the use of JavaBeans to develop component-based Java software

Module – 1	**Teaching Hours**
Enumerations, Autoboxing and Annotations(metadata): Enumerations, Enumeration fundamentals, the values() and valueOf() Methods, java enumerations are class types, enumerations Inherits Enum, example, type wrappers, Autoboxing, Autoboxing and Methods, Autoboxing/Unboxing occurs in Expressions, Autoboxing/Unboxing, Boolean and character values, Autoboxing/Unboxing helps prevent errors, A word of Warning. Annotations, Annotation basics, specifying retention policy, Obtaining Annotations at run time by use of reflection, Annotated element Interface, Using Default values, Marker Annotations, Single Member annotations, Built-In annotations.	**8 Hours**
Module – 2	
The collections and Framework: Collections Overview, Recent Changes to Collections, The Collection Interfaces, The Collection Classes, Accessing a collection Via an Iterator, Storing User Defined Classes in Collections, The Random Access Interface, Working With Maps, Comparators, The Collection Algorithms, Why Generic Collections?, The legacy Classes and Interfaces, Parting Thoughts on Collections.	**8 Hours**
Module – 3	
String Handling **:**The String Constructors, String Length, Special String Operations, String Literals, String Concatenation, String Concatenation with Other Data Types, String Conversion and toString( ) Character Extraction, charAt( ), getChars( ), getBytes( ) toCharArray(), String Comparison, equals( ) and equalsIgnoreCase( ), regionMatches( ) startsWith( ) and endsWith( ), equals( ) Versus == , compareTo( ) Searching Strings, Modifying a String, substring( ), concat( ), replace( ), trim( ), Data Conversion Using valueOf( ), Changing the Case of Characters Within a String, Additional String Methods, StringBuffer , StringBuffer Constructors, length( ) and capacity( ), ensureCapacity( ), setLength( ), charAt( ) and setCharAt( ), getChars( ),append( ), insert( ), reverse( ), delete( ) and deleteCharAt( ), replace( ), substring( ), Additional StringBuffer Methods, StringBuilder **Text Book 1: Ch 15**	**8 Hours**

Module – 4	
Background; The Life Cycle of a Servlet; Using Tomcat for Servlet Development; A simple Servlet; The Servlet API; The Javax.servlet Package; Reading Servlet Parameter; The Javax.servlet.http package; Handling HTTP Requests and Responses; Using Cookies; Session Tracking. Java Server Pages (JSP): JSP, JSP Tags, Tomcat, Request String, User Sessions, Cookies, Session Objects **Text Book 1: Ch 31 Text Book 2: Ch 11**	**8 Hours**
Module – 5	
The Concept of JDBC; JDBC Driver Types; JDBC Packages; A Brief Overview of the JDBC process; Database Connection; Associating the JDBC/ODBC Bridge with the Database; Statement Objects; ResultSet; Transaction Processing; Metadata, Data types; Exceptions. **Text Book 2: Ch 06**	**8 Hours**

Course outcomes: The students should be able to:

- Interpret the need for advanced Java concepts like enumerations and collections in developing modular and efficient programs
- Build client-server applications and TCP/IP socket programs
- Illustrate database access and details for managing information using the JDBC API
- Describe how servlets fit into Java-based web application architecture
- Develop reusable software components using Java Beans

Question paper pattern:
The question paper will have TEN questions.
There will be TWO questions from each module.
Each question will have questions covering all the topics under a module.
The students will have to answer FIVE full questions, selecting ONE full question from each module.

Text Books:

1. Herbert Schildt: JAVA the Complete Reference, 7th/9th Edition, Tata McGraw Hill, 2007.
2. Jim Keogh: J2EE-TheCompleteReference, McGraw Hill, 2007.

Reference Books:

1. Y. Daniel Liang: Introduction to JAVA Programming, 7thEdition, Pearson Education, 2007.
2. Stephanie Bodoff et al: The J2EE Tutorial, 2nd Edition, Pearson Education,2004.
3. Uttam K Roy, Advanced JAVA programming, Oxford University press, 2015.

ARTIFICIAL INTELLIGENCE [As per Choice Based Credit System (CBCS) scheme] (Effective from the academic year 2016 -2017) SEMESTER – V			
Subject Code	15CS562	IA Marks	20
Number of Lecture Hours/Week	3	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03
CREDITS – 03			

Course objectives: This course will enable students to

- Identify the problems where AI is required and the different methods available
- Compare and contrast different AI techniques available.
- Define and explain learning algorithms

Module – 1	**Teaching Hours**
What is artificial intelligence?, Problems, Problem Spaces and search, Heuristic search technique **TextBook1: Ch 1, 2 and 3**	**8 Hours**
Module – 2	
Knowledge Representation Issues, Using Predicate Logic, Representing knowledge using Rules, **TextBoook1: Ch 4, 5 and 6.**	**8 Hours**
Module – 3	
Symbolic Reasoning under Uncertainty, Statistical reasoning, Weak Slot and Filter Structures. **TextBoook1: Ch 7, 8 and 9.**	**8 Hours**
Module – 4	
Strong slot-and-filler structures, Game Playing. **TextBoook1: Ch 10 and 12**	**8 Hours**
Module – 5	
Natural Language Processing, Learning, Expert Systems. **TextBook1: Ch 15,17 and 20**	**8 Hours**

Course outcomes: The students should be able to:

- Identify the AI based problems
- Apply techniques to solve the AI problems
- Define learning and explain various learning techniques
- Discuss on expert systems

Question paper pattern:
The question paper will have TEN questions.
There will be TWO questions from each module.
Each question will have questions covering all the topics under a module.
The students will have to answer FIVE full questions, selecting ONE full question from each module.

Text Books:

1. E. Rich , K. Knight & S. B. Nair - Artificial Intelligence, 3/e, McGraw Hill.

Reference Books:

1. Artificial Intelligence: A Modern Approach, Stuart Rusell, Peter Norving, Pearson Education 2nd Edition.

1. Dan W. Patterson, Introduction to Artificial Intelligence and Expert Systems – Prentice Hal of India.
2. G. Luger, “Artificial Intelligence: Structures and Strategies for complex problem Solving”, Fourth Edition, Pearson Education, 2002.
3. Artificial Intelligence and Expert Systems Development by D W Rolston-Mc Graw hill.
4. N.P. Padhy “Artificial Intelligence and Intelligent Systems” , Oxford University Press-2015

EMBEDDED SYSTEMS [As per Choice Based Credit System (CBCS) scheme] (Effective from the academic year 2016 -2017) SEMESTER – V			
Subject Code	15CS563	IA Marks	20
Number of Lecture Hours/Week	3	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03
CREDITS – 03			

Course objectives: This course will enable students to

- Provide a general overview of Embedded Systems
- Show current statistics of Embedded Systems
- Design, code, compile, and test real-time software
- Integrate a fully functional system including hardware and software.

Module – 1	Teaching Hours
Introduction to embedded systems: Embedded systems, Processor embedded into a system, Embedded hardware units and device in a system, Embedded software in a system, Examples of embedded systems, Design process in embedded system, Formalization of system design, Design process and design examples, Classification of embedded systems, skills required for an embedded system designer.	**8 Hours**
Module – 2	
Devices and communication buses for devices network: IO types and example, Serial communication devices, Parallel device ports, Sophisticated interfacing features in device ports, Wireless devices, Timer and counting devices, Watchdog timer, Real time clock, Networked embedded systems, Serial bus communication protocols, Parallel bus device protocols-parallel communication internet using ISA, PCI, PCI-X and advanced buses, Internet enabled systems-network protocols, Wireless and mobile system protocols.	**8 Hours**
Module – 3	
Device drivers and interrupts and service mechanism: Programming-I/O busy-wait approach without interrupt service mechanism, ISR concept, Interrupt sources, Interrupt servicing (Handling) Mechanism, Multiple interrupts, Context and the periods for context switching, interrupt latency and deadline, Classification of processors interrupt service mechanism from Context-saving angle, Direct memory access, Device driver programming.	**8 Hours**
Module – 4	
Inter process communication and synchronization of processes, Threads and tasks: Multiple process in an application, Multiple threads in an application, Tasks, Task states, Task and Data, Clear-cut distinction between functions. ISRS and tasks by their characteristics, concept and semaphores, Shared data, Inter-process communication, Signal function, Semaphore functions, Message Queue functions, Mailbox functions, Pipe functions, Socket functions, RPC functions.	**8 Hours**
Module – 5	
Real-time operating systems: OS Services, Process management, Timer functions, Event functions, Memory management, Device, file and IO subsystems management, Interrupt routines in RTOS environment and handling of interrupt source calls, Real-time operating systems, Basic design using an RTOS, RTOS task scheduling models, interrupt latency and response of the tasks	**8 Hours**

as performance metrics, OS security issues. Introduction to embedded software development process and tools, Host and target machines, Linking and location software.	
Course outcomes: The students should be able to:	
• Distinguish the characteristics of embedded computer systems. • Examine the various vulnerabilities of embedded computer systems. • Design and develop modules using RTOS. • Implement RPC, threads and tasks	
Question paper pattern: The question paper will have TEN questions. There will be TWO questions from each module. Each question will have questions covering all the topics under a module. The students will have to answer FIVE full questions, selecting ONE full question from each module.	
Text Books:	
1. Raj Kamal, "Embedded Systems: Architecture, Programming, and Design" 2nd / 3rd edition , Tata McGraw hill-2013.	
Reference Books:	
1. Marilyn Wolf, "Computer as Components, Principles of Embedded Computing System Design" 3rd edition, Elsevier-2014.	

CRYPTOGRAPHY, NETWORK SECURITY AND CYBER LAW [As per Choice Based Credit System (CBCS) scheme] (Effective from the academic year 2016 -2017) SEMESTER – VI			
Subject Code	15CS61	IA Marks	20
Number of Lecture Hours/Week	4	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03
CREDITS – 04			

Course objectives: This course will enable students to

- Explain the concepts of Cyber security
- Illustrate key management issues and solutions.
- Familiarize with Cryptography and very essential algorithms
- Introduce cyber Law and ethics to be followed.

Module – 1	Teaching Hours
Introduction - Cyber Attacks, Defence Strategies and Techniques, Guiding Principles, Mathematical Background for Cryptography - Modulo Arithmetic's, The Greatest Comma Divisor, Useful Algebraic Structures, Chinese Remainder Theorem, Basics of Cryptography - Preliminaries, Elementary Substitution Ciphers, Elementary Transport Ciphers, Other Cipher Properties, Secret Key Cryptography – Product Ciphers, DES Construction.	**10 Hours**
Module – 2	
Public Key Cryptography and RSA – RSA Operations, Why Does RSA Work?, Performance, Applications, Practical Issues, Public Key Cryptography Standard (PKCS), Cryptographic Hash - Introduction, Properties, Construction, Applications and Performance, The Birthday Attack, Discrete Logarithm and its Applications - Introduction, Diffie-Hellman Key Exchange, Other Applications.	**10 Hours**
Module – 3	
Key Management - Introduction, Digital Certificates, Public Key Infrastructure, Identity–based Encryption, Authentication–I - One way Authentication, Mutual Authentication, Dictionary Attacks, Authentication – II – Centalised Authentication, The Needham-Schroeder Protocol, Kerberos, Biometrics, IPSec-Security at the Network Layer – Security at Different layers: Pros and Cons, IPSec in Action, Internet Key Exchange (IKE) Protocol, Security Policy and IPSEC, Virtual Private Networks, Security at the Transport Layer - Introduction, SSL Handshake Protocol, SSL Record Layer Protocol, OpenSSL.	**10 Hours**
Module – 4	
IEEE 802.11 Wireless LAN Security - Background, Authentication, Confidentiality and Integrity, Viruses, Worms, and Other Malware, Firewalls – Basics, Practical Issues, Intrusion Prevention and Detection - Introduction, Prevention Versus Detection, Types of Instruction Detection Systems, DDoS Attacks Prevention/Detection, Web Service Security – Motivation, Technologies for Web Services, WS- Security, SAML, Other Standards.	**10 Hours**
Module – 5	
IT act aim and objectives, Scope of the act, Major Concepts, Important provisions, Attribution, acknowledgement, and dispatch of electronic records, Secure electronic records and secure digital signatures, Regulation of certifying authorities: Appointment of Controller and Other officers, Digital Signature certificates, Duties of Subscribers, Penalties and adjudication, The cyber	**10 Hours**

regulations appellate tribunal, Offences, Network service providers not to be liable in certain cases, Miscellaneous Provisions.

Course outcomes: The students should be able to:

- Discuss cryptography and its need to various applications
- Design and develop simple cryptography algorithms
- Understand cyber security and need cyber Law

Question paper pattern:

The question paper will have TEN questions.
There will be TWO questions from each module.
Each question will have questions covering all the topics under a module.
The students will have to answer FIVE full questions, selecting ONE full question from each module.

Text Books:

1. Cryptography, Network Security and Cyber Laws – Bernard Menezes, Cengage Learning, 2010 edition (Chapters-1,3,4,5,6,7,8,9,10,11,12,13,14,15,19(19.1-19.5),21(21.1-21.2),22(22.1-22.4),25

Reference Books:

1. Cryptography and Network Security- Behrouz A Forouzan, Debdeep Mukhopadhyay, Mc-GrawHill, 3rd Edition, 2015
2. Cryptography and Network Security- William Stallings, Pearson Education, 7th Edition
3. Cyber Law simplified- Vivek Sood, Mc-GrawHill, 11th reprint , 2013
4. Cyber security and Cyber Laws, Alfred Basta, Nadine Basta, Mary brown, ravindra kumar, Cengage learning

OPERATING SYSTEMS [As per Choice Based Credit System (CBCS) scheme] (Effective from the academic year 2016 -2017) SEMESTER – VI			
Subject Code	15CS64	IA Marks	20
Number of Lecture Hours/Week	4	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03
CREDITS – 04			

Course objectives: This course will enable students to

- Introduce concepts and terminology used in OS
- Explain threading and multithreaded systems
- Illustrate process synchronization and concept of Deadlock
- Introduce Memory and Virtual memory management, File system and storage techniques

Module – 1	**Teaching Hours**
Introduction to operating systems, System structures: What operating systems do; Computer System organization; Computer System architecture; Operating System structure; Operating System operations; Process management; Memory management; Storage management; Protection and Security; Distributed system; Special-purpose systems; Computing environments. Operating System Services; User - Operating System interface; System calls; Types of system calls; System programs; Operating system design and implementation; Operating System structure; Virtual machines; Operating System generation; System boot. **Process Management** Process concept; Process scheduling; Operations on processes; Inter process communication	**10 Hours**
Module – 2	
Multi-threaded Programming: Overview; Multithreading models; Thread Libraries; Threading issues. Process Scheduling: Basic concepts; Scheduling Criteria; Scheduling Algorithms; Multiple-processor scheduling; Thread scheduling. **Process Synchronization:** Synchronization: The critical section problem; Peterson's solution; Synchronization hardware; Semaphores; Classical problems of synchronization; Monitors.	**10 Hours**
Module – 3	
Deadlocks : Deadlocks; System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock. **Memory Management:** Memory management strategies: Background; Swapping; Contiguous memory allocation; Paging; Structure of page table; Segmentation.	**10 Hours**
Module – 4	
Virtual Memory Management: Background; Demand paging; Copy-on-write; Page replacement; Allocation of frames; Thrashing. **File System, Implementation of File System:** File system: File concept; Access methods; Directory structure; File system mounting; File sharing; Protection: Implementing File system: File system structure; File system implementation; Directory implementation; Allocation methods; Free space management.	**10 Hours**
Module – 5	
Secondary Storage Structures, Protection: Mass storage structures; Disk	**10 Hours**

structure; Disk attachment; Disk scheduling; Disk management; Swap space management. Protection: Goals of protection, Principles of protection, Domain of protection, Access matrix, Implementation of access matrix, Access control, Revocation of access rights, Capability- Based systems. **Case Study: The Linux Operating System:** Linux history; Design principles; Kernel modules; Process management; Scheduling; Memory Management; File systems, Input and output; Inter-process communication.	

Course outcomes: The students should be able to:

- Demonstrate need for OS and different types of OS
- Apply suitable techniques for management of different resources
- Use processor, memory, storage and file system commands
- Realize the different concepts of OS in platform of usage through case studies

Question paper pattern:

The question paper will have TEN questions.
There will be TWO questions from each module.
Each question will have questions covering all the topics under a module.
The students will have to answer FIVE full questions, selecting ONE full question from each module.

Text Books:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Principles 7th edition, Wiley-India, 2006.

Reference Books

1. Ann McHoes Ida M Fylnn, Understanding Operating System, Cengage Learning, 6th Edition
2. D.M Dhamdhere, Operating Systems: A Concept Based Approach 3rd Ed, McGraw-Hill, 2013.
3. P.C.P. Bhatt, An Introduction to Operating Systems: Concepts and Practice 4th Edition, PHI(EEE), 2014.
4. William Stallings Operating Systems: Internals and Design Principles, 6th Edition, Pearson.

DATA MINING AND DATA WAREHOUSING
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2016 -2017)
SEMESTER – VI

Subject Code	15CS651	IA Marks	20
Number of Lecture Hours/Week	3	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 03

Course objectives: This course will enable students to

- Define multi-dimensional data models.
- Explain rules related to association, classification and clustering analysis.
- Compare and contrast between different classification and clustering algorithms

Module – 1	Teaching Hours
Data Warehousing & modeling: Basic Concepts: Data Warehousing: A multitier Architecture, Data warehouse models: Enterprise warehouse, Data mart and virtual warehouse, Extraction, Transformation and loading, Data Cube: A multidimensional data model, Stars, Snowflakes and Fact constellations: Schemas for multidimensional Data models, Dimensions: The role of concept Hierarchies, Measures: Their Categorization and computation, Typical OLAP Operations.	**8 Hours**
Module – 2	
Data warehouse implementation& Data mining: Efficient Data Cube computation: An overview, Indexing OLAP Data: Bitmap index and join index, Efficient processing of OLAP Queries, OLAP server Architecture ROLAP versus MOLAP Versus HOLAP. **:** Introduction: What is data mining, Challenges, Data Mining Tasks, Data: Types of Data, Data Quality, Data Preprocessing, Measures of Similarity and Dissimilarity,	**8 Hours**
Module – 3	
Association Analysis: Association Analysis: Problem Definition, Frequent Item set Generation, Rule generation. Alternative Methods for Generating Frequent Item sets, FP-Growth Algorithm, Evaluation of Association Patterns.	**8 Hours**
Module – 4	
Classification : Decision Trees Induction, Method for Comparing Classifiers, Rule Based Classifiers, Nearest Neighbor Classifiers, Bayesian Classifiers.	**8 Hours**
Module – 5	
Clustering Analysis: Overview, K-Means, Agglomerative Hierarchical Clustering, DBSCAN, Cluster Evaluation, Density-Based Clustering, Graph-Based Clustering, Scalable Clustering Algorithms.	**8 Hours**

Course outcomes: The students should be able to:

- Identify data mining problems and implement the data warehouse
- Write association rules for a given data pattern.
- Choose between classification and clustering solution.

Question paper pattern:

The question paper will have TEN questions.
There will be TWO questions from each module.
Each question will have questions covering all the topics under a module.

The students will have to answer FIVE full questions, selecting ONE full question from each module.
Text Books:
1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar: Introduction to Data Mining, Pearson, First impression,2014. 2. Jiawei Han, Micheline Kamber, Jian Pei: Data Mining -Concepts and Techniques, 3rd Edition, Morgan Kaufmann Publisher, 2012.
Reference Books:
1. Sam Anahory, Dennis Murray: Data Warehousing in the Real World, Pearson,Tenth Impression,2012. 2. Michael.J.Berry,Gordon.S.Linoff: Mastering Data Mining , Wiley Edition, second edtion,2012.

PYTHON APPLICATION PROGRAMMING
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2016 -2017)
SEMESTER – VI

Subject Code	15CS664	IA Marks	20
Number of Lecture Hours/Week	3	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 03

Course objectives: This course will enable students to

- Learn Syntax and Semantics and create Functions in Python.
- Handle Strings and Files in Python.
- Understand Lists, Dictionaries and Regular expressions in Python.
- Implement Object Oriented Programming concepts in Python
- Build Web Services and introduction to Network and Database Programmingin Python.

Module – 1	**Teaching Hours**
Why should you learn to write programs, Variables, expressions and statements, Conditional execution, Functions	**8 Hours**
Module – 2	
Iteration, Strings, Files	**8 Hours**
Module – 3	
Lists, Dictionaries, Tuples, Regular Expressions	**8 Hours**
Module – 4	
Classes and objects, Classes and functions, Classes and methods	**8 Hours**
Module – 5	
Networked programs, Using Web Services, Using databases and SQL	**8 Hours**

Course outcomes: The students should be able to:

- Examine Python syntax and semantics and be fluent in the use of Python flow control and functions.
- Demonstrate proficiency in handling Strings and File Systems.
- Create, run and manipulate Python Programs using core data structures like Lists, Dictionaries and use Regular Expressions.
- Interpret the concepts of Object-Oriented Programming as used in Python.
- Implement exemplary applications related to Network Programming, Web Services and Databases in Python.

Question paper pattern:
The question paper will have TEN questions.
There will be TWO questions from each module.
Each question will have questions covering all the topics under a module.
The students will have to answer FIVE full questions, selecting ONE full question from each module.

Text Books:

1. Charles R. Severance, “Python for Everybody: Exploring Data Using Python 3”, 1st Edition, CreateSpace Independent Publishing Platform, 2016. (http://do1.dr-chuck.com/pythonlearn/EN_us/pythonlearn.pdf) (Chapters 1 – 13, 15)
2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist”, 2ndEdition, Green Tea Press, 2015.

(http://greenteapress.com/thinkpython2/thinkpython2.pdf) (Chapters 15, 16, 17) (Download pdf files from the above links)
Reference Books:
1. Charles Dierbach, "Introduction to Computer Science Using Python", 1st Edition, Wiley India Pvt Ltd. ISBN-13: 978-8126556014 2. Mark Lutz, “Programming Python”, 4th Edition, O’Reilly Media, 2011.ISBN-13: 978-9350232873 3. Wesley J Chun, “Core Python Applications Programming”, 3rd Edition,Pearson Education India, 2015. ISBN-13: 978-9332555365 4. Roberto Tamassia, Michael H Goldwasser, Michael T Goodrich, “Data Structures and Algorithms in Python”,1stEdition, Wiley India Pvt Ltd, 2016. ISBN-13: 978-8126562176 5. Reema Thareja, “Python Programming using problem solving approach”, Oxford university press, 2017

WEB TECHNOLOGY AND ITS APPLICATIONS [As per Choice Based Credit System (CBCS) scheme] (Effective from the academic year 2016 -2017) SEMESTER – VII			
Subject Code	**15CS71**	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03
CREDITS – 04			

Course Objectives: This course will enable students to

- Illustrate the Semantic Structure of HTML and CSS
- Compose forms and tables using HTML and CSS
- Design Client-Side programs using JavaScript and Server-Side programs using PHP
- Infer Object Oriented Programming capabilities of PHP
- Examine JavaScript frameworks such as jQuery and Backbone

Module – 1	Teaching Hours
Introduction to HTML, What is HTML and Where did it come from?, HTML Syntax, Semantic Markup, Structure of HTML Documents, Quick Tour of HTML Elements, HTML5 Semantic Structure Elements, Introduction to CSS, What is CSS, CSS Syntax, Location of Styles, Selectors, The Cascade: How Styles Interact, The Box Model, CSS Text Styling.	**10 Hours**
Module – 2	
HTML Tables and Forms, Introducing Tables, Styling Tables, Introducing Forms, Form Control Elements, Table and Form Accessibility, Microformats, Advanced CSS: Layout, Normal Flow, Positioning Elements, Floating Elements, Constructing Multicolumn Layouts, Approaches to CSS Layout, Responsive Design, CSS Frameworks.	**10 Hours**
Module – 3	
JavaScript: Client-Side Scripting, What is JavaScript and What can it do?, JavaScript Design Principles, Where does JavaScript Go?, Syntax, JavaScript Objects, The Document Object Model (DOM), JavaScript Events, Forms, Introduction to Server-Side Development with PHP, What is Server-Side Development, A Web Server's Responsibilities, Quick Tour of PHP, Program Control, Functions	**10 Hours**
Module – 4	
PHP Arrays and Superglobals, Arrays, $_GET and $_POST Superglobal Arrays, $_SERVER Array, $_Files Array, Reading/Writing Files, PHP Classes and Objects, Object-Oriented Overview, Classes and Objects in PHP, Object Oriented Design, Error Handling and Validation, What are Errors and Exceptions?, PHP Error Reporting, PHP Error and Exception Handling	**10 Hours**
Module – 5	
Managing State, The Problem of State in Web Applications, Passing Information via Query Strings, Passing Information via the URL Path, Cookies, Serialization, Session State, HTML5 Web Storage, Caching, Advanced JavaScript and jQuery, JavaScript Pseudo-Classes, jQuery Foundations, AJAX, Asynchronous File Transmission, Animation, Backbone MVC Frameworks, XML Processing and Web Services, XML Processing, JSON, Overview of Web Services.	**10 Hours**

Course Outcomes: After studying this course, students will be able to

- Adapt HTML and CSS syntax and semantics to build web pages.

- Construct and visually format tables and forms using HTML and CSS
- Develop Client-Side Scripts using JavaScript and Server-Side Scripts using PHP to generate and display the contents dynamically.
- Appraise the principles of object oriented development using PHP
- Inspect JavaScript frameworks like jQuery and Backbone which facilitates developer to focus on core features.

Question paper pattern:

The question paper will have ten questions.
There will be 2 questions from each module.
Each question will have questions covering all the topics under a module.
The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. Randy Connolly, Ricardo Hoar, **"Fundamentals of Web Development",** 1st Edition, Pearson Education India. (**ISBN:**978-9332575271)

Reference Books:

1) Robin Nixon, **"Learning PHP, MySQL &JavaScript with jQuery, CSS and HTML5",** 4th Edition, O'Reilly Publications, 2015. (**ISBN:**978-9352130153)
2) Luke Welling, Laura Thomson, **"PHP and MySQL Web Development",** 5th Edition, Pearson Education, 2016. (**ISBN:**978-9332582736)
3) Nicholas C Zakas, **"Professional JavaScript for Web Developers",** 3rd Edition, Wrox/Wiley India, 2012. (**ISBN:**978-8126535088)
4) David Sawyer Mcfarland, **"JavaScript & jQuery: The Missing Manual",** 1st Edition, O'Reilly/Shroff Publishers & Distributors Pvt Ltd, 2014 (**ISBN:**978-9351108078)
5) Zak Ruvalcaba Anne Boehm, **"Murach's HTML5 and CSS3"**, 3rd Edition, Murachs/Shroff Publishers & Distributors Pvt Ltd, 2016. (**ISBN:**978-9352133246)

MACHINE LEARNING
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2016 -2017)
SEMESTER – VII

Subject Code	15CS73	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03

CREDITS – 04

Course Objectives: This course will enable students to

- Define machine learning and problems relevant to machine learning.
- Differentiate supervised, unsupervised and reinforcement learning
- Apply neural networks, Bayes classifier and k nearest neighbor, for problems appear in machine learning.
- Perform statistical analysis of machine learning techniques.

Module – 1	Teaching Hours
Introduction: Well posed learning problems, Designing a Learning system, Perspective and Issues in Machine Learning. **Concept Learning:** Concept learning task, Concept learning as search, Find-S algorithm, Version space, Candidate Elimination algorithm, Inductive Bias. **Text Book1, Sections: 1.1 – 1.3, 2.1-2.5, 2.7**	**10 Hours**
Module – 2	
Decision Tree Learning: Decision tree representation, Appropriate problems for decision tree learning, Basic decision tree learning algorithm, hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning. **Text Book1, Sections: 3.1-3.7**	**10 Hours**
Module – 3	
Artificial Neural Networks: Introduction, Neural Network representation, Appropriate problems, Perceptrons, Backpropagation algorithm. **Text book 1, Sections: 4.1 – 4.6**	**08 Hours**
Module – 4	
Bayesian Learning: Introduction, Bayes theorem, Bayes theorem and concept learning, ML and LS error hypothesis, ML for predicting probabilities, MDL principle, Naive Bayes classifier, Bayesian belief networks, EM algorithm **Text book 1, Sections: 6.1 – 6.6, 6.9, 6.11, 6.12**	**10 Hours**
Module – 5	
Evaluating Hypothesis: Motivation, Estimating hypothesis accuracy, Basics of sampling theorem, General approach for deriving confidence intervals, Difference in error of two hypothesis, Comparing learning algorithms. **Instance Based Learning:** Introduction, k-nearest neighbor learning, locally weighted regression, radial basis function, cased-based reasoning, **Reinforcement Learning:** Introduction, Learning Task, Q Learning **Text book 1, Sections: 5.1-5.6, 8.1-8.5, 13.1-13.3**	**12 Hours**

Course Outcomes: After studying this course, students will be able to

- Identify the problems for machine learning. And select the either supervised,

unsupersvised or reinforcement learning. • Explain theory of probability and statistics related to machine learning • Investigate concept learning, ANN, Bayes classifier, k nearest neighbor, Q,
Question paper pattern:
The question paper will have ten questions. There will be 2 questions from each module. Each question will have questions covering all the topics under a module. The students will have to answer 5 full questions, selecting one full question from each module.
Text Books:
1. Tom M. Mitchell, Machine Learning**,** India Edition 2013, McGraw Hill Education.
Reference Books:
1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, h The Elements of Statistical Learning, 2nd edition, springer series in statistics. 2. Ethem Alpaydın, Introduction to machine learning, second edition, MIT press.

CLOUD COMPUTING AND ITS APPLICATIONS **[As per Choice Based Credit System (CBCS) scheme]** **(Effective from the academic year 2016 -2017)** **SEMESTER – VII**			
Subject Code	15CS742	IA Marks	20
Number of Lecture Hours/Week	3	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03
CREDITS – 03			

Course objectives: This course will enable students to

- Explain the fundamentals of cloud computing
- Illustrate the cloud application programming and aneka platform
- Contrast different cloud platforms used in industry

Module – 1	**Teaching Hours**
Introduction ,Cloud Computing at a Glance, The Vision of Cloud Computing, Defining a Cloud, A Closer Look, Cloud Computing Reference Model, Characteristics and Benefits, Challenges Ahead, Historical Developments, Distributed Systems, Virtualization, Web 2.0, Service-Oriented Computing, Utility-Oriented Computing, Building Cloud Computing Environments, Application Development, Infrastructure and System Development, Computing Platforms and Technologies, Amazon Web Services (AWS), Google AppEngine, Microsoft Azure, Hadoop, Force.com and Salesforce.com, Manjrasoft Aneka Virtualization, Introduction, Characteristics of Virtualized, Environments Taxonomy of Virtualization Techniques, Execution Virtualization, Other Types of Virtualization, Virtualization and Cloud Computing, Pros and Cons of Virtualization, Technology Examples Xen: Paravirtualization, VMware: Full Virtualization, Microsoft Hyper-V	**8 Hours**
Module – 2	
Cloud Computing Architecture, Introduction, Cloud Reference Model, Architecture, Infrastructure / Hardware as a Service, Platform as a Service, Software as a Service, Types of Clouds, Public Clouds, Private Clouds, Hybrid Clouds, Community Clouds, Economics of the Cloud, Open Challenges, Cloud Definition, Cloud Interoperability and Standards Scalability and Fault Tolerance Security, Trust, and Privacy Organizational Aspects Aneka: Cloud Application Platform, Framework Overview, Anatomy of the Aneka Container, From the Ground Up: Platform Abstraction Layer, Fabric Services, foundation Services, Application Services, Building Aneka Clouds, Infrastructure Organization, Logical Organization, Private Cloud Deployment Mode, Public Cloud Deployment Mode, Hybrid Cloud Deployment Mode, Cloud Programming and Management, Aneka SDK, Management Tools	**8 Hours**
Module – 3	
Concurrent Computing: Thread Programming, Introducing Parallelism for Single Machine Computation, Programming Applications with Threads, What is a Thread?, Thread APIs, Techniques for Parallel Computation with Threads, Multithreading with Aneka, Introducing the Thread Programming Model, Aneka Thread vs. Common Threads, Programming Applications with Aneka Threads, Aneka Threads Application Model, Domain Decomposition: Matrix	**8 Hours**

Multiplication, Functional Decomposition: Sine, Cosine, and Tangent. High-Throughput Computing: Task Programming, Task Computing, Characterizing a Task, Computing Categories, Frameworks for Task Computing, Task-based Application Models, Embarrassingly Parallel Applications, Parameter Sweep Applications, MPI Applications, Workflow Applications with Task Dependencies, Aneka Task-Based Programming, Task Programming Model, Developing Applications with the Task Model, Developing Parameter Sweep Application, Managing Workflows.	
Module – 4	
Data Intensive Computing: Map-Reduce Programming, What is Data-Intensive Computing?, Characterizing Data-Intensive Computations, Challenges Ahead, Historical Perspective, Technologies for Data-Intensive Computing, Storage Systems, Programming Platforms, Aneka MapReduce Programming, Introducing the MapReduce Programming Model, Example Application	**8 Hours**
Module – 5	
Cloud Platforms in Industry, Amazon Web Services, Compute Services, Storage Services, Communication Services, Additional Services, Google AppEngine, Architecture and Core Concepts, Application Life-Cycle, Cost Model, Observations, Microsoft Azure, Azure Core Concepts, SQL Azure, Windows Azure Platform Appliance. Cloud Applications Scientific Applications, Healthcare: ECG Analysis in the Cloud, Biology: Protein Structure Prediction, Biology: Gene Expression Data Analysis for Cancer Diagnosis, Geoscience: Satellite Image Processing, Business and Consumer Applications, CRM and ERP, Productivity, Social Networking, Media Applications, Multiplayer Online Gaming.	**8 Hours**

Course outcomes: The students should be able to:

- Explain cloud computing, virtualization and classify services of cloud computing
- Illustrate architecture and programming in cloud
- Describe the platforms for development of cloud applications and List the application of cloud.

Question paper pattern:

The question paper will have ten questions.

There will be 2 questions from each module.

Each question will have questions covering all the topics under a module.

The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi Mastering Cloud. Computing McGraw Hill Education

Reference Books:

1. Dan C. Marinescu, Cloud Computing Theory and Practice, Morgan Kaufmann, Elsevier 2013.

COMPUTER VISION AND ROBOTICS [As per Choice Based Credit System (CBCS) scheme] (Effective from the academic year 2016 -2017) SEMESTER – VII			
Subject Code	15CS752	IA Marks	20
Number of Lecture Hours/Week	3	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03
CREDITS – 03			

Course objectives: This course will enable students to

- Review image processing techniques for computer vision
- Explain shape and region analysis
- Illustrate Hough Transform and its applications to detect lines, circles, ellipses
- Contrast three-dimensional image analysis techniques, motion analysis and applications of computer vision algorithms

Module – 1	**Teaching Hours**
CAMERAS: Pinhole Cameras**, Radiometry – Measuring Light:** Light in Space, Light Surfaces, Important Special Cases, **Sources, Shadows, And Shading:** Qualitative Radiometry, Sources and Their Effects, Local Shading Models, Application: Photometric Stereo, Interreflections: Global Shading Models, **Color:** The Physics of Color, Human Color Perception, Representing Color, A Model for Image Color, Surface Color from Image Color.	**8 Hours**
Module – 2	
Linear Filters: Linear Filters and Convolution, Shift Invariant Linear Systems, Spatial Frequency and Fourier Transforms, Sampling and Aliasing, Filters as Templates, **Edge Detection:** Noise, Estimating Derivatives, Detecting Edges, **Texture:** Representing Texture, Analysis (and Synthesis) Using Oriented Pyramids, Application: Synthesis by Sampling Local Models, Shape from Texture.	**8 Hours**
Module – 3	
The Geometry of Multiple Views: Two Views, **Stereopsis:** Reconstruction, Human Stereposis, Binocular Fusion, Using More Cameras, **Segmentation by Clustering:** What Is Segmentation?, Human Vision: Grouping and Getstalt, Applications: Shot Boundary Detection and Background Subtraction, Image Segmentation by Clustering Pixels, Segmentation by Graph-Theoretic Clustering,	**8 Hours**
Module – 4	
Segmentation by Fitting a Model: The Hough Transform, Fitting Lines, Fitting Curves, Fitting as a Probabilistic Inference Problem, Robustness, **Segmentation and Fitting Using Probabilistic Methods:** Missing Data Problems, Fitting, and Segmentation, The EM Algorithm in Practice, **Tracking With Linear Dynamic Models:** Tracking as an Abstract Inference Problem, Linear Dynamic Models, Kalman Filtering, Data Association, Applications and Examples**.**	**8 Hours**
Module – 5	
Geometric Camera Models: Elements of Analytical Euclidean Geometry, Camera Parameters and the Perspective Projection, Affine Cameras and Affine Projection Equations, **Geometric Camera Calibration:** Least-Squares Parameter Estimation, A Linear Approach to Camera Calibration, Taking Radial Distortion into Account, Analytical Photogrammetry, An Application: Mobile Robot Localization, **Model- Based Vision:** Initial Assumptions, Obtaining	**8 Hours**

Hypotheses by Pose Consistency, Obtaining Hypotheses by pose Clustering, Obtaining Hypotheses Using Invariants, Verification, Application: Registration In Medical Imaging Systems, Curved Surfaces and Alignment.

Course outcomes: The students should be able to:

- Implement fundamental image processing techniques required for computer vision
- Perform shape analysis
- Implement boundary tracking techniques
- Apply chain codes and other region descriptors
- Apply Hough Transform for line, circle, and ellipse detections.
- Apply 3D vision techniques.
- Implement motion related techniques.
- Develop applications using computer vision techniques.

Question paper pattern:

The question paper will have ten questions.
There will be 2 questions from each module.
Each question will have questions covering all the topics under a module.
The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. David A. Forsyth and Jean Ponce: Computer Vision – A Modern Approach, PHI Learning (Indian Edition), 2009.

Reference Books:

2. E. R. Davies: Computer and Machine Vision – Theory, Algorithms and Practicalities, Elsevier (Academic Press), 4^{th} edition, 2013.

DIGITAL IMAGE PROCESSING [As per Choice Based Credit System (CBCS) scheme] (Effective from the academic year 2016 -2017) SEMESTER – VII			
Subject Code	15CS753	IA Marks	20
Number of Lecture Hours/Week	3	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 03	
Course objectives: This course will enable students to	
• Define the fundamental concepts in image processing • Evaluate techniques followed in image enhancements • Illustrate image segmentation and compression algorithms	
Module – 1	**Teaching Hours**
Introduction Fundamental Steps in Digital Image Processing, Components of an Image Processing System, Sampling and Quantization, Representing Digital Images (Data structure), Some Basic Relationships Between Pixels- Neighbors and Connectivity of pixels in image, Applications of Image Processing: Medical imaging, Robot vision, Character recognition, Remote Sensing.	**8 Hours**
Module – 2	
Image Enhancement In The Spatial Domain: Some Basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic/Logic Operations, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters, Combining Spatial Enhancement Methods.	**8 Hours**
Module – 3	
Image Enhancement In Frequency Domain: Introduction, Fourier Transform, Discrete Fourier Transform (DFT), properties of DFT , Discrete Cosine Transform (DCT), Image filtering in frequency domain.	**8 Hours**
Module – 4	
Image Segmentation: Introduction, Detection of isolated points, line detection, Edge detection, Edge linking, Region based segmentation- Region growing, split and merge technique, local processing, regional processing, Hough transform, Segmentation using Threshold.	**8 Hours**
Module – 5	
Image Compression: Introduction, coding Redundancy , Inter-pixel redundancy, image compression model, Lossy and Lossless compression, Huffman Coding, Arithmetic Coding, LZW coding, Transform Coding, Sub-image size selection, blocking, DCT implementation using FFT, Run length coding.	**8 Hours**
Course outcomes: The students should be able to:	
• Explain fundamentals of image processing • Compare transformation algorithms • Contrast enhancement, segmentation and compression techniques	
Question paper pattern: The question paper will have ten questions. There will be 2 questions from each module. Each question will have questions covering all the topics under a module. The students will have to answer 5 full questions, selecting one full question from each module.	

Text Books:

1. Rafael C G., Woods R E. and Eddins S L, Digital Image Processing, Prentice Hall, 3rd edition, 2008.

Reference Books:

1. Milan Sonka,"Image Processing, analysis and Machine Vision", Thomson Press India Ltd, Fourth Edition.
2. Fundamentals of Digital Image Processing- Anil K. Jain, 2nd Edition, Prentice Hall of India.
3. S. Sridhar , Digital Image Processing, Oxford University Press, 2nd Ed, 2016.

MACHINE LEARNING LABORATORY [As per Choice Based Credit System (CBCS) scheme] (Effective from the academic year 2016 -2017) SEMESTER – VII			
Subject Code	15CSL76	IA Marks	20
Number of Lecture Hours/Week	01I + 02P	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03
CREDITS – 02			

Course objectives: This course will enable students to

1. Make use of Data sets in implementing the machine learning algorithms
2. Implement the machine learning concepts and algorithms in any suitable language of choice.

Description (If any):

1. The programs can be implemented in either JAVA or Python.
2. For Problems 1 to 6 and 10, programs are to be developed without using the built-in classes or APIs of Java/Python.
3. Data sets can be taken from standard repositories (https://archive.ics.uci.edu/ml/datasets.html) or constructed by the students.

Lab Experiments:

1. Implement and demonstratethe **FIND-Salgorithm** for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the **Candidate-Elimination algorithm**to output a description of the set of all hypotheses consistent with the training examples.
3. Write a program to demonstrate the working of the decision tree based **ID3 algorithm**. Use an appropriate data set for building the decision tree and apply this knowledge toclassify a new sample.
4. Build an Artificial Neural Network by implementing the **Backpropagation algorithm** and test the same using appropriate data sets.
5. Write a program to implement the **naïve Bayesian classifier** for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
6. Assuming a set of documents that need to be classified, use the **naïve Bayesian Classifier** model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
7. Write a program to construct a**Bayesian network** considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
8. Apply **EM algorithm** to cluster a set of data stored in a .CSV file. Use the same data set for clustering using ***k*-Means algorithm**. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
9. Write a program to implement ***k*-Nearest Neighbour algorithm** to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.
10. Implement the non-parametric **Locally Weighted Regressionalgorithm** in order to fit data points. Select appropriate data set for your experiment and draw graphs.

Study Experiment / Project:
NIL
Course outcomes: The students should be able to:
1. Understand the implementation procedures for the machine learning algorithms. 2. Design Java/Python programs for various Learning algorithms. 3. Applyappropriate data sets to the Machine Learning algorithms. 4. Identify and apply Machine Learning algorithms to solve real world problems.
Conduction of Practical Examination:
• All laboratory experiments are to be included for practical examination. • Students are allowed to pick one experiment from the lot. • Strictly follow the instructions as printed on the cover page of answer script • Marks distribution: Procedure + Conduction + Viva:**20 + 50 +10 (80)** **Change of experiment is allowed only once and marks allotted to the procedure part to be made zero.**

INTERNET OF THINGS TECHNOLOGY [As per Choice Based Credit System (CBCS) scheme] (Effective from the academic year 2016 -2017) SEMESTER – VIII			
Subject Code	**15CS81**	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03

CREDITS – 04

Course Objectives: This course will enable students to

- Assess the genesis and impact of IoT applications, architectures in real world.
- Illustrate diverse methods of deploying smart objects and connect them to network.
- Compare different Application protocols for IoT.
- Infer the role of Data Analytics and Security in IoT.
- Identifysensor technologies for sensing real world entities and understand the role of IoT in various domains of Industry.

Module – 1	**Teaching Hours**
What is IoT, Genesis of IoT, IoT and Digitization, IoT Impact, Convergence of IT and IoT, IoT Challenges, IoT Network Architecture and Design, Drivers Behind New Network Architectures, Comparing IoT Architectures, A Simplified IoT Architecture, The Core IoT Functional Stack, IoT Data Management and Compute Stack.	**10 Hours**
Module – 2	
Smart Objects: The “Things” in IoT, Sensors, Actuat ors, and Smart Objects, Sensor Networks, Connecting Smart Objects, Communications Criteria, IoT Access Technologies.	**10 Hours**
Module – 3	
IP as the IoT Network Layer, The Business Case for IP, The need for Optimization, Optimizing IP for IoT, Profiles and Compliances, Application Protocols for IoT, The Transport Layer, IoT Application Transport Methods.	**10 Hours**
Module – 4	
Data and Analytics for IoT, An Introduction to Data Analytics for IoT, Machine Learning, Big Data Analytics Tools and Technology, Edge Streaming Analytics, Network Analytics, Securing IoT, A Brief History of OT Security, Common Challenges in OT Security, How IT and OT Security Practices and Systems Vary, Formal Risk Analysis Structures: OCTAVE and FAIR, The Phased Application of Security in an Operational Environment	**10 Hours**
Module – 5	
IoT Physical Devices and Endpoints - Arduino UNO: Introduction to Arduino, Arduino UNO, Installing the Software, Fundamentals of Arduino Programming. IoT Physical Devices and Endpoints - RaspberryPi: Introduction to RaspberryPi, About the RaspberryPi Board: Hardware Layout, Operating Systems on RaspberryPi, Configuring RaspberryPi, Programming RaspberryPi with Python, Wireless Temperature Monitoring System Using Pi, DS18B20 Temperature Sensor, Connecting Raspberry Pi via SSH, Accessing Temperature from DS18B20 sensors, Remote access to RaspberryPi, Smart and Connected Cities, An IoT Strategy for Smarter Cities, Smart City IoT Architecture,	**10 Hours**

Smart City Security Architecture, Smart City Use-Case Examples.	

Course Outcomes: After studying this course, students will be able to

- Interpret the impact and challenges posed by IoT networks leading to new architectural models.
- Compare and contrast the deployment of smart objects and the technologies to connect them to network.
- Appraise the role of IoT protocols for efficient network communication.
- Elaborate the need for Data Analytics and Security in IoT.
- Illustrate different sensor technologies for sensing real world entities and identify the applications of IoT in Industry.

Question paper pattern:

The question paper will have ten questions.
There will be 2 questions from each module.
Each question will have questions covering all the topics under a module.
The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry,**"IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things",** 1st Edition, Pearson Education (Cisco Press Indian Reprint). (**ISBN:** 978-9386873743)
2. Srinivasa K G, **"Internet of Things",** CENGAGE Leaning India, 2017

Reference Books:

1. Vijay Madisetti and ArshdeepBahga, **"Internet of Things (A Hands -on-Approach)",** 1st Edition, VPT, 2014. (**ISBN:** 978-8173719547)
2. Raj Kamal, **"Internet of Things: Architecture and Design Princi ples",** 1st Edition, McGraw Hill Education, 2017. (**ISBN:** 978-9352605224)

BIG DATA ANALYTICS
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2016 -2017)
SEMESTER – VIII

Subject Code	15CS82	IA Marks	20
Number of Lecture Hours/Week	4	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03

CREDITS – 04

Course objectives: This course will enable students to

- Understand Hadoop Distributed File system and examine MapReduce Programming
- Explore Hadoop tools and manage Hadoop with Ambari
- Appraise the role of Business intelligence and its applications across industries
- Assess core data mining techniques for data analytics
- Identify various Text Mining techniques

Module – 1	**Teaching Hours**
Hadoop Distributed File System Basics, Running Example Programs and Benchmarks, Hadoop MapReduce Framework, MapReduce Programming	**10 Hours**
Module – 2	
Essential Hadoop Tools, Hadoop YARN Applications, Managing Hadoop with Apache Ambari, Basic Hadoop Administration Procedures	**10 Hours**
Module – 3	
Business Intelligence Concepts and Application, Data Warehousing, Data Mining, Data Visualization	**10 Hours**
Module – 4	
Decision Trees, Regression, Artificial Neural Networks, Cluster Analysis, Association Rule Mining	**10 Hours**
Module – 5	
Text Mining, Naïve-Bayes Analysis, Support Vector Machines, Web Mining, Social Network Analysis	**10 Hours**

Course outcomes: The students should be able to:

- Master the concepts of HDFS and MapReduce framework
- Investigate Hadoop related tools for Big Data Analytics and perform basic Hadoop Administration
- Recognize the role of Business Intelligence, Data warehousing and Visualization in decision making
- Infer the importance of core data mining techniques for data analytics
- Compare and contrast different Text Mining Techniques

Question paper pattern:
The question paper will have ten questions.
There will be 2 questions from each module.
Each question will have questions covering all the topics under a module.
The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. Douglas Eadline,**"Hadoop 2 Quick-Start Guide: Learn the Essentials of Big Data Computing in the Apache Hadoop 2 Ecosystem",** 1st Edition, Pearson Education, 2016. ISBN-13: 978-9332570351

2. Anil Maheshwari, **“Data Analytics”,** 1st Edition, McGraw Hill Education, 2017. ISBN-13: 978-9352604180
Reference Books:
1) Tom White, **“Hadoop: The Definitive Guide”,** 4th Edition, O’Reilly Media, 2) Boris Lublinsky, Kevin T.Smith, Alexey Yakubovich,**"Professional Hadoop Solutions",** 1st Edition, Wrox Press, 2014ISBN-13: 978-8126551071 3) Eric Sammer,**"Hadoop Operations: A Guide for Developers and Administrators",**1st Edition, O'Reilly Media, 2012.ISBN-13: 978-9350239261

MANAGING BIG DATA
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2016 -2017)
SEMESTER - II

Subject Code	16LNI422 / 16SCE21 / 16SCN24 / **16SCS21** / 16SIT41 / 16SSE422	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03

CREDITS – 04

Course objectives: This course will enable students to

- Define big data for business intelligence
- Analyze business case studies for big data analytics
- Explain managing of Big data Without SQL
- Develop map-reduce analytics using Hadoop and related tools

Module -1	Teaching Hours
UNDERSTANDING BIG DATA: What is big data – why big data –.Data!, Data Storage and Analysis, Comparison with Other Systems, Rational Database Management System , Grid Computing, Volunteer Computing, convergence of key trends – unstructured data – industry examples of big data – web analytics – big data and marketing – fraud and big data – risk and big data – credit risk management – big data and algorithmic trading – big data and healthcare – big data in medicine – advertising and big data – big data technologies – introduction to Hadoop – open source technologies – cloud and big data – mobile business intelligence – Crowd sourcing analytics – inter and trans firewall analytics.	**10Hours**
Module -2	
NOSQL DATA MANAGEMENT: Introduction to NoSQL – aggregate data models – aggregates – key-value and document data models – relationships – graph databases – schema less databases – materialized views – distribution models – shading –– version – map reduce – partitioning and combining – composing map-reduce calculations.	**10 Hours**
Module – 3	
BASICS OF HADOOP: Data format – analyzing data with Hadoop – scaling out – Hadoop streaming – Hadoop pipes – design of Hadoop distributed file system (HDFS) – HDFS concepts – Java interface – data flow – Hadoop I/O – data integrity – compression – serialization – Avro – file-based data structures.	**10 Hours**
Module-4	
MAPREDUCE APPLICATIONS: MapReduce workflows – unit tests with MRUnit – test data and local tests – anatomy of MapReduce job run – classic Map-reduce – YARN – failures in classic Map-reduce and YARN – job scheduling – shuffle and sort – task execution – MapReduce types – input formats – output formats	**10 Hours**
Module-5	
HADOOP RELATED TOOLS: Hbase – data model and implementations – Hbase clients – Hbase examples –praxis. Cassandra – Cassandra data model – Cassandra examples – Cassandra clients –Hadoop integration. Pig – Grunt – pig data model – Pig Latin – developing and testing Pig Latin scripts. Hive – data types and file formats – HiveQL data definition – HiveQL data manipulation – HiveQL queries.	**10 Hours**

Course outcomes:

The students shall able to:

- Describe big data and use cases from selected business domains
- Explain NoSQL big data management
- Install, configure, and run Hadoop and HDFS
- Perform map-reduce analytics using Hadoop

- Use Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data Analytics

Question paper pattern:

The question paper will have ten questions.
There will be 2 questions from each module.
Each question will have questions covering all the topics under a module.
The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012.
2. Eric Sammer, "Hadoop Operations", O'Reilley, 2012.

Reference Books:

1. Vignesh Prajapati, Big data analytics with R and Hadoop, SPD 2013.
2. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.
3. Lars George, "HBase: The Definitive Guide", O'Reilley, 2011.
4. Alan Gates, "Programming Pig", O'Reilley, 2011

from any of the leading reputed and refereed journals like:

1. IEEE Transactions, journals, magazines, etc.
2. ACM Transactions, journals, magazines, SIG series, etc.
3. Springer
4. Elsevier publications etc

In the area of (to name few and not limited to)

- Web Technology
- Cloud Computing
- Artificial Intelligent
- Networking
- Security
- Data mining

Course Outcomes

The students should be able to:

- Conduct survey on recent technologies
- Infer and interpret the information from the survey conducted
- Motivated towards research

Conduction:

The students have to present at least ONE technical seminar on the selected topic and submit a report for internal evaluation.

Marks Distribution: Literature Survey + Presentation (PPT) + Report + Question & Answer + Paper: 20 + 30 + 30 + 20 (100).

MACHINE LEARNING TECHNIQUES
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2016 -2017)
SEMESTER - IV

Subject Code	**16SCS41**/16SIT424	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03

CREDITS – 04

Course objectives: This course will enable students to

- Explain basic concepts of learning and decision trees.
- Compare and contrast neural networks and genetic algorithms
- Apply the Bayesian techniques and instant based learning
- Examine analytical learning and reinforced learning

Module -1	Teaching Hours
INTRODUCTION, CONCEPT LEARNING AND DECISION TREES Learning Problems – Designing Learning systems, Perspectives and Issues – Concept Learning – Version Spaces and Candidate Elimination Algorithm – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search	**10Hours**
Module -2	
NEURAL NETWORKS AND GENETIC ALGORITHMS: Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evolution and Learning.	**10 Hours**
Module – 3	
BAYESIAN AND COMPUTATIONAL LEARNINGL Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes	**10 Hours**

Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier– Bayesian Belief Network – EM Algorithm – Probably Learning – Sample Complexity for Finite and Infinite Hypothesis Spaces – Mistake Bound Model.	
Module-4	
INSTANT BASED LEARNING AND LEARNING SET OF RULES: K- Nearest Neighbor Learning – Locally Weighted Regression – Radial Basis Functions –Case-Based Reasoning – Sequential Covering Algorithms – Learning Rule Sets – Learning First Order Rules – Learning Sets of First Order Rules – Induction as Inverted Deduction – Inverting Resolution	**10 Hours**
Module-5	
ANALYTICAL LEARNING AND REINFORCED LEARNING: Perfect Domain Theories – Explanation Based Learning – Inductive-Analytical Approaches - FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning	**10 Hours**

Course outcomes:

On Completion of the course, the students will be able to

- Choose the learning techniques with this basic knowledge.
- Apply effectively neural networks and genetic algorithms for appropriate applications.
- Apply bayesian techniques and derive effectively learning rules.
- Choose and differentiate reinforcement and analytical learning techniques

Question paper pattern:

The question paper will have ten questions.
There will be 2 questions from each module.
Each question will have questions covering all the topics under a module.
The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. Tom M. Mitchell, “Machine Learning”, McGraw-Hill Education (INDIAN EDITION), 2013.

Reference Books:

1. Ethem Alpaydin, “Introduction to Machine Learning”, 2^{nd} Ed., PHI Learning Pvt. Ltd., 2013.
2. T. Hastie, R. Tibshirani, J. H. Friedman, “The Elements of Statistical Learning”, Springer; 1st edition, 2001.

Computer Vision
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2016 -2017)
SEMESTER - IV

Subject Code	**16SCS421**	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 03

Course objectives: This course will enable students to

- Review image processing techniques for computer vision
- Discuss shape and region analysis
- Analyze Hough Transform and its applications to detect lines, circles, ellipses
- Analyze three-dimensional image analysis techniques
- Illustrate motion analysis
- Discuss some applications of computer vision algorithms

ANALOG ELECTRONICS [As per Choice Based Credit System (CBCS) scheme] SEMESTER – III (EC/TC)			
Subject Code	15EC32	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50 (10 Hours per Module)	Exam Hours	03
CREDITS – 04			

Course objectives: This course will enable students to:

- Explain various BJT parameters, connections and configurations.
- Explain BJT Amplifier, Hybrid Equivalent and Hybrid Models.
- Explain construction and characteristics of JFETs and MOSFETs.
- Explain various types of FET biasing, and demonstrate the use of FET amplifiers.
- Construct frequency response of BJT and FET amplifiers at various frequencies.
- Analyze Power amplifier circuits in different modes of operation.
- Construct Feedback and Oscillator circuits using FET.

Modules	RBT Level
Module -1	
BJT AC Analysis: BJT Transistor Modeling, The re transistor model, Common emitter fixed bias, Voltage divider bias, Emitter follower configuration. Darlington connection-DC bias; The Hybrid equivalent model, Approximate Hybrid Equivalent Circuit- Fixed bias, Voltage divider, Emitter follower configuration; Complete Hybrid equivalent model, Hybrid π Model.	**L1, L2,L3**
Module -2	
Field Effect Transistors: Construction and Characteristics of JFETs, Transfer Characteristics, Depletion type MOSFET, Enhancement type MOSFET. **FET Amplifiers:** JFET small signal model, Fixed bias configuration, Self bias configuration, Voltage divider configuration, Common Gate configuration. Source-Follower Configuration, Cascade configuration.	**L1, L2, L3**
Module -3	
BJT and JFET Frequency Response: Logarithms, Decibels, Low frequency response – BJT Amplifier with RL, Low frequency response-FET Amplifier, Miller effect capacitance, High frequency response – BJT Amplifier, High frequency response-FET Amplifier, Multistage Frequency Effects.	**L1, L2, L3**
Module -4	

Feedback and Oscillator Circuits: Feedback concepts, Feedback connection types, Practical feedback circuits, Oscillator operation, FET Phase shift oscillator, Wien bridge oscillator, Tuned Oscillator circuit, Crystal oscillator, UJT construction, UJT Oscillator.	**L1,L2, L3**
Module -5	
Power Amplifiers: Definition and amplifier types, Series fed class A amplifier, Transformer coupled class A amplifier, Class B amplifier operation and circuits, Amplifier distortion, Class C and Class D amplifiers. **Voltage Regulators:** Discrete transistor voltage regulation - Series and Shunt Voltage regulators.	**L1, L2, L3**

Course Outcomes: After studying this course, students will be able to:

- Describe the working principle and characteristics of BJT, FET, Single stage, cascaded and feedback amplifiers.
- Describe the Phase shift, Wien bridge, tuned and crystal oscillators using BJT/FET/UJT.
- Calculate the AC gain and impedance for BJT using re and h parameters models for CE and CC configuration.
- Determine the performance characteristics and parameters of BJT and FET amplifier using small signal model.
- Determine the parameters which affect the low frequency and high frequency responses of BJT and FET amplifiers and draw the characteristics.
- Evaluate the efficiency of Class A and Class B power amplifiers and voltage regulators.

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of Three sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module. The students will have to answer 5 full questions, selecting one full question from each module.

Text Book:

Robert L. Boylestad and Louis Nashelsky, "Electronics devices and Circuit theory", Pearson, 10^{th}/11th Edition, 2012, ISBN:978-81-317-6459-6.

Reference Books:

1. Adel S. Sedra and Kenneth C. Smith, "Micro Electronic Circuits Theory and Application", 5th Edition ISBN:0198062257
2. Fundamentals of Microelectronics, Behzad Razavi, John Weily ISBN 2013 978-81-265-2307-8
3. J.Millman & C.C.Halkias—Integrated Electronics, 2^{nd} edition, 2010, TMH. ISBN 0-07-462245-5
4. K. A. Navas, "Electronics Lab Manual", Volume I, PHI, 5th Edition, 2015, ISBN:9788120351424.

DIGITAL ELECTRONICS [As per Choice Based Credit System (CBCS) scheme] SEMESTER – III (EC/TC)			
Subject Code	15EC33	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50 (10 Hours per Module)	Exam Hours	03
CREDITS – 04			

Course objectives: This course will enable students to:

- Illustrate simplification of Algebraic equations using Karnaugh Maps and Quine-McClusky Techniques.
- Design combinational logic circuits.
- Design Decoders, Encoders, Digital Multiplexer, Adders, Subtractors and Binary Comparators.
- Describe Latches and Flip-flops, Registers and Counters.
- Analyze Mealy and Moore Models.
- Develop state diagrams Synchronous Sequential Circuits.

Modules	RBT Level
Module – 1	
Principles of combination logic: Definition of combinational logic, canonical forms, Generation of switching equations from truth tables, Karnaugh maps-3,4,5 variables, Incompletely specified functions (Don't care terms) Simplifying Max term equations, Quine-McCluskey minimization technique, Quine-McCluskey using don't care terms, Reduced prime implicants Tables.(Text 1, Chapter 3)	**L1, L2, L3**
Module -2	
Analysis and design of combinational logic: General approach to combinational logic design, Decoders, BCD decoders, Encoders, digital multiplexers, Using multiplexers as Boolean function generators, Adders and subtractors, Cascading full adders, Look ahead carry, Binary comparators**.**(Text 1, Chapter 4)	**L1, L2, L3**
Module -3	
Flip-Flops: Basic Bistable elements, Latches, Timing considerations, The master-slave flip-flops (pulse-triggered flip-flops): SR flip-flops,JK flip-flops, Edge triggered flip-flops, Characteristic equations. (Text 2, Chapter 6)	**L1,L2**
Module -4	
Simple Flip-Flops Applications: Registers, binary ripple counters, synchronous binary counters, Counters based on shift registers, Design of a synchronous counters, Design of a synchronous mod-n counter using clocked T , JK , D and SR flip-flops. (Text 2, Chapter 6)	**L1,L2, L3**

Module -5	
Sequential Circuit Design: Mealy and Moore models, State machine notation, Synchronous Sequential circuit analysis, Construction of state diagrams, counter design. (Text 1, Chapter 6)	**L1, L2, L3**

Course Outcomes: After studying this course, students will be able to:

- Develop simplified switching equation using Karnaugh Maps and Quine-McClusky techniques.
- Explain the operation of decoders, encoders, multiplexers, demultiplexers, adders, subtractors and comparators.
- Explain the working of Latches and Flip Flops (SR,D,T and JK).
- Design Synchronous/Asynchronous Counters and Shift registers using Flip Flops.
- Develop Mealy/Moore Models and state diagrams for the given clocked sequential circuits.
- Apply the knowledge gained in the design of Counters and Registers.

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of Three sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module. The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. Digital Logic Applications and Design, John M Yarbrough, Thomson Learning, 2001. ISBN 981-240-062-1.
2. Donald D. Givone, "Digital Principles and Design", McGraw Hill, 2002. ISBN 978-0-07-052906-9.

Reference Books:

1. D. P. Kothari and J. S Dhillon, "Digital Circuits and Design", Pearson, 2016, ISBN:9789332543539.
2. Morris Mano, "Digital Design", Prentice Hall of India, Third Edition.
3. Charles H Roth, Jr., "Fundamentals of logic design", Cengage Learning.
4. K. A. Navas, "Electronics Lab Manual", Volume I, PHI, 5th Edition, 2015, ISBN: 9788120351424.

<table>
<tr><td colspan="4" align="center"><u>MICROPROCESSORS</u>
[As per Choice Based Credit System (CBCS) scheme]
SEMESTER – IV (EC/TC)</td></tr>
<tr><td>Subject Code</td><td>15EC42</td><td>IA Marks</td><td>20</td></tr>
<tr><td>Number of Lecture Hours/Week</td><td>04</td><td>Exam Marks</td><td>80</td></tr>
<tr><td>Total Number of Lecture Hours</td><td>50 (10 Hours per Module)</td><td>Exam Hours</td><td>03</td></tr>
<tr><td colspan="4" align="center">CREDITS – 04</td></tr>
<tr><td colspan="4">Course objectives: This course will enable students to:
• Familiarize basic architecture of 8086 microprocessor
• Program 8086 Microprocessor using Assembly Level Language
• Use Macros and Procedures in 8086 Programs
• Understand interfacing of 16 bit microprocessor with memory and peripheral chips involving system design
• Understand the architecture of 8088, 8087 Coprocessor and other CPU architectures</td></tr>
</table>

Modules	RBT Level
Module -1	
8086 PROCESSOR: Historical background (refer Reference Book 1), 8086 CPU Architecture (1.1 – 1.3 of Text). Addressing modes, Machine language instruction formats, Machine coding the program (2.2, 2.1, 3.2 of Text). **INSTRUCTION SET OF 8086:** Data transfer and arithmetic instructions. Control/Branch Instructions, Illustration of these instructions with example programs (2.3 of Text).	**L1, L2, L3**
Module -2	
Logical Instructions, String manipulation instructions, Flag manipulation and Processor control instructions, Illustration of these instructions with example programs. Assembler Directives and Operators, Assembly Language Programming and example programs (2.3, 2.4, 3.4 of Text).	**L1, L2, L3**
Module -3	
Stack and Interrupts: Introduction to stack, Stack structure of 8086, Programming for Stack. Interrupts and Interrupt Service routines, Interrupt cycle of 8086, NMI, INTR, Interrupt programming, Passing parameters to procedures, Macros, Timing and Delays. (Chap. 4 of Text).	**L1, L2, L3**
Module -4	

8086 Bus Configuration and Timings: Physical memory Organization, General Bus operation cycle, I/O addressing capability, Special processor activities, Minimum mode 8086 system and Timing diagrams, Maximum Mode 8086 system and Timing diagrams. (1.4 to 1.9 of Text). **Basic Peripherals and their Interfacing with 8086 (Part 1)**: Static RAM Interfacing with 8086 (5.1.1), Interfacing I/O ports, PIO 8255, Modes of operation – Mode-0 and BSR Mode, Interfacing Keyboard and 7-Segment digits using 8255 (Refer 5.3, 5.4, 5.5 of Text).	**L1, L2, L3**
Module 5	
Basic Peripherals and their Interfacing with 8086 (Part 2): Interfacing ADC-0808/0809, DAC-0800, Stepper Motor using 8255 (5.6.1, 5.7.2, 5.8). Timer 8254 – Mode 0, 1, 2 & 3 and Interfacing programmes for these modes (refer 6.1 of Text). **INT 21H DOS Function calls** - for handling Keyboard and Display (refer Appendix-B of Text). **Other Architectures:** Architecture of 8088 (refer 1.10 upto 1.10.1 of Text) and Architecture of NDP 8087 (refer 8.3.1, 8.3.5 of Text). Von-Neumann & Harvard CPU architecture and CISC & RISC CPU architecture (refer Reference Book 1).	**L1, L2, L3**

Course Outcomes: At the end of the course students will be able to:

- Explain the History of evaluation of Microprocessors, Architecture and instruction set of 8086, 8088, 8087, CISC & RISC, Von-Neumann & Harvard CPU Architecture, Configuration & Timing diagrams of 8086 and Instruction set of 8086.
- Write8086 Assembly level programs using the 8086 instruction set
- Write modular programs using procedures and macros.
- Write 8086 Stack and Interrupts programming
- Interface 8086 to Static memory chips and 8255, 8254, 0808 ADC, 0800 DAC, Keyboard, Display and Stepper motors.
- Use INT 21 DOS interrupt function calls to handle Keyboard and Display.

Question paper pattern:

- The question paper will have ten questions.
- Each full Question consisting of 16 marks
- There will be 2 full questions (with a maximum of Three sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Text Book:

Advanced Microprocessors and Peripherals - A.K. Ray and K.M. Bhurchandi, TMH, 3rd Edition, 2012, ISBN 978-1-25-900613-5.

Reference Books:

1. **Microprocessor and Interfacing**- Douglas V Hall, SSSP Rao, 3rd edition TMH, 2012.
2. **Microcomputer systems-The 8086 / 8088 Family** – Y.C. Liu and A. Gibson, 2nd edition, PHI -2003.
3. **The 8086 Microprocessor: Programming & Interfacing the PC** – Kenneth J Ayala, CENGAGE Learning, 2011.
4. **The Intel Microprocessor, Architecture, Programming and Interfacing** - Barry B. Brey, 6e, Pearson Education / PHI, 2003.

DIGITAL SIGNAL PROCESSING

B.E., V Semester, Electronics & Communication Engineering / Telecommunication Engineering

[As per Choice Based Credit System (CBCS) scheme]

Subject Code	15EC52	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50 (10 Hours / Module)	Exam Hours	03
CREDITS – 04			

Course objectives: This course will enable students to

- Understand the frequency domain sampling and reconstruction of discrete time signals.
- Study the properties and the development of efficient algorithms for the computation of DFT.
- Realization of FIR and IIR filters in different structural forms.
- Learn the procedures to design of IIR filters from the analog filters using impulse invariance and bilinear transformation.
- Study the different windows used in the design of FIR filters and design appropriate filters based on the specifications.

Modules

Module-1	**RBT Level**
Discrete Fourier Transforms (DFT): Frequency domain sampling and reconstruction of discrete time signals. DFT as a linear transformation, its relationship with other transforms. Properties of DFT, multiplication of two DFTs- the circular convolution.	L1, L2
Module-2	
Additional DFT properties, use of DFT in linear filtering, overlap-save and overlap-add method. Fast-Fourier-Transform (FFT) algorithms: Direct computation of DFT, need for efficient computation of the DFT (FFT algorithms).	L1, L2, L3
Module-3	
Radix-2 FFT algorithm for the computation of DFT and IDFT–decimation-in-time and decimation-in-frequency algorithms. Goertzel algorithm, and chirp-z transform.	L1, L2, L3
Module-4	
Structure for IIR Systems: Direct form, Cascade form, Parallel form structures. IIR filter design: Characteristics of commonly used analog filter – Butterworth and Chebyshev filters, analog to analog frequency transformations. Design of IIR Filters from analog filter using Butterworth filter: Impulse invariance, Bilinear transformation.	L1, L2, L3
Module-5	
Structure for FIR Systems: Direct form, Linear Phase, Frequency sampling	L1, L2,

structure, Lattice structure. FIR filter design: Introduction to FIR filters, design of FIR filters using - Rectangular, Hamming, Hanning and Bartlett windows.	L3

Course Outcomes: After studying this course, students will be able to:

- Determine response of LTI systems using time domain and DFT techniques.
- Compute DFT of real and complex discrete time signals.
- Computation of DFT using FFT algorithms and linear filtering approach.
- Solve problems on digital filter design and realize using digital computations.

Question paper pattern:

- The question paper will have ten questions
- Each full question consists of 16 marks**.**
- There will be 2 full questions (with a maximum of three sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module
- The students will have to answer 5 full questions, selecting one full question from each module.

Text Book:

Digital signal processing – Principles Algorithms & Applications, Proakis & Monalakis, Pearson education, 4th Edition, New Delhi, 2007.

Reference Books:

1. Discrete Time Signal Processing, Oppenheim & Schaffer, PHI, 2003.
2. Digital Signal Processing, S. K. Mitra, Tata Mc-Graw Hill, 3rd Edition, 2010.
3. Digital Signal Processing, Lee Tan: Elsevier publications, 2007.

Verilog HDL
B.E., V Semester, Electronics & Communication Engineering/ Telecommunication Engineering
[As per Choice Based Credit System (CBCS) scheme]

Subject Code	15EC53	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50 (10 Hours / Module)	Exam Hours	03
CREDITS – 04			

Course objectives: This course will enable students to:

- Differentiate between Verilog and VHDL descriptions.
- Learn different Verilog HDL and VHDL constructs.
- Familiarize the different levels of abstraction in Verilog.
- Understand Verilog Tasks and Directives.
- Understand timing and delay Simulation.
- Learn VHDL at design levels of data flow, behavioral and structural for effective modeling of digital circuits.

Module-1	RBT Level
Overview of Digital Design with Verilog HDL Evolution of CAD, emergence of HDLs, typical HDL-flow, why Verilog HDL?, trends in HDLs. (Text1) **Hierarchical Modeling Concepts** Top-down and bottom-up design methodology, differences between modules and module instances, parts of a simulation, design block, stimulus block. (Text1)	L1, L2, L3
Module-2	
Basic Concepts Lexical conventions, data types, system tasks, compiler directives. (Text1) **Modules and Ports** Module definition, port declaration, connecting ports, hierarchical name referencing. (Text1)	L1, L2, L3
Module-3	
Gate-Level Modeling Modeling using basic Verilog gate primitives, description of and/or and buf/not type gates, rise, fall and turn-off delays, min, max, and typical delays. (Text1) **Dataflow Modeling** Continuous assignments, delay specification, expressions, operators, operands, operator types. (Text1)	L1, L2, L3
Module-4	
Behavioral Modeling Structured procedures, initial and always, blocking and non-blocking	L1, L2, L3

statements, delay control, generate statement, event control, conditional statements, Multiway branching, loops, sequential and parallel blocks. (Text1)	
Module-5	
Introduction to VHDL **Introduction:** Why use VHDL?, Shortcomings, Using VHDL for Design Synthesis, Design tool flow, Font conventions. **Entities and Architectures:** Introduction, A simple design, Design entities, Identifiers, Data objects, Data types, and Attributes. (Text 2)	L1, L2, L3

Course Outcomes: At the end of this course, students should be able to

- Write Verilog programs in gate, dataflow (RTL), behavioral and switch modeling levels of Abstraction.
- Write simple programs in VHDL in different styles.
- Design and verify the functionality of digital circuit/system using test benches.
- Identify the suitable Abstraction level for a particular digital design.
- Write the programs more effectively using Verilog tasks and directives.
- Perform timing and delay Simulation.

Question paper pattern:

- The question paper will have ten questions
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of three sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module
- The students will have to answer 5 full questions, selecting one full question from each module

Text Books:

1. Samir Palnitkar, "**Verilog HDL: A Guide to Digital Design and Synthesis**", Pearson Education, Second Edition.
2. Kevin Skahill, "**VHDL for Programmable Logic**", PHI/Pearson education, 2006.

Reference Books:

1. Donald E. Thomas, Philip R. Moorby, "The Verilog Hardware Description Language", Springer Science+Business Media, LLC, Fifth edition.
2. Michael D. Ciletti, "Advanced Digital Design with the Verilog HDL" Pearson (Prentice Hall), Second edition.
3. Padmanabhan, Tripura Sundari, "Design through Verilog HDL", Wiley, 2016 or earlier.

INFORMATION THEORY AND CODING

B.E., V Semester, Electronics & Communication Engineering / Telecommunication Engineering

[As per Choice Based Credit System (CBCS) scheme]

Subject Code	15EC54	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50 (10 Hours / Module)	Exam Hours	03
CREDITS – 04			

Course Objectives: This course will enable students to:

- Understand the concept of Entropy, Rate of information and order of the source with reference to dependent and independent source.
- Study various source encoding algorithms.
- Model discrete & continuous communication channels.
- Study various error control coding algorithms.

Modules

Module-1	**RBT Level**
Information Theory: Introduction, Measure of information, Information content of message, Average Information content of symbols in Long Independent sequences, Average Information content of symbols in Long dependent sequences, Markov Statistical Model of Information Sources, Entropy and Information rate of Markoff Sources (Section 4.1, 4.2 of Text 1).	L1, L2, L3
Module-2	
Source Coding: Source coding theorem, Prefix Codes, Kraft McMillan Inequality property – KMI (Section 2.2 of Text 2). Encoding of the Source Output, Shannon's Encoding Algorithm (Sections 4.3, 4.3.1 of Text 1). Shannon Fano Encoding Algorithm, Huffman codes, Extended Huffman coding, Arithmetic Coding, Lempel – Ziv Algorithm (Sections 3.6, 3.7, 3.8, 3.10 of Text 3).	L1, L2, L3
Module-3	
Information Channels: Communication Channels (Section 4.4 of Text 1). Channel Models, Channel Matrix, Joint probabilty Matrix, Binary Symmetric Channel, System Entropies, Mutual Information, Channel Capacity, Channel Capacity of : Binary Symmetric Channel, Binary Erasure Channel, Muroga,s Theorem, Contineuos Channels (Sections 4.2, 4.3, 4.4, 4.6, 4.7 of Text 3).	L1, L2, L3
Module-4	

Error Control Coding: Introduction, Examples of Error control coding, methods of Controlling Errors, Types of Errors, types of Codes, Linear Block Codes: matrix description of Linear Block Codes, Error Detection and Error Correction Capabilities of Linear Block Codes, Single Error Correcting hamming Codes, Table lookup Decoding using Standard Array. **Binary Cyclic Codes:** Algebraic Structure of Cyclic Codes, Encoding using an (n-k) Bit Shift register, Syndrome Calculation, Error Detection and Correction (Sections 9.1, 9.2, 9.3, 9.3.1, 9.3.2, 9.3.3 of Text 1).	L1, L2, L3
Module-5	
Some Important Cyclic Codes: Golay Codes, BCH Codes(Section 8.4 – Article 5 of Text 2). **Convolution Codes**: Convolution Encoder, Time domain approach, Transform domain approach, Code Tree, Trellis and State Diagram, The Viterbi Algorithm) (Section 8.5 – Articles 1,2 and 3, 8.6- Article 1 of Text 2).	L1, L2, L3

Course Outcomes: At the end of the course the students will be able to:

- Explain concept of Dependent & Independent Source, measure of information, Entropy, Rate of Information and Order of a source
- Represent the information using Shannon Encoding, Shannon Fano, Prefix and Huffman Encoding Algorithms
- Model the continuous and discrete communication channels using input, output and joint probabilities
- Determine a codeword comprising of the check bits computed using Linear Block codes, cyclic codes & convolutional codes
- Design the encoding and decoding circuits for Linear Block codes, cyclic codes, convolutional codes, BCH and Golay codes.

Question paper pattern:

- The question paper will have ten questions
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of three sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module
- The students will have to answer 5 full questions, selecting one full question from each module

Text Books:

1. Digital and analog communication systems, K. Sam Shanmugam, John Wiley India Pvt. Ltd, 1996.
2. Digital communication, Simon Haykin, John Wiley India Pvt. Ltd, 2008.
3. Information Theory and Coding, Muralidhar Kulkarni, K.S. Shivaprakasha, Wiley India Pvt. Ltd, 2015, ISBN:978-81-265-5305-1.

Reference Books:

1. ITC and Cryptography, Ranjan Bose, TMH, II edition, 2007
2. Principles of digital communication, J. Das, S. K. Mullick, P. K. Chatterjee, Wiley, 1986 - Technology & Engineering

3. Digital Communications – Fundamentals and Applications, Bernard Sklar, Second Edition, Pearson Education, 2016, ISBN: 9780134724058.
4. Information Theory and Coding, K.N.Haribhat, D.Ganesh Rao, Cengage Learning, 2017.

DSP Lab

B.E., V Semester, EC/TC

[As per Choice Based Credit System (CBCS) scheme]

Subject Code	15ECL57	IA Marks	20
Number of Lecture Hours/Week	01Hr Tutorial (Instructions) + 02 Hours Laboratory=03	Exam Marks	80
RBT Levels	L1, L2, L3	Exam Hours	03

CREDITS – 02

Course objectives: This course will enable students to

- Simulate discrete time signals and verification of sampling theorem.
- Compute the DFT for a discrete signal and verification of its properties using MATLAB.
- Find solution to the difference equations and computation of convolution and correlation along with the verification of properties.
- Compute and display the filtering operations and compare with the theoretical values.
- Implement the DSP computations on DSP hardware and verify the result.

Laboratory Experiments

Following Experiments to be done using MATLAB / SCILAB / OCTAVE or equivalent:

1. Verification of sampling theorem.
2. Linear and circular convolution of two given sequences, Commutative, distributive and associative property of convolution.
3. Auto and cross correlation of two sequences and verification of their properties
4. Solving a given difference equation.
5. Computation of N point DFT of a given sequence and to plot magnitude and phase spectrum (using DFT equation and verify it by built-in routine).
6. (i) Verification of DFT properties (like Linearity and Parseval's theorem, etc.)
   (ii) DFT computation of square pulse and Sinc function etc.
7. Design and implementation of FIR filter to meet given specifications (using different window techniques).
8. Design and implementation of IIR filter to meet given specifications.

Following Experiments to be done using DSP kit

9. Linear convolution of two sequences
10. Circular convolution of two sequences
11. N-point DFT of a given sequence
12. Impulse response of first order and second order system
13. Implementation of FIR filter

Course outcomes: On the completion of this laboratory course, the students will be able to:

- Understand the concepts of analog to digital conversion of signals and frequency domain sampling of signals.

- Modelling of discrete time signals and systems and verification of its properties and results.
- Implementation of discrete computations using DSP processor and verify the results.
- Realize the digital filters using a simulation tool and a DSP processor and verify the frequency and phase response.

Conduct of Practical Examination:

1. All laboratory experiments are to be included for practical examination.
2. Strictly follow the instructions as printed on the cover page of answer script for breakup of marks.
3. Change of experiment is allowed only once and Marks allotted to the procedure part to be made zero.

HDL Lab

B.E., V Semester, EC/TC

[As per Choice Based Credit System (CBCS) scheme]

Subject Code	15ECL58	IA Marks	20
Number of Lecture Hours/Week	01 Hr Tutorial (Instructions) + 02 Hours Laboratory = 03	Exam Marks	80
RBT Levels	L1, L2, L3	Exam Hours	03

CREDITS – 02

Course objectives: This course will enable students to:

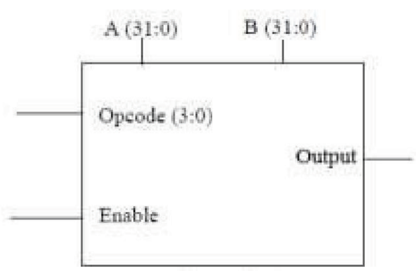
- Familiarize with the CAD tool to write HDL programs.
- Understand simulation and synthesis of digital design.
- Program FPGAs/CPLDs to synthesise the digital designs.
- Interface hardware to programmable ICs through I/O ports.
- Choose either Verilog or VHDL for a given Abstraction level.

Note: Programming can be done using any compiler. Download the programs on a FPGA/CPLD boards such as Apex/Acex/Max/Spartan/Sinfi or equivalent and performance testing may be done using 32 channel pattern generator and logic analyzer apart from verification by simulation with tools such as Altera/Modelsim or equivalent.

Laboratory Experiments

Part–A: PROGRAMMING

1. Write Verilog code to realize all the logic gates
2. Write a Verilog program for the following combinational designs
   a. 2 to 4 decoder
   b. 8 to 3 (encoder without priority & with priority)
   c. 8 to 1 multiplexer.
   d. 4 bit binary to gray converter
   e. Multiplexer, de-multiplexer, comparator.
3. Write a VHDL and Verilog code to describe the functions of a Full Adder using three modeling styles.
4. Write a Verilog code to model 32 bit ALU using the schematic diagram shown below



- ALU should use combinational logic to calculate an output based on the four bit op-code input.
- ALU should pass the result to the out bus when enable line in high, and tri-state the out bus when the enable line is low.

- ALU should decode the 4 bit op-code according to the example given below.

OPCODE	ALU Operation
1.	A+B
2.	A-B
3.	A Complement
4.	A*B
5.	A AND B
6.	A OR B
7.	A NAND B
8.	A XOR B

5. Develop the Verilog code for the following flip-flops, SR, D, JK and T.
6. Design a 4 bit binary, BCD counters (Synchronous reset and Asynchronous reset) and “any sequence” counters, using Verilog code.

Part–B: INTERFACING (at least four of the following must be covered using VHDL/Verilog)

1. Write HDL code to display messages on an alpha numeric LCD display.
2. Write HDL code to interface Hex key pad and display the key code on seven segment display.
3. Write HDL code to control speed, direction of DC and Stepper motor.
4. Write HDL code to accept Analog signal, Temperature sensor and display the data on LCD or Seven segment display.
5. Write HDL code to generate different waveforms (Sine, Square, Triangle, Ramp etc.,) using DAC - change the frequency.
6. Write HDL code to simulate Elevator operation.

Course Outcomes: At the end of this course, students should be able to:

- Write the Verilog/VHDL programs to simulate Combinational circuits in Dataflow, Behavioral and Gate level Abstractions.
- Describe sequential circuits like flip flops and counters in Behavioral description and obtain simulation waveforms.
- Synthesize Combinational and Sequential circuits on programmable ICs and test the hardware.
- Interface the hardware to the programmable chips and obtain the required output.

Conduct of Practical Examination:

1. All laboratory experiments are to be included for practical examination.
2. Strictly follow the instructions as printed on the cover page of answer script for breakup of marks.
3. Change of experiment is allowed only once and Marks allotted to the procedure part to be made zero.

B.E E&C SIXTH SEMESTER SYLLABUS

DIGITAL COMMUNICATION

B.E., VI Semester, Electronics & Communication Engineering/ Telecommunication Engineering

[As per Choice Based Credit System (CBCS) scheme]

Subject Code	15EC61	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50 (10 Hours/Module)	Exam Hours	03
CREDITS – 04			

Course Objectives: The objectives of the course is to enable students to:

- Understand the mathematical representation of signal, symbol, noise and channels.
- Apply the concept of signal conversion to symbols and signal processing to symbols in transmitter and receiver functional blocks.
- Compute performance issues and parameters for symbol processing and recovery in ideal and corrupted channel conditions.
- Compute performance parameters and mitigate for these parameters in corrupted and distorted channel conditions.

Module-1	RBT Level
Bandpass Signal to Equivalent Lowpass: Hilbert Transform, Pre-envelopes, Complex envelopes, Canonical representation of bandpass signals, Complex low pass representation of bandpass systems, Complex representation of band pass signals and systems (Text 1: 2.8, 2.9, 2.10, 2.11, 2.12, 2.13). **Line codes:** Unipolar, Polar, Bipolar (AMI) and Manchester code and their power spectral densities (Text 1: Ch 6.10). Overview of HDB3, B3ZS, B6ZS (Ref. 1: 7.2)	L1, L2, L3
Module-2	
Signaling over AWGN Channels- Introduction, Geometric representation of signals, Gram-Schmidt Orthogonalization procedure, Conversion of the continuous AWGN channel into a vector channel, Optimum receivers using coherent detection: ML Decoding, Correlation receiver, matched filter receiver (Text 1: 7.1, 7.2, 7.3, 7.4).	L1, L2, L3
Module-3	
Digital Modulation Techniques: Phase shift Keying techniques using coherent detection: generation, detection and error probabilities of BPSK and QPSK, M–ary PSK, M–ary QAM (Relevant topics in Text 1 of 7.6, 7.7). Frequency shift keying techniques using Coherent detection: BFSK	

generation, detection and error probability (Relevant topics in Text 1 of 7.8). Non coherent orthogonal modulation techniques: BFSK, DPSK Symbol representation, Block diagrams treatment of Transmitter and Receiver, Probability of error (without derivation of probability of error equation) (Text 1: 7.11, 7.12. 7.13).	
Module-4	
Communication through Band Limited Channels: Digital Transmission through Band limited channels: Digital PAM Transmission through Band limited Channels, Signal design for Band limited Channels: Design of band limited signals for zero ISI–The Nyquist Criterion (statement only), Design of band limited signals with controlled ISI-Partial Response signals, Probability of error for detection of Digital PAM: Probability of error for detection of Digital PAM with Zero ISI, Symbol–by–Symbol detection of data with controlled ISI (Text 2: 9.1, 9.2, 9.3.1, 9.3.2). Channel Equalization: Linear Equalizers (ZFE, MMSE), Adaptive Equalizers (Text 2: 9.4.2).	L1, L2, L3
Module-5	
Principles of Spread Spectrum: Spread Spectrum Communication Systems: Model of a Spread Spectrum Digital Communication System, Direct Sequence Spread Spectrum Systems, Effect of De-spreading on a narrowband Interference, Probability of error (statement only), Some applications of DS Spread Spectrum Signals, Generation of PN Sequences, Frequency Hopped Spread Spectrum, CDMA based on IS-95 (Text 2: 11.3.1, 11.3.2, 11.3.3, 11.3.4, 11.3.5, 11.4.2).	L1, L2, L3

Course Outcomes: At the end of the course, the students will be able to:

- Associate and apply the concepts of Bandpass sampling to well specified signals and channels.
- Analyze and compute performance parameters and transfer rates for low pas and bandpass symbol under ideal and corrupted non band limited channels.
- Test and validate symbol processing and performance parameters at the receiver under ideal and corrupted bandlimited channels.
- Demonstrate by simulation and emulation that bandpass signals subjected to corrupted and distorted symbols in a bandlimited channel, can be demodulated and estimated at receiver to meet specified performance criteria.

Question paper pattern:

- The question paper will have ten questions
- Each full question consists of 16 marks**.**
- There will be 2 full questions (with a maximum of Three sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module
- The students will have to answer 5 full questions, selecting one full question from each module

Text Books:

1. Simon Haykin, “Digital Communication Systems”, John Wiley & sons, First Edition, 2014, ISBN 978-0-471-64735-5.
2. John G Proakis and Masoud Salehi, “Fundamentals of Communication Systems”, 2014 Edition, Pearson Education, ISBN 978-8-131-70573-5.

Reference Books:

1. B.P.Lathi and Zhi Ding, “Modern Digital and Analog communication Systems”, Oxford University Press, 4th Edition, 2010, ISBN: 978-0-198-07380-2.
2. Ian A Glover and Peter M Grant, “Digital Communications”, Pearson Education, Third Edition, 2010, ISBN 978-0-273-71830-7.
3. John G Proakis and Masoud Salehi, “Communication Systems Engineering”, 2nd Edition, Pearson Education, ISBN 978-93-325-5513-6.

ARM MICROCONTROLLER & EMBEDDED SYSTEMS

B.E., VI Semester, Electronics & Communication Engineering/
Telecommunication Engineering
[As per Choice Based Credit System (CBCS) scheme]

ARM MICROCONTROLLER & EMBEDDED SYSTEMS

B.E., VI Semester, Electronics & Communication Engineering/ Telecommunication Engineering [As per Choice Based Credit System (CBCS) Scheme]

Course Code	**15EC62**	**IA Marks**	**20**
Number of Lecture Hours/Week	**04**	**Exam Marks**	**80**
Total Number of Lecture Hours	**50 (10 Hours / Module)**	**Exam Hours**	**03**

CREDITS – 04

Course objectives: This course will enable students to:

- Understand the architectural features and instruction set of 32 bit microcontroller ARM Cortex M3.
- Program ARM Cortex M3 using the various instructions and C language for different applications.
- Understand the basic hardware components and their selection method based on the characteristics and attributes of an embedded system.
- Develop the hardware software co-design and firmware design approaches.
- Explain the need of real time operating system for embedded system applications.

Module-1

ARM-32 bit Microcontroller: Thumb-2 technology and applications of ARM, Architecture of ARM Cortex M3, Various Units in the architecture, Debugging support, General Purpose Registers, Special Registers, exceptions, interrupts, stack operation, reset sequence (Text 1: Ch 1, 2, 3) **L1, L2**

Module-2

ARM Cortex M3 Instruction Sets and Programming: Assembly basics, Instruction list and description, Useful instructions, Memory mapping, Bit-band operations and CMSIS, Assembly and C language Programming (Text 1: Ch-4, Ch-5, Ch-10 (10.1, 10.2, 10.3, 10.5 only) **L1, L2, L3**

Module-3

Embedded System Components: Embedded Vs General computing system, Classification of Embedded systems, Major applications and purpose of ES. Core of an Embedded System including all types of processor/controller, Memory, Sensors, Actuators, LED, 7 segment LED display, Optocoupler, Relay, Piezo buzzer, Push button switch, Communication Interface (onboard and external types), Embedded firmware, Other system components.
(Text 2: All the Topics from Ch-1 and Ch-2, excluding 2.3.3.4 (stepper motor), 2.3.3.8 (keyboard) and 2.3.3.9 (PPI) sections). **L1, L2, L3**

Module-4

Embedded System Design Concepts: Characteristics and Quality Attributes of Embedded Systems, Operational and non-operational quality attributes, Embedded

Systems-Application and Domain specific, Hardware Software Co-Design and Program Modelling (excluding UML), Embedded firmware design and development (excluding C language).
(Text 2: Ch-3, Ch-4, Ch-7 (Sections 7.1, 7.2 only), Ch-9 (Sections 9.1, 9.2, 9.3.1, 9.3.2 only) **L1, L2, L3**

Module-5

RTOS and IDE for Embedded System Design: Operating System basics, Types of operating systems, Task, process and threads (Only POSIX Threads with an example program), Thread preemption, Preemptive Task scheduling techniques, Task Communication, Task synchronization issues – Racing and Deadlock, Concept of Binary and counting semaphores (Mutex example without any program), How to choose an RTOS, Integration and testing of Embedded hardware and firmware, Embedded system Development Environment – Block diagram (excluding Keil), Disassembler/decompiler, simulator, emulator and debugging techniques
(Text 2: Ch-10 (Sections 10.1, 10.2, 10.3, 10.5.2 , 10.7, 10.8.1.1, 10.8.1.2, 10.8.2.2, 10.10 only), Ch 12, Ch-13 (a block diagram before 13.1, 13.3, 13.4, 13.5, 13.6 only)
L1, L2, L3

Course outcomes: After studying this course, students will be able to:

- Describe the architectural features and instructions of 32 bit microcontroller ARM Cortex M3.
- Apply the knowledge gained for Programming ARM Cortex M3 for different applications.
- Understand the basic hardware components and their selection method based on the characteristics and attributes of an embedded system.
- Develop the hardware /software co-design and firmware design approaches.
- Explain the need of real time operating system for embedded system applications.

Text Books:

1. Joseph Yiu, "The Definitive Guide to the ARM Cortex-M3", 2nd Edition, Newnes, (Elsevier), 2010.

2. Shibu K V, "Introduction to Embedded Systems", Tata McGraw Hill Education Private Limited, 2nd Edition.

COMPUTER COMMUNICATION NETWORKS

B.E., VI Semester, Electronics & Communication Engineering / Telecommunication Engineering

[As per Choice Based Credit System (CBCS) scheme]

COMPUTER COMMUNICATION NETWORKS

B.E., VI Semester, Electronics & Communication Engineering / Telecommunication Engineering

[As per Choice Based Credit System (CBCS) Scheme]

Course Code	**15EC64**	**IA Marks**	**20**
Number of Lecture Hours/Week	**04**	**Exam Marks**	**80**
Total Number of Lecture Hours	**50 (10 Hours / Module)**	**Exam Hours**	**03**

CREDITS – 04

Course Objectives: This course will enable students to:

- Understand the layering architecture of OSI reference model and TCP/IP protocol suite.
- Understand the protocols associated with each layer.
- Learn the different networking architectures and their representations.
- Learn the various routing techniques and the transport layer services.

Module-1

Introduction: Data Communications: Components, Representations, Data Flow, Networks: Physical Structures, Network Types: LAN, WAN, Switching, Internet.

Network Models: Protocol Layering: Scenarios, Principles, Logical Connections, TCP/IP Protocol Suite: Layered Architecture, Layers in TCP/IP suite, Description of layers, Encapsulation and Decapsulation, Addressing, Multiplexing and Demultiplexing, The OSI Model: OSI Versus TCP/IP.

Data-Link Layer: Introduction: Nodes and Links, Services, Categories' of link, Sublayers, Link Layer addressing: Types of addresses, ARP. Data Link Control (DLC) services: Framing, Flow and Error Control, Data Link Layer Protocols: Simple Protocol, Stop and Wait protocol, Piggybacking. **L1, L2**

Module-2

Media Access Control: Random Access: ALOHA, CSMA, CSMA/CD, CSMA/CA. Controlled Access: Reservation, Polling, Token Passing.

Wired LANs: Ethernet: Ethernet Protocol: IEEE802, Ethernet Evolution, Standard Ethernet: Characteristics, Addressing, Access Method, Efficiency, Implementation, Fast Ethernet: Access Method, Physical Layer, Gigabit Ethernet: MAC Sublayer, Physical Layer, 10 Gigabit Ethernet. **L1, L2**

Module-3

Wireless LANs: Introduction: Architectural Comparison, Characteristics, IEEE 802.11: Architecture, MAC Sublayer, Addressing Mechanism, Physical Layer, Bluetooth: Architecture, Layers.

Connecting Devices: Hubs, Switches, **Virtual LANs:** Membership, Configuration, Communication between Switches and Routers, Advantages.

Network Layer: Introduction, Network Layer services: Packetizing, Routing and Forwarding, Other services, Packet Switching: Datagram Approach, Virtual Circuit Approach, IPV4 Addresses: Address Space, Classful Addressing, Classless Addressing, DHCP, Network Address Resolution, Forwarding of IP Packets: Based on destination Address and Label. **L1, L2**

Module-4

Network Layer Protocols: Internet Protocol (IP): Datagram Format, Fragmentation, Options, Security of IPv4 Datagrams, ICMPv4: Messages, Debugging Tools, Mobile IP: Addressing, Agents, Three Phases, Inefficiency in Mobile IP.

Unicast Routing: Introduction, Routing Algorithms: Distance Vector Routing, Link State Routing, Path vector routing, Unicast Routing Protocol: Internet Structure, Routing Information Protocol, Open Shortest Path First, Border Gateway Protocol Version 4. **L1, L2, L3**

Module-5

Transport Layer: Introduction: Transport Layer Services, Connectionless and Connection oriented Protocols, Transport Layer Protocols: Simple protocol, Stop and wait protocol, Go-Back-N Protocol, Selective repeat protocol, User Datagram Protocol: User Datagram, UDP Services, UDP Applications, Transmission Control Protocol: TCP Services, TCP Features, Segment, Connection, State Transition diagram, Windows in TCP, Flow control, Error control, TCP congestion control. **L1, L2**

Course Outcomes: At the end of the course, the students will be able to:

- Identify the protocols and services of Data link layer.
- Identify the protocols and functions associated with the transport layer services.
- Describe the layering architecture of computer networks and distinguish between the OSI reference model and TCP/IP protocol suite.
- Distinguish the basic network configurations and standards associated with each network.
- Construct a network model and determine the routing of packets using different routing algorithms.

Text Book:

Data Communications and Networking , Forouzan, 5th Edition, McGraw Hill, 2016 ISBN: 1-25-906475-3

Reference Books:

1. Computer Networks, James J Kurose, Keith W Ross, Pearson Education, 2013, ISBN: 0-273-76896-4
2. Introduction to Data Communication and Networking, Wayarles Tomasi, Pearson Education, 2007, ISBN:0130138282

B.E E&C SEVENTH SEMESTER SYLLABUS

MICROWAVES AND ANTENNAS

B.E., VII Semester, Electronics &Communication Engineering

[As per Choice Based Credit System (CBCS) scheme]

Course Code	**15EC71**	**IA Marks**	**20**
Number of Lecture Hours/Week	**04**	**Exam Marks**	**80**
Total Number of Lecture Hours	**50 (10 Hours / Module)**	**Exam Hours**	**03**

CREDITS – 04

Course objectives: This course will enable students to:

- Describe the microwave properties and its transmission media
- Describe microwave devices for several applications
- Understand the basics of antenna theory
- Select antennas for specific applications

Module-1

Microwave Tubes: Introduction, Reflex Klystron Oscillator, Mechanism of Oscillations, Modes of Oscillations, Mode Curve (Qualitative Analysis only). (Text 1: 9.1, 9.2.2)
Microwave Transmission Lines: Microwave Frequencies, Microwave devices, Microwave Systems, Transmission Line equations and solutions, Reflection Coefficient and Transmission Coefficient, Standing Wave and Standing Wave Ratio, Smith Chart, Single Stub matching. (Text 2: 0.1, 0.2, 0.3, 3.1, 3.2, 3.3, 3.5, 3.6 Except Double stub matching) **L1, L2**

Module-2

Microwave Network theory: Symmetrical Z and Y-Parameters for Reciprocal Networks, S matrix representation of Multi-Port Networks. (Text 1: 6.1, 6.2, 6.3)
Microwave Passive Devices: Coaxial Connectors and Adapters, Attenuators, Phase Shifters, Waveguide Tees, Magic tees. (Text 1: 6.4.2, 6.4.14, 6.4.15, 6.4.16) **L1, L2**

Module-3

Strip Lines: Introduction, Micro Strip lines, Parallel Strip lines, Coplanar Strip lines, Shielded Strip Lines. (Text 2: Chapter 11)
Antenna Basics: Introduction, Basic Antenna Parameters, Patterns, Beam Area, Radiation Intensity, Beam Efficiency, Directivity and Gain, Antenna Apertures, Effective Height, Bandwidth, Radio Communication Link, Antenna Field Zones & Polarization. (Text 3: 2.1- 2.11, 2.13,2.15) **L1, L2, L3**

Module-4

Point Sources and Arrays: Introduction, Point Sources, Power Patterns, Power Theorem, Radiation Intensity, Field Patterns, Phase Patterns, Arrays of Two Isotropic Point Sources, Pattern Multiplication, Linear Arrays of n Isotropic Point Sources of equal Amplitude and Spacing.(Text 3: 5.1 – 5.10,5.13)
Electric Dipoles: Introduction, Short Electric Dipole, Fields of a Short Dipole (General and Far Field Analyses), Radiation Resistance of a Short Dipole, Thin Linear Antenna (Field Analyses), Radiation Resistances of Lambda/2 Antenna. (Text 3: 6.1 -6.6)
L1, L2, L3, L4

Module-5

Loop and Horn Antenna: Introduction, Small loop, Comparison of Far fields of Small Loop and Short Dipole, The Loop Antenna General Case, Far field Patterns of Circular Loop Antenna with Uniform Current, Radiation Resistance of Loops, Directivity of Circular Loop Antennas with Uniform Current, Horn antennas Rectangular Horn Antennas.(Text 3: 7.1-7.8, 7.19, 7.20)
Antenna Types: Helical Antenna, Helical Geometry, Practical Design Considerations of Helical Antenna, Yagi-Uda array, Parabola General Properties, Log Periodic Antenna. (Text 3: 8.3, 8.5, 8.8, 9.5, 11.7) **L1, L2, L3**

Course Outcomes: At the end of the course, students will be able to:
- Describe the use and advantages of microwave transmission
- Analyze various parameters related to microwave transmission lines and waveguides
- Identify microwave devices for several applications
- Analyze various antenna parameters necessary for building an RF system
- Recommend various antenna configurations according to the applications

Text Books:
1. **Microwave Engineering** – Annapurna Das, Sisir K Das TMH Publication, 2^{nd}, 2010.
2. **Microwave Devices and circuits**- Liao, Pearson Education.
3. **Antennas and Wave Propagation,** John D. Krauss, Ronald J Marhefka and Ahmad S Khan,4^{th} Special Indian Edition , McGraw- Hill Education Pvt. Ltd., 2010.

Reference Books:
1. **Microwave Engineering** – David M Pozar, John Wiley India Pvt. Ltd. 3^{rd}Edn, 2008.
2. **Microwave Engineering** – Sushrut Das, Oxford Higher Education, 2^{nd}Edn, 2015.
3. **Antennas and Wave Propagation** – Harish and Sachidananda: Oxford University Press, 2007.

DIGITAL IMAGE PROCESSING

B.E., VII Semester, Electronics & Communication Engineering

[As per Choice Based Credit System (CBCS) scheme]

Subject Code	15EC72	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50 (10 Hours / Module)	Exam Hours	03
CREDITS – 04			

Course Objectives: The objectives of this course are to:

- Understand the fundamentals of digital image processing
- Understand the image transform used in digital image processing
- Understand the image enhancement techniques used in digital image processing
- Understand the image restoration techniques and methods used in digital image processing
- Understand the Morphological Operations and Segmentation used in digital image processing

Module-1	RBT Level
Digital Image Fundamentals: What is Digital Image Processing?, Origins of Digital Image Processing, Examples of fields that use DIP, Fundamental Steps in Digital Image Processing, Components of an Image Processing System, Elements of Visual Perception, Image Sensing and Acquisition, Image Sampling and Quantization, Some Basic Relationships Between Pixels, Linear and Nonlinear Operations. [Text: Chapter 1 and Chapter 2: Sections 2.1 to 2.5, 2.6.2]	L1, L2
Module-2	
Spatial Domain: Some Basic Intensity Transformation Functions, Histogram Processing, Fundamentals of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters **Frequency Domain**: Preliminary Concepts, The Discrete Fourier Transform (DFT) of Two Variables, Properties of the 2-D DFT, Filtering in the Frequency Domain, Image Smoothing and Image Sharpening Using Frequency Domain Filters, Selective Filtering. [Text: Chapter 3: Sections 3.2 to 3.6 and Chapter 4: Sections 4.2, 4.5 to 4.10]	L1, L2, L3
Module-3	
Restoration: Noise models, Restoration in the Presence of Noise Only using Spatial Filtering and Frequency Domain Filtering, Linear, Position-Invariant Degradations, Estimating the Degradation Function, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering, Constrained Least Squares Filtering. [Text: Chapter 5: Sections 5.2, to 5.9]	L1, L2, L3
Module-4	

Color Image Processing: Color Fundamentals, Color Models, Pseudocolor Image Processing. **Wavelets:** Background, Multiresolution Expansions. **Morphological Image Processing:** Preliminaries, Erosion and Dilation, Opening and Closing, The Hit-or-Miss Transforms, Some Basic Morphological Algorithms. [Text: Chapter 6: Sections 6.1 to 6.3, Chapter 7: Sections 7.1 and 7.2, Chapter 9: Sections 9.1 to 9.5]	L1, L2, L3
Module-5	
Segmentation: Point, Line, and Edge Detection, Thresholding, Region-Based Segmentation, Segmentation Using Morphological Watersheds. **Representation and Description:** Representation, Boundary descriptors. [Text: Chapter 10: Sections 10.2, to 10.5 and Chapter 11: Sections 11.1 and 11.2]	L1, L2, L3

Course Outcomes: At the end of the course students should be able to:

- Understand image formation and the role human visual system plays in perception of gray and color image data.
- Apply image processing techniques in both the spatial and frequency (Fourier) domains.
- Design image analysis techniques in the form of image segmentation and to evaluate the Methodologies for segmentation.
- Conduct independent study and analysis of Image Enhancement techniques.

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of Three sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module. The students will have to answer 5 full questions, selecting one full question from each module.

Text Book:

Digital Image Processing- Rafel C Gonzalez and Richard E. Woods, PHI 3rd Edition 2010.

Reference Books:

1. **Digital Image Processing**- S.Jayaraman, S.Esakkirajan, T.Veerakumar, Tata McGraw Hill 2014.
2. **Fundamentals of Digital Image Processing**-A. K. Jain, Pearson 2004.

OPERATING SYSTEM

B.E., V Semester, Electronics & Communication Engineering / Telecommunication Engineering

[As per Choice Based Credit System (CBCS) scheme]

Subject Code	15EC553	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40 (8 Hours / Module)	Exam Hours	03
CREDITS – 03			

Course objectives: This course will enable students to:

- Understand the services provided by an operating system.
- Understand how processes are synchronized and scheduled.
- Understand different approaches of memory management and virtual memory management.
- Understand the structure and organization of the file system
- Understand interprocess communication and deadlock situations.

Module-1	RBT Level
Introduction to Operating Systems OS, Goals of an OS, Operation of an OS, Computational Structures, Resource allocation techniques, Efficiency, System Performance and User Convenience, Classes operating System, Batch processing, Multi programming, Time Sharing Systems, Real Time and distributed Operating Systems (Topics from Sections 1.2, 1.3, 2.2 to 2.8 of Text).	L1, L2
Module-2	
Process Management: OS View of Processes, PCB, Fundamental State Transitions, Threads, Kernel and User level Threads, Non-preemptive scheduling- FCFS and SRN, Preemptive Scheduling- RR and LCN, Long term, medium term and short term scheduling in a time sharing system (Topics from Sections 3.3, 3.3.1 to 3.3.4, 3.4, 3.4.1, 3.4.2 , 4.2, 4.3, 4.4.1 of Text).	L1, L2
Module-3	
Memory Management: Contiguous Memory allocation, Non-Contiguos Memory Allocation, Paging, Segmentation, Segmentation with paging, Virtual Memory Management, Demand Paging, Paging Hardware, VM handler, FIFO, LRU page replacement policies (Topics from Sections 5.5 to 5.9, 6.1 to 6.3, except Optimal policy and 6.3.1of Text).	L1, L2
Module-4	
File Systems: File systems and IOCS, File Operations, File Organizations, Directory structures, File Protection, Interface between File system and IOCS, Allocation of disk space, Implementing file access (Topics from Sections 7.1 to 7.8 of Text).	L1, L2, L3
Module-5	
Message Passing and Deadlocks: Overview of Message Passing, Implementing message passing, Mailboxes, Deadlocks, Deadlocks in resource allocation, Resource state modelling, Deadlock detection algorithm, Deadlock Prevention (Topics from Sections 10.1 to 10.3, 11.1 to	L1, L2, L3

11.5 of Text).	

Course outcomes: After studying this course, students will be able to:

- Explain the goals, structure, operation and types of operating systems.
- Apply scheduling techniques to find performance factors.
- Explain organization of file systems and IOCS.
- Apply suitable techniques for contiguous and non-contiguous memory allocation.
- Describe message passing, deadlock detection and prevention methods.

Question paper pattern:

- The question paper will have ten questions
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of three sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module
- The students will have to answer 5 full questions, selecting one full question from each module

Text Book:

Operating Systems – A concept based approach, by Dhamdare, TMH, 2nd edition.

Reference Books:

1. Operating systems concepts, Silberschatz and Galvin, John Wiley India Pvt. Ltd, 5th edition,2001.
2. Operating system–internals and design system, William Stalling, Pearson Education, 4th ed, 2006.
3. Design of operating systems, Tannanbhaum, TMH, 2001.

Object Oriented Programming Using C++

B.E. V Semester (Open Elective)

[As per Choice Based Credit System (CBCS)scheme]

Subject Code	15EC562	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40 (08 Hrs/ Module	Exam Hours	03
CREDITS – 03			

Course objectives: This course will enable students to:

- Define Encapsulation, Inheritance and Polymorphism.
- Solve the problem with object oriented approach.
- Analyze the problem statement and build object oriented system model.
- Describe the characters and behavior of the objects that comprise a system.
- Explain function overloading, operator overloading and virtual functions.
- Discuss the advantages of object oriented programming over procedure oriented programming.

Module -1	RBT Level
Beginning with C++ and its features: What is C++?, Applications and structure of C++ program, Different Data types, Variables, Different Operators, expressions, operator overloading and control structures in C++ (Topics from Ch -2,3 of Text).	L1, L2
Module -2	
Functions, classes and Objects: Functions, Inline function, function overloading, friend and virtual functions, Specifying a class, C++ program with a class, arrays within a class, memory allocation to objects, array of objects, members, pointers to members and member functions (Selected Topics from Chap-4,5 of Text).	L1, L2, L3
Module -3	
Constructors, Destructors and Operator overloading: Constructors, Multiple constructors in a class, Copy constructor, Dynamic constructor, Destructors, Defining operator overloading, Overloading Unary and binary operators, Manipulation of strings using operators (Selected topics from Chap-6, 7 of Text).	L1, L2, L3
Module -4	
Inheritance, Pointers, Virtual Functions, Polymorphism: Derived Classes, Single, multilevel, multiple inheritance, Pointers to objects and derived classes, this pointer, Virtual and pure virtual functions (Selected topics from Chap-8,9 of Text).	L1, L2, L3

Module -5	
Streams and Working with files: C++ streams and stream classes, formatted and unformatted I/O operations, Output with manipulators, Classes for file stream operations, opening and closing a file, EOF (Selected topics from Chap-10, 11 of Text).	L1, L2, L3

Course Outcomes: At the end of the course, students will be able to:

- Explain the basics of Object Oriented Programming concepts.
- Apply the object initialization and destroy concept using constructors and destructors.
- Apply the concept of polymorphism to implement compile time polymorphism in programs by using overloading methods and operators.
- Use the concept of inheritance to reduce the length of code and evaluate the usefulness.
- Apply the concept of run time polymorphism by using virtual functions, overriding functions and abstract class in programs.
- Use I/O operations and file streams in programs.

Question paper pattern:

- The question paper will have ten questions.
- Each full Question consisting of 16 marks
- There will be 2 full questions (with a maximum of Three sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Text Book:

Object Oriented Programming with C++, E.Balaguruswamy, TMH, 6th Edition, 2013.

Reference Book:

Object Oriented Programming using C++, Robert Lafore, Galgotia publication 2010.

POWER ELECTRONICS

B.E., VII Semester, Electronics & Communication Engineering

[As per Choice Based Credit System (CBCS) scheme]

POWER ELECTRONICS

B.E., VII Semester, Electronics & Communication Engineering

[As per Choice Based Credit System (CBCS) Scheme]

Course Code	**15EC73**	**IA Marks**	**20**
Number of Lecture Hours/Week	**04**	**Exam Marks**	**80**
Total Number of Lecture Hours	**50 (10 Hours / Module)**	**Exam Hours**	**03**

CREDITS – 04

Course Objectives: This course will enable students to:

- Understand the construction and working of various power devices.
- Study and analysis of thyristor circuits with different triggering conditions.
- Learn the applications of power devices in controlled rectifiers, converters and inverters.
- Study of power electronics circuits under various load conditions.

Module-1

Introduction - Applications of Power Electronics, Power Semiconductor Devices, Control Characteristics of Power Devices, types of Power Electronic Circuits, Peripheral Effects.
Power Transistors: Power BJTs: Steady state characteristics. Power MOSFETs: device operation, switching characteristics, IGBTs: device operation, output and transfer characteristics, di/dt and dv/dt limitations. (Text 1) **L1, L2**

Module-2

Thyristors - Introduction, Principle of Operation of SCR, Static Anode-Cathode Characteristics of SCR, Two transisitor model of SCR, Gate Characteristics of SCR, Turn-ON Methods, Turn-OFF Mechanism, Turn-OFF Methods: Natural and Forced Commutation – Class A and Class B types, Gate Trigger Circuit: Resistance Firing Circuit, Resistance capacitance firing circuit, UJT Firing Circuit. (Text 2) **L1, L2, L3**

Module-3

Controlled Rectifiers - Introduction, Principle of Phase-Controlled Converter Operation, Single-Phase Full Converter with RL Load, Single-Phase Dual Converters, Single-Phase Semi Converter with RL load.
AC Voltage Controllers - Introduction, Principles of ON-OFF Control, Principle of Phase Control, Single phase controllers with resistive and inductive loads. (Text 1) **L1, L2, L3**

Module-4

DC-DC Converters - Introduction, principle of step-down operation and it's analysis with RL load, principle of step-up operation, Step-up converter with a resistive load, Performance parameters, Converter classification, Switching mode regulators: Buck regulator, Boost regulator, Buck-Boost Regulators, Chopper circuit design. (Text 1) **L1, L2**

Module-5

Pulse Width Modulated Inverters- Introduction, principle of operation, performance parameters, Single phase bridge inverters, voltage control of single phase inverters, current source inverters, Variable DC-link inverter, Boost inverter, Inverter circuit design.
Static Switches: Introduction, Single phase AC switches, DC Switches, Solid state

relays, Microelectronic relays. (Text 1) **L1, L2**
Course Outcomes: At the end of the course students should be able to: • Describe the characteristics of different power devices and identify the various applications associated with it. • Illustrate the working of power circuit as DC-DC converter. • Illustrate the operation of inverter circuit and static switches. • Determine the output response of a thyristor circuit with various triggering options. • Determine the response of controlled rectifier with resistive and inductive loads.
Evaluation of Internal Assessment Marks: It is suggested that at least 4 experiments of Power Electronics to be conducted by the students. This activity can be considered for the evaluation of 05 marks out of 20 Internal Assessment (IA) Marks, reserved for the other activities.
Text Books: 1. Mohammad H Rashid, Power Electronics, Circuits, Devices and Applications, 3rd/4th Edition, Pearson Education Inc, 2014, ISBN: 978-93-325-1844-5. 2. M.D Singh and K B Khanchandani, Power Electronics, 2nd Edition, Tata Mc-Graw Hill, 2009, ISBN: 0070583897
Reference Books: 1. L. Umanand, Power Electronics, Essentials and Applications, John Wiley India Pvt. Ltd, 2009. 2. Dr. P. S. Bimbhra, “Power Electronics”, Khanna Publishers, Delhi, 2012. 3. P.C. Sen, “Modern Power Electronics”, S Chand & Co New Delhi, 2005. 4. Earl Gose, Richard Johnsonbaugh, Steve Jost, Pattern Recognition and Image Analysis, ePub eBook.

MULTIMEDIA COMMUNICATION

B.E., VII Semester, Electronics & Communication Engineering/ Telecommunication Engineering

[As per Choice Based credit System (CBCS) Scheme

Subject Code	15EC741	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40 (08 Hours / Module)	Exam Hours	03
CREDITS – 03			

Course objectives: This course will enable students to:

- Gain fundamental knowledge in understanding the basics of different multimedia networks and applications.
- Understand digitization principle techniques required to analyze different media types.
- Analyze compression techniques required to compress text and image and gain knowledge of DMS.
- Analyze compression techniques required to compress audio and video.
- Gain fundamental knowledge about multimedia communication across different networks.

EMBEDDED CONTROLLER LAB

B.E., VI Semester, Electronics & Communication Engineering/ Telecommunication Engineering

[As per Choice Based Credit System (CBCS) scheme]

Subject Code	15ECL67	IA Marks	20
Number of Lecture Hours/Week	01Hr Tutorial (Instructions) + 02 Hours Laboratory = 03	Exam Marks	80
RBT Levels	L1, L2, L3	Exam Hours	03

CREDITS – 02

Course objectives: This course will enable students to:

- Understand the instruction set of ARM Cortex M3, a 32 bit microcontroller and the software tool required for programming in Assembly and C language.
- Program ARM Cortex M3 using the various instructions in assembly level language for different applications.
- Interface external devices and I/O with ARM Cortex M3.
- Develop C language programs and library functions for embedded system applications.

Laboratory Experiments

PART-A: Conduct the following Study experiments to learn ALP using ARM Cortex M3 Registers using an Evaluation board and the required software tool.

1. ALP to multiply two 16 bit binary numbers.
2. ALP to find the sum of first 10 integer numbers.

PART-B: Conduct the following experiments on an ARM CORTEX M3 evaluation board using evaluation version of Embedded 'C' & Keil uVision-4 tool/compiler.

1. Display “Hello World” message using Internal UART.
2. Interface and Control a DC Motor.
3. Interface a Stepper motor and rotate it in clockwise and anti-clockwise direction.

4. Interface a DAC and generate Triangular and Square waveforms.
5. Interface a 4x4 keyboard and display the key code on an LCD.
6. Using the Internal PWM module of ARM controller generate PWM and vary its duty cycle.
7. Demonstrate the use of an external interrupt to toggle an LED On/Off.
8. Display the Hex digits 0 to F on a 7-segment LED interface, with an appropriate delay in between.
9. Interface a simple Switch and display its status through Relay, Buzzer and LED.
10. Measure Ambient temperature using a sensor and SPI ADC IC.

Course outcomes: After studying this course, students will be able to:

- Understand the instruction set of 32 bit microcontroller ARM Cortex M3, and the software tool required for programming in Assembly and C language.
- Develop assembly language programs using ARM Cortex M3 for different applications.
- Interface external devices and I/O with ARM Cortex M3.
- Develop C language programs and library functions for embedded system applications.

Conduction of Practical Examination:

1. PART-B experiments using Embedded-C are only to be considered for the practical examination. PART-A ALP programs are for study purpose and can be considered for Internal Marks evaluation.

2. Strictly follow the instructions as printed on the cover page of answer script for breakup of marks.

3. Change of experiment is allowed only once and Marks allotted to the procedure part to be made zero.

B.E ELECTRICAL AND ELECTRONICS ENGINEERING(EEE)
CHOICE BASED CREDIT SYSTEM (CBCS)
SEMESTER - III

TRANSFORMERS AND GENERATORS (Core Course)

Subject Code	15EE33	IA Marks	20
Number of Lecture Hours/Week	04	Exam Hours	03
Total Number of Lecture Hours	50	Exam Marks	80

Credits - 04

Course objectives:

- To understand the concepts of transformers and their analysis.
- To suggest a suitable three phase transformer connection for a particular operation.
- To understand the concepts of generator and to evaluate their performance.
- To explain the requirement for the parallel operation of transformers and synchronous generators.■

Module-1	Teaching Hours
Single phase Transformers: Review of Principle of operation, constructional details of shell type and core type single-phase transformers, EMF equation, losses and commercial efficiency, conditions for maximum efficiency (No question shall be set from the review portion). Salient features of ideal transformer, operation of practical transformer under no - load and on - load with phasor diagrams. Equivalent circuit, Open circuit and Short circuit tests, calculation of equivalent circuit parameters and predetermination of efficiency- commercial and all-day. Voltage regulation and its significance. **Three-phase Transformers:** Introduction, Constructional features of three-phase transformers. Choice between single unit three-phase transformer and a bank of three single-phase transformers. Transformer connection for three phase operation – star/star, delta/delta, star/delta, zigzag/star and V/V, choice of connection. Phase conversion - Scott connection for three-phase to two-phase conversion. Labelling of three-phase transformer terminals, vector groups. Equivalent circuit of three phase transformers. ■	**10**
Revised Bloom's Taxonomy Level: L_1 – Remembering, L_2 – Understanding, L_3 – Applying, L_4 – Analysing.	

Module-2	
Parallel Operation of Transformers: Necessity of Parallel operation, conditions for parallel operation – Single phase and three phase. Load sharing in case of similar and dissimilar transformers. **Autotransformers and Tap changing transformers:** Introduction to auto transformer - copper economy, equivalent circuit, three phase auto connection and voltage regulation. Voltage regulation by tap changing – off circuit and on load. **Tertiary winding Transformers:** Necessity of tertiary winding, equivalent circuit and voltage regulation, tertiary winding in star/star transformers, rating of tertiary winding.■	**10**
Revised Bloom's Taxonomy Level: L_2 – Understanding, L_3 – Applying, L_4 – Analysing.	

Module-3	
Transformers (continuation): Cause and effects of harmonics, Current inrush in transformers, noise in transformers. Objects of testing transformers, polarity test, Sumpner's test. **Direct current Generator –** Review of construction, types, armature windings, relation between no load and terminal voltage (No question shall be set from the review portion). Armature reaction, Commutation and associated problems, no load and full load characteristics. Reasons for reduced dependency on dc generators. **Synchronous generators-** Review of construction and operation of salient & non-salient pole synchronous generators (No question shall be set from the review portion). Armature windings, winding factors, emf equation. Harmonics – causes, reduction and elimination. Armature reaction, Synchronous reactance, Equivalent circuit.■	**10**
Revised Bloom's Taxonomy Level: L_2 – Understanding, L_3 – Applying, L_4 – Analysing, L_5 – Evaluating.	

Module-4	
Synchronous generators (continuation): Generator load characteristic. Voltage regulation, excitation control for constant terminal voltage. Generator input and output. Parallel operation of	**10**

B.E ELECTRICAL AND ELECTRONICS ENGINEERING(EEE)
CHOICE BASED CREDIT SYSTEM (CBCS)
SEMESTER - III

15EE33 TRANSFORMERS AND GENERATORS (Core Course) (continued)

Module-4(continued)		**Teaching Hours**
Synchronous generators(continuation): generators and load sharing. Synchronous generator on infinite bus-bars – General load diagram, Electrical load diagram, mechanical load diagram, O – curves and V – curves. Power angle characteristic and synchronizing power. **Synchronous generators(continuation):** Effects of saliency, two-reaction theory, Direct and Quadrature reactance, power angle diagram, reluctance power, slip test. ■		
Revised Bloom's Taxonomy Level	L_1 – Remembering, L_2 – Understanding, L_3 – Applying, L_4 – Analysing.	
Module-5		
Synchronous generators(continuation): Open circuit and short circuit characteristics, Assessment of reactance- short circuit ratio, synchronous reactance, adjusted synchronous reactance and Potier reactance. Voltage regulation by EMF, MMF, ZPF and ASA methods. **Performance of synchronous generators:** Capability curve for large turbo generators and salient pole generators. Starting, synchronizing and control. Hunting and dampers. ■		**10**
Revised Bloom's Taxonomy Level	L_1 – Remembering, L_2 – Understanding, L_3 – Applying, L_4 – Analysing.	

Course outcomes:

At the end of the course the student will be able to:

- Explain the construction and operation and performance of transformers.
- Explain different connections for the three phase operations, their advantages and applications.
- Explain the construction and operation of Synchronous machines and evaluate the regulation of synchronous machines by different methods.
- Analyze the operation of the synchronous machine connected to infinite machine.

Graduate Attributes (As per NBA)

Engineering Knowledge, Problem analysis.

Question paper pattern:

- The question paper will have ten questions.
- Each full question is for 16 marks.
- There will be 2full questions (with a maximum of four sub questions in one full question) from each module.
- Each full question with sub questions will cover the contents under a module.
- Students will have to answer 5 full questions, selecting one full question from each module. ■

Text/Reference Books

1	Electric Machines	D. P. Kothari, et al	McGraw Hill	4th Edition, 2011
2	Performance and Design of A.C. Machines	M. G. Say	CBS Publishers	3rd Edition, 2002
3	Principles of Electric Machines and power Electronics	P.C.Sen	Wiley	2nd Edition, 2013
4	Electric Machines	MulukuntlaS.Sarma,at el	Cengage	1st Edition, 2009
5	Electrical Machines, Drives and Power systems	Theodore Wildi	Pearson	6th Edition, 2014
6	Electrical Machines	M.V. Deshpande	PHI Learning	1st Edition, 2013
7	Electrical Machines	AbhijitChakrabarti et al	McGraw Hill	1st Edition, 2015
8	A Textbook of Electrical Machines	K.R.SiddapuraD.B.Raval	Vikas	1st Edition, 2014

B.E ELECTRICAL AND ELECTRONICS ENGINEERING (EEE)
CHOICE BASED CREDIT SYSTEM (CBCS)
SEMESTER - III

ANALOG ELECTRONIC CIRCUITS (Core Course)

Subject Code	15EE34	IA Marks	20
Number of Lecture Hours/Week	04	Exam Hours	03
Total Number of Lecture Hours	50	Exam Marks	80

Credits - 04

Course objectives:

- Provide the knowledge for the analysis of diode and transistor circuits.
- Develop skills to design the electronic circuits like amplifiers and oscillators.
- Highlight the importance of FET and MOSFET. ■

Module	Teaching Hours
Module-1	
Diode Circuits: Review of diodes as rectifiers (No question shall be set from review portion). Diode clipping and clamping circuits. **Transistor biasing and stabilization**: Operating point, analysis and design of fixed bias circuit, self-bias circuit, Emitter stabilized bias circuit, voltage divider bias circuit, stability factor of different biasing circuits. Problems. **Transistor switching circuits:** Transistor switching circuits,PNP transistors, thermal compensation techniques. ■	**10**
Revised Bloom's Taxonomy Level: L_1 – Remembering, L_2 – Understanding, L_3 – Applying.	
Module-2	
Transistor at low frequencies: BJT transistor modelling, CE fixed bias configuration, voltage divider bias, emitter follower, CB configuration, collector feedback configuration, analysis using h – parameter model, relation between h – parameters model of CE, CC and CB modes, Millers theorem and its dual. **Transistor frequency response:** General frequency considerations, low frequency response, Miller effect capacitance, high frequency response, multistage frequency effects. ■	**10**
Revised Bloom's Taxonomy Level: L_2 – Understanding, L_3 – Applying, L_4 – Analysing, L_5 – Evaluating.	
Module-3	
Multistage amplifiers: Cascade and cascode connections, Darlington circuits, analysis and design. **Feedback amplifiers:** Feedback concept, different types, practical feedback circuits, analysis and design of feedback circuits. ■	**10**
Revised Bloom's Taxonomy Level: L_1 – Remembering, L_2 – Understanding, L_3 – Applying, L_4 – Analysing.	
Module-4	
Power amplifiers: Amplifier types, analysis and design of different power amplifiers, distortion in power amplifiers. **Oscillators:** Principle of operation, analysis and derivation of frequency of oscillation of phase shift oscillator, Wien bridge oscillator, RF and crystal oscillator and frequency stability. ■	**10**
Revised Bloom's Taxonomy Level: L_1 – Remembering, L_2 – Understanding, L_3 – Applying, L_4 – Analysing.	
Module-5	
FETs: Construction, working andcharacteristics of JFET and MOSFET. Biasing of JFET and MOSFET, JFET and MOSFET amplifiers, analysis and design. ■	**10**
Revised Bloom's Taxonomy Level: L_1 – Remembering, L_2 – Understanding, L_3 – Applying, L_4 – Analysing.	

MATERIAL SCIENCE

[AS PER CHOICE ASED CREDIT SYSTEM (CBCS) SCHEME]

SEMESTER – III

Subject Code	15 ME 32	IA Marks	20
Number of Lecture Hrs / Week	04	Exam Marks	80
Total Number of Lecture Hrs	50	Exam Hours	03
CREDITS – 04			

COURSE OBJECTIVES:

This course provides

1. The foundation for understanding the structure and various modes of failure in materials common in mechanical engineering.
2. Topics are designed to explore the mechanical properties of metals and their alloys, polymers, ceramics ,smart materials and composites.
3. The means of modifying such properties, as well as the processing and failure of materials.
4. Concepts of use of materials for various applications are highlighted.

COURSE OUTCOMES:

The student shall be able to

1. Describe the mechanical properties of metals, their alloys and various modes of failure.
2. Understand the microstructures of ferrous and non-ferrous materials to mechanical properties.
3. Explain the processes of heat treatment of various alloys.
4. Understand the properties and potentialities of various materials available and material selection procedures.
5. Know about composite materials and their processing as well as applications.

MODULE 1

Basics, Mechanical Behavior, Failure of Materials

Introduction to Crystal Structure – Coordination number, atomic packing factor, Simple Cubic, BCC, FCC and HCP Structures, Crystal imperfections – point, line, surface and volume imperfections, Atomic Diffusion: Phenomenon, Fick's laws of diffusion; Factors affecting diffusion.

Mechanical Behavior:

Stress-strain diagrams showing ductile and brittle behavior of materials, Engineering and true strains, Linear and non-linear elastic behavior and properties, Mechanical properties in plastic range. Stiffness, Yield strength, Offset Yield strength, Ductility, Ultimate Tensile strength, Toughness, Plastic deformation of single crystal by slip and twinning, Mechanisms of strengthening in metals

Fracture: Type I, Type II and Type III,

Fatigue: Types of fatigue loading with examples, Mechanism of fatigue, Fatigue properties, S-N diagram, Fatigue testing.

Creep: Description of the phenomenon with examples, three stages of creep, creep properties, Stress relaxation. Concept of fracture toughness, numerical on diffusion, strain and stress relaxation 10 Hours

MODULE 2

Alloys, Steels, Solidification

Concept of formation of alloys: Types of alloys, solid solutions, factors affecting solid solubility (Hume Rothery rules), Binary phase diagrams: Eutectic, and Eutectoid systems, Lever rule, Substitutional and interstitial solid solutions, Intermediate phases, Gibbs phase rule Effect of non- equilibrium cooling, Coring and Homogenization Iron-Carbon (Cementite) diagram: description of phases, Effect of common alloying elements in steel, Common alloy steels, Stainless steel, Tool steel, Specifications of steels. Solidification: Mechanism of solidification, Homogenous and Heterogeneous nucleation, Crystal growth, Cast metal structures Solidification of Steels and Cast irons. Numerical on lever rule

10 Hours

MODULE 3

Heat Treatment, Ferrous and Non-Ferrous Alloys

Heat treating of metals: Time-Temperature-Transformation (TTT) curves, Continuous Cooling Transformation (CCT) curves, Annealing: Recovery, Recrystallization and Grain growth, Types of annealing, Normalizing, Hardening, Tempering, Martempering, Austempering, Concept of hardenability, Factors affecting it hardenability, surface hardening methods: carburizing, cyaniding, nitriding, flame hardening and induction hardening, Age hardening of aluminum-copper alloys and PH steels. Ferrous materials: Properties, Compositions and uses of Grey cast iron, Malleable iron, SG iron and steel, 10 Hours

MODULE 4

Other Materials, Material Selection

Ceramics: Structure types and properties and applications of ceramics. Mechanical / Electrical behavior and processing of Ceramics.

Plastics: Various types of polymers/plastics and their applications. Mechanical behaviors and processing of plastics, Failure of plastics.

Other materials: Brief description of other materials such as optical and thermal materials Smart materials – fiber optic materials, piezo-electrics, shape memory alloys Shape Memory Alloys – Nitinol, superelasticity, Biological applications of smart materials - materials used as implants in human Body, Selection of Materials, Performance of materials in service Residual life assessment – use of non-destructive testing, Economics, Environment and Sustainability 10 Hours

MODULE 5

Composite Materials

Composite materials - Definition, classification, types of matrix materials & reinforcements, Metal Matrix Composites (MMCs), Ceramic Matrix Composites (CMCs) and Polymer Matrix Composites (PMCs), Particulate-reinforced and fiber-reinforced composites, Fundamentals of production of composites, Processes for production of composites, Characterization of composites, Constitutive relations of composites, Determination of composite properties from component properties, Hybrid composites, Applications of composite materials, Numericals on determining properties of composites 10 Hours

TEXT BOOKS:

1. Smith, Foundations of Materials Science and Engineering, 4th Edition, McGraw Hill, 2009.
2. William D. Callister, Material science and Engineering and Introduction, Wiley, 2006.

REFERENCE BOOKS

1. V.Raghavan, Materials Science and Engineering, , PHI, 2002
2. Donald R. Askland and Pradeep.P. Phule, The Science and Engineering of Materials, Cengage Learning, 4lh Ed., 2003.
3. George Ellwood Dieter, Mechanical Metallurgy, McGraw-Hill.
4. ASM Handbooks, American Society of Metals.

Scheme of Examination:

Two question to be set from each module. Students have to answer five full questions, choosing at least one full question from each module.

METAL CASTING AND WELDING

[AS PER CHOICE ASED CREDIT SYSTEM (CBCS) SCHEME]

SEMESTER – III / IV

Subject Code	15 ME 35 A	IA Marks	20
Number of Lecture Hrs / Week	04	Exam Marks	80
Total Number of Lecture Hrs	50	Exam Hours	03
CREDITS – 04			

COURSE OBJECTIVE

- To provide detailed information about the moulding processes.
- To provide knowledge of various casting process in manufacturing.
- To impart knowledge of various joining process used in manufacturing.
- To provide adequate knowledge of quality test methods conducted on welded and casted components.

COURSE OUTCOMES

CO No.	Course Outcomes	Blooms level	PO
CO1	Describe the casting process, preparation of Green, Core, dry sand molds and Sweep, Shell, Investment and plaster molds.	U	PO1
CO2	Explain the Pattern, Core, Gating, Riser system and Jolt, Squeeze, Sand Slinger Molding Machines.	U	PO1
CO3	Compare the Gas fired pit, Resistance, Coreless, Electrical and Cupola Metal Furnaces.	U	PO1
CO4	Compare the Gravity, Pressure die, Centrifugal, Squeeze, slush and Continuous Metal mold castings.	U	PO1
CO5	Explain the Solidification process and Casting of Non-Ferrous Metals.	U	PO1
CO6	Describe the Metal Arc, TIG, MIG, Submerged and Atomic Hydrogen Welding processes used in manufacturing.	U	PO1
CO7	Explain the Resistance spot, Seam, Butt , Projection, Friction, Explosive, Thermit, Laser and Electron Beam Special type of welding process used in manufacturing.	U	PO1
CO8	Describe the Metallurgical aspects in Welding and inspection methods for the quality assurance of components made of casting and joining process.	U	PO1
Total Hours of instruction		**50**	

MODULE -1

INTRODUCTION & BASIC MATERIALS USED IN FOUNDRY

Introduction: Definition, Classification of manufacturing processes. Metals cast in the foundry-classification, factors that determine the selection of a casting alloy.

Introduction to casting process & steps involved. Patterns: Definition, classification, materials used for pattern, various pattern allowances and their importance.

Sand molding: Types of base sand, requirement of base sand. Binder, Additives definition, need and types

Preparation of sand molds: Molding machines- Jolt type, squeeze type and Sand slinger. Study of important molding process: Green sand, core sand, dry sand, sweep mold, CO2 mold, shell mold, investment mold, plaster mold, cement bonded mold. Cores: Definition, need, types. Method of making cores, concept of gating (top, bottom, parting line, horn gate) and risering (open, blind) Functions and types

10 Hours

MODULE -2

MELTING & METAL MOLD CASTING METHODS

Melting furnaces: Classification of furnaces, Gas fired pit furnace, Resistance furnace, Coreless induction furnace, electric arc furnace, constructional features & working principle of cupola furnace.

Casting using metal molds: Gravity die casting, pressure die casting, centrifugal casting, squeeze casting, slush casting, thixocasting, and continuous casting processes

10 Hours

MODULE -3

SOLIDIFICATION & NON FERROUS FOUNDRY PRACTICE

Solidification: Definition, Nucleation, solidification variables, Directional solidification-need and methods. Degasification in liquid metals-Sources of gas, degasification methods.

Fettling and cleaning of castings: Basic steps involved. Sand Casting defects- causes, features and remedies. Advantages & limitations of casting process

Nonferrous foundry practice: Aluminum castings - Advantages, limitations, melting of aluminum using lift-out type crucible furnace. Hardeners used, drossing, gas absorption, fluxing and flushing, grain refining, pouring temperature. Stir casting set up, procedure, uses, advantages and limitations.

10 Hours

MODULE -4

WELDING PROCESS

Welding process: Definition, Principles, Classification, Application, Advantages & limitations of welding. Arc welding: Principle, Metal arc welding (MAW), Flux Shielded Metal Arc Welding (FSMAW), Inert Gas Welding (TIG & MIG) Submerged Arc Welding (SAW) and Atomic Hydrogen Welding (AHW).

Special type of welding: Resistance welding principles, Seam welding, Butt welding, Spot welding and Projection welding. Friction welding, Explosive welding, Thermit welding, Laser welding and electron beam welding.

10 Hours

MODULE -5

SOLDERING , BRAZING AND METALLURGICAL ASPECTS IN WELDING

Structure of welds, Formation of different zones during welding, Heat Affected Zone (HAZ), Parameters affecting HAZ. Effect of carbon content on structure and properties of steel, Shrinkage in welds & Residual stresses, Concept of electrodes, filler rod and fluxes. Welding defects- Detection, causes & remedy.

Soldering, brazing, gas welding: Soldering, Brazing, Gas Welding: Principle, oxy-Acetylene welding, oxy-hydrogen welding, air-acetylene welding, Gas cutting, powder cutting.

Inspection methods: Methods used for inspection of casting and welding. Visual, magnetic particle, fluorescent particle, ultrasonic. Radiography, eddy current, holography methods of inspection.

10 Hours

TEXT BOOKS:

1. **“Manufacturing Process-I”,** Dr.K. Radhakrishna, Sapna Book House, 5th Revised Edition 2009.
2. **“Manufacturing & Technology**: Foundry Forming and Welding”, P.N. Rao, 3rd Ed., Tata McGraw Hill, 2003.

REFERENCE BOOKS:

1. **“Process and Materials of Manufacturing**”, Roy A Lindberg, 4th Ed. Pearson Edu. 2006.
2. **“Manufacturing Technology**”, Serope Kalpakjian, Steuen. R. Sechmid, Pearson Education Asia, 5th Ed. 2006.
3. **“Principles of metal casting”**, Rechard W. Heine, Carl R. Loper Jr., Philip C. Rosenthal, Tata McGraw Hill Education Private Limited Ed.1976.

Question paper pattern:

- The question paper will have ten questions.
- Each full question consisting of 16 marks.
- There will be **2** full questions (with a **maximum** of **4** sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer **5** full questions, selecting one full question from each module.

MACHINE TOOLS AND OPERATIONS

[AS PER CHOICE ASED CREDIT SYSTEM (CBCS) SCHEME]

SEMESTER – III / IV

Subject Code	15 ME 35 B	IA Marks	20
Number of Lecture Hrs / Week	04	Exam Marks	80
Total Number of Lecture Hrs	50	Exam Hours	03
CREDITS – 04			

COURSE OBJECTIVES:

- To introduce students to different machine tools in order to produce components having different shapes and sizes.
- To enrich the knowledge pertaining to relative motion and mechanics required for various machine tools.
- To develop the knowledge on mechanics of machining process and effect of various parameters on economics of machining.

COURSE OUTCOMES:

- Explain the construction & specification of various machine tools.
- Describe various machining processes pertaining to relative motions between tool & work piece.
- Discuss different cutting tool materials, tool nomenclature & surface finish.
- Apply mechanics of machining process to evaluate machining time.
- Analyze tool wear mechanisms and equations to enhance tool life and minimize machining cost.

MODULE 1

MACHINE TOOLS

Introduction, Classification, construction and specifications of lathe, drilling machine, milling machine, boring machine, broaching machine, shaping machine, planing machine, grinding machine [**Simple sketches showing major parts of the machines**] 10 hours

MODULE 2

MACHINING PROCESSES

Introduction, Types of motions in machining, turning and Boring, Shaping, Planing and Slotting, Thread cutting, Drilling and reaming, Milling, Broaching, Gear cutting and Grinding, Machining parameters and related quantities.

[Sketches pertaining to relative motions between tool and work piece only] 10 Hours

MODULE 3

CUTTING TOOL MATERIALS, GEOMETRY AND SURFACE FINISH

Introduction, desirable Properties and Characteristics of cutting tool materials, cutting tool geometry, cutting fluids and its applications, surface finish, effect of machining parameters on surface finish.

Machining equations for cutting operations: Turning, Shaping, Planing, slab milling, cylindrical grinding and internal grinding, Numerical Problems 10 Hours

MODULE 4

MECHANICS OF MACHINING PROCESSES

Introduction, Chip formation, Orthogonal cutting, Merchants model for orthogonal cutting, Oblique cutting, Mechanics of turning process, Mechanics of drilling process, Mechanics of milling process, Numerical problems. 10 Hours

MODULE 5

TOOL WEAR, TOOL LIFE: Introduction, tool wear mechanism, tool wear equations, tool life equations, effect of process parameters on tool life, machinability, Numerical problems

ECONOMICS OF MACHNING PROCESSES: Introduction, choice of feed, choice of cutting speed, tool life for minimum cost and minimum production time, machining at maximum efficiency, Numerical problems 10 Hours

TEXT BOOKS:

1. Fundamentals of metal cutting and Machine Tools, B.L. Juneja, G.S. Sekhon and Nitin Seth, New Age International Publishers 2nd Edition, 2003
2. All about Machine Tools, Heinrich Gerling, New Age International Publishers revised 2nd Edition, 2006

REFERENCE BOOKS:

1. Fundamental of Machining and Machine Tools, Geoffrey Boothroyd and Winston A. Knight, CRC Taylor & Francis, Third Edition.
2. Metal cutting principles, Milton C. Shaw, Oxford University Press, Second Edition,2005.

Scheme of Examination:

Two question to be set from each module. Students have to answer five full questions, choosing at least one full question from each module.

MECHANICAL MEASUREMENTS AND METROLOGY

[AS PER CHOICE ASED CREDIT SYSTEM (CBCS) SCHEME]

SEMESTER – III / IV

Subject Code	15 ME 36 B / 46B	IA Marks	20
Number of Lecture Hrs / Week	04	Exam Marks	80
Total Number of Lecture Hrs	50	Exam Hours	03
CREDITS – 03			

COURSE OBJECTIVES

Students are expected to –

- Understand metrology, its advancements & measuring instruments,
- Acquire knowledge on different standards of length, calibration of End Bars, linear and angular measurements, Screw thread and gear measurement & comparators.
- Equip with knowledge of limits, fits, tolerances and gauging.
- Acquire knowledge of measurement systems and methods with emphasis on different transducers, intermediate modifying and terminating devices.
- Understand the measurement of Force, Torque, Pressure, Temperature and Strain.

COURSE OUTCOMES

At the end of the course students will be able to –

	Description	CL	POs
CO1	Understand the objectives of metrology, methods of measurement, selection of measuring instruments, standards of measurement and calibration of end bars.	U	PO1, PO6
CO2	Describe slip gauges, wringing of slip gauges and building of slip gauges, angle measurement using sine bar, sine center, angle gauges, optical instruments and straightness measurement using Autocollimator.	U	PO1, PO6
CO3	Explain tolerance, limits of size, fits, geometric and position tolerances, gauges and their design.	U	PO1, PO6
CO4	Understand the principle of Johnson Mikrokator, sigma comparator, dial indicator, LVDT, back pressure gauges, Solex comparators and Zeiss Ultra Optimeter	U	PO1, PO6
CO5	Describe measurement of major diameter, minor diameter, pitch, angle and effective diameter of screw threads by 2 – wire, 3 – wire methods, screw thread gauges and tool maker's microscope.	U	PO1, PO6
CO6	Explain measurement of tooth thickness using constant chord method, addendum comparator methods and base tangent method, composite error using gear roll tester and measurement of pitch, concentricity, run out and involute profile.	U	PO1, PO6
CO7	Understand laser interferometers and Coordinate measuring machines.	U	PO1, PO6
CO8	Explain measurement systems, transducers, intermediate modifying devices and terminating devices.	U	PO1, PO6
CO9	Describe functioning of force, torque, pressure, strain and temperature measuring devices.	U	PO1, PO6
Total Hours of Instructions		**50**	

MODULE -1

Introduction to Metrology: Definition, objectives and concept of metrology, Need of inspection, Principles, process, methods of measurement, Classification and selection of measuring instruments and systems. Accuracy, precision and errors in measurement.

System of measurement, Material Standard, Wavelength Standards, Subdivision of standards, Line and End standards, Classification of standards and Traceability, calibration of End bars (Numericals), standardization.

Linear Measurement and angular measurements:

Slip gauges- Indian standards on slip gauge, method of selection of slip gauge, stack of slip gauge, adjustable slip gauge, wringing of slip gauge, care of slip gauge, slip gauge accessories, problems on building of slip gauges (M87, M112).

Measurement of angles- sine bar, sine center, angle gauges, optical instruments for angular measurements, Auto collimator-applications for measuring straightness and squareness. **10 Hours**

MODULE -2

System of Limits, Fits, Tolerance and Gauging:

Definition of tolerance, Specification in assembly, Principle of interchangeability and selective assembly, limits of size, Indian standards, concept of limits of size and tolerances, definition of fits, hole basis system, shaft basis system, types of fits and their designation (IS 919-1963), geometric tolerance, position-tolerances.

Classification of gauges, brief concept of design of gauges (Taylor's principles), Wear allowance on gauges, Types of gauges-plain plug gauge, ring gauge, snap gauge, limit gauge and gauge materials.

Comparators:

Functional requirements, classification, mechanical- Johnson Mikrokator, sigma comparators, dial indicator, electrical-principles, , LVDT, Pneumatic- back pressure gauges, solex comparators and optical comparators- Zeiss ultra-optimeter.

10 Hours

MODULE -3

Measurement of screw thread and gear:

Terminology of screw threads, measurement of major diameter, minor diameter, pitch, angle and effective diameter of screw threads by 2-wire and 3- wire methods, best size wire. Screw thread gauges, Tool maker's microscope.

Gear tooth terminology, tooth thickness measurement using constant chord method, addendum comparator method and base tangent method, measurement of pitch, concentricity, run out, and involute profile. Gear roll tester for composite error.

Advances in metrology:

Basic concepts of lasers, advantages of lasers, laser interferometers, types, applications. Basic concepts of Coordinate Measuring Machines-constructional features, applications. **10 Hours**

MODULE -4

Measurement systems and basic concepts of measurement methods:

Definition, significance of measurement, generalized measurement system, definitions and concept of accuracy, precision, calibration, threshold, sensitivity, hysteresis, repeatability, linearity, loading effect, system response-time delay. Errors in measurement, classification of errors. Transducers, transfer efficiency, primary and secondary transducers, electrical, mechanical, electronic transducers, advantages of each type transducers.

Intermediate modifying and terminating devices: Mechanical systems, inherent problems, electrical intermediate modifying devices, input circuitry, ballast circuit, electronic amplifiers. Terminating devices, Cathode ray oscilloscope, Oscillographs. **10 Hours**

MODULE -5

Force, Torque and Pressure Measurement:

Direct methods and indirect method, force measuring inst. Torque measuring inst., Types of dynamometers, Absorption dynamometer, Prony brake and rope brake dynamometer, and power measuring instruments. Pressure measurement, principle, use of elastic members, Bridgeman gauge, McLeod gauge, Pirani gauge.

Measurement of strain and temperature:

Theory of strain gauges, types, electrical resistance strain gauge, preparation and mounting of strain gauges, gauge factor, methods of strain measurement. Temperature Compensation, Wheatstone bridge circuit, orientation of strain gauges for force and torque, Strain gauge based load cells and torque sensors.

Resistance thermometers, thermocouple, law of thermocouple, materials used for construction, pyrometer, optical pyrometer. **10 Hours**

TEXT BOOKS:

1. **Mechanical Measurements,** Beckwith Marangoni and Lienhard, Pearson Education, 6th Ed., 2006.
2. **Engineering Metrology,** R.K. Jain, Khanna Publishers, Delhi, 2009.

REFERENCE BOOKS:

1. **Engineering Metrology and Measurements,** Bentley, Pearson Education.
2. **Theory and Design for Mechanical Measurements, III edition,** Richard S Figliola, Donald E Beasley, WILEY India Publishers.
3. **Engineering Metrology,** Gupta I.C., Dhanpat Rai Publications.
4. **Deoblin's Measurement system**, Ernest Deoblin, Dhanesh manick, McGraw –Hill.
5. **Engineering Metrology and Measurements,** N.V.Raghavendra and L.Krishnamurthy, Oxford University Press.

Scheme of Examination:

Two question to be set from each module. Students have to answer five full questions, choosing at least one full question from each module.

MATERIALS TESTING LAB

[AS PER CHOICE ASED CREDIT SYSTEM (CBCS) SCHEME]

SEMESTER – III / IV

Subject Code	**15MEL37A/47A**	IA Marks	20
Number of Lecture Hrs / Week	01	Exam Marks	80
No of Practical Hours / Week	02	Exam Hours	03
CREDITS – 02			

COURSE OBJECTIVES

Students are expected-

1. To learn the concept of the preparation of samples to perform characterization such as microstructure, volume fraction of phases and grain size.
2. To understand mechanical behavior of various engineering materials by conducting standard tests.
3. To learn material failure modes and the different loads causing failure.
4. To learn the concepts of improving the mechanical properties of materials by different methods like heat treatment, surface treatment etc.

COURSE OUTCOMES

At the end of the course, the students will be able to:

1. Acquire experimentation skills in the field of material testing.
2. 2.Develop theoretical understanding of the mechanical properties of materials by performing experiments.
3. Apply the knowledge to analyze a material failure and determine the failure inducing agent/s.
4. Apply the knowledge of testing methods in related areas.
5. Know how to improve structure/behavior of materials for various industrial applications.

PART – A

1. Preparation of specimen for Metallographic examination of different engineering materials.
   To report microstructures of plain carbon steel, tool steel, gray C.I, SG iron, Brass, Bronze & composites.

2. Heat treatment: Annealing, normalizing, hardening and tempering of steel.
   Metallographic specimens of heat treated components to be supplied and students should report microstructures of furnace cooled,water cooled, air cooled, tempered steel.
   Students should be able to distinguish the phase changes in a heat treated specimen compared to untreated specimen.
3. Brinell, Rockwell and Vickers's Hardness tests on untreated and heat treated specimens.
4. To study the defects of Cast and Welded components using
   Non-destructive tests like:
   a) Ultrasonic flaw detection
   b) Magnetic crack detection
   c) Dye penetration testing.

PART – B

5. Tensile, shear and compression tests of steel, aluminum and cast iron specimens using Universal Testing Machine
6. Torsion Test on steel bar.
7. Bending Test on steel and wood specimens.
8. Izod and Charpy Tests on Mild steel and C.I Specimen.
9. To study the wear characteristics of ferrous and non-ferrous materials under different parameters.
10. Fatigue Test (demonstration only).

Students should make observations on nature of failure and manifestations of failure in each of the experiments apart from reporting values of mechanical properties determined after conducting the tests.

<u>Scheme of Examination:</u>

ONE question from part -A:	**25 Marks**
ONE question from part -B:	**40 Marks**
Viva -Voice:	**15 Marks**
Total :	**80 Marks**

KINEMATICS OF MACHINES

Subject Code : 15ME42 **IA Marks : 20**
Hours/Week : 04 **Exam Hours : 03**
Total Hours : 50 **Exam Marks : 80**

Course objectives

Students will

1. Familiarize with mechanisms and motion analysis of mechanisms.
2. Understand methods of mechanism motion analysis and their characteristics.
3. Analyse motion of planar mechanisms, gears, gear trains and cams.

Course outcomes

Students will be able to

1. Identify mechanisms with basic understanding of motion.
2. Comprehend motion analysis of planar mechanisms, gears, gear trains and cams.
3. Carry out motion analysis of planar mechanisms, gears, gear trains and cams.

MODULE - 1
Introduction: Definitions: Link, kinematic pairs, kinematic chain, mechanism, structure, degrees of freedom, Classification links, Classifiction of pairs based on type of relative motion, Grubler's criterion, mobility of mechanism, Groshoff's criteria, inversions of Grashoff's chain.
Mechanisms: Quick return motion mechanisms-Drag link mechanism, Whitworth mechanism and Crank and slotted lever Mechanism. Oldham's coupling, Straight line motion mechanisms Peaucellier's mechanism and Robert's mechanism. Intermittent Motion mechanisms:Geneva wheel mechanism, Ratchet and Pawl mechanism, toggle mechanism, pantograph, condition for correct steering, Ackerman steering gear mechanism. **10 Hours**

MODULE -2
Velocity and Acceleration Analysis of Mechanisms (Graphical Method): Velocity and acceleration analysis of four bar mechanism, slider crank mechanism. Mechanism illustrating Coriolis component of acceleration. Angular velocity and angular acceleration of links, velocity of rubbing.
Velocity Analysis by Instantaneous Center Method: Definition, Kennedy's theorem, Determination of linear and angular velocity using instantaneous center method.
Klein's Construction: Analysis of velocity and acceleration of single slider crank mechanism.
10 Hours

NOTE: Feedback and suggestions are invited till 20th January 2017

MODULE – 3

Velocity and Acceleration Analysis of Mechanisms (Analytical Method): Velocity and acceleration analysis of four bar mechanism, slider crank mechanism using complex algebra method.

Freudenstein's equation for four bar mechanism and slider crank mechanism.

Function Generation for four bar mechanism.

10 Hours

Module – 4

Spur Gears: Gear terminology, law of gearing, path of contact, arc of contact, contact ratio of spur gear. Interference in involute gears, methods of avoiding interference, back lash, condition for minimum number of teeth to avoid interference, expressions for arc of contact and path of contact

Gear Trains: Simple gear trains, compound gear trains. Epicyclic gear trains:aAlgebraic and tabular methods of finding velocity ratio of epicyclic gear trains, torque calculation in epicyclic gear trains.

10 Hours

Cams: Types of cams, types of followers. displacement, velocity and acceleration curves for uniform velocity, Simple Harmonic Motion, Uniform Acceleration Retradation, Cycloidal motion. Cam profiles: disc cam with reciprocating / oscillating follower having knife-edge, roller and flat-face follower inline and offset.

Analysis of Cams: Analysis of arc cam with flat faced follower.

10 Hours

Graphical Solutions may be obtained either on the Graph Sheets or in the Answer Book itself.

TEXT BOOKS:

1. Rattan S.S, Theory of Machines, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 4th Edition, 2014.
2. Ambekar A. G., Mechanism and Machine Theory, PHI, 2009.

REFERENCE BOOKS:

1. Michael M Stanisic, Mechanisms and Machines-Kinematics, Dynamics and Synthesis, Cengage Learning, 2016.
2. Sadhu Singh, **Theory of Machines,** Pearson Education (Singapore)Pvt. Ltd, Indian Branch New Delhi, 2nd Edi. 2006.

NOTE: Feedback and suggestions are invited till 20th January 2017

IV - SEMESTER: MECHANICAL ENGINEERING

Course	Code	Credits	L-T-P	Assessment		Exam Duration
				SEE	CIA	
Applied Thermodynamics	15ME43	04	3-2-0	80	20	3Hrs

Courselearning objectives:

- To have a working knowledge of basic performance of Gas power cycles.
- To Calculate the forces exerted by a fluid at rest on submerged surfaces and understand the force of buoyancy
- To understand and evaluate the performance of steam power cycles their various Engineering applications
- To know how fuel burns and their thermodymic properties.
- To Understand mechanism of power transfer through belt, rope, chain and gear drives in I C Engines
- To determine performance parameters of refrigeration and air-conditioning systems.
- Evaluate the performance parameters of reciprocating air compressor as a function of receiver pressure.

Module - I

Gas Power Cycles : Air standard cycles; Carnot, Otto, Diesel, Dual and Stirling cycles, p-v and T -s diagrams, description, efficiencies and mean effective pressures. Comparison of Otto and Diesel cycles. Gas turbine (Brayton) cycle; description and analysis. Regenerative gas turbine cycle. Inter-cooling and reheating in gas turbine cycles.

Jet propulsion: Introduction to the principles of jet propulsion, turbojet, turboprop, Ramjet and turbofan engines and their processes . Principles of rocket propulsion, Introduction to rocket engine.10 Hours

Module –II

Vapour Power Cycles: Carnotvapour power cycle, drawbacks as a reference cycle. Simple Rankine cycle; description, T-s diagram, analysis for performance. Comparison of Carnot and Rankine cycles. Effects of pressure and temperature on Rankine cycle performance. Actual vapourpower cycles. Ideal and practical regenerative Rankine cycles, open and closed feed water heaters. Reheat Rankine cycle. Characteristics of an Ideal working fluid in Vapour power cycles, Binary Vapour cycles

10 Hours

Module –III

Combustion Thermodynamics: Theoretical (Stoichiometric) air for combustion of fuels. Excess air, mass balance, Exhaust gas analysis, A/F ratio. Energy balance for a chemical reaction, enthalpy of formation, enthalpy and internal energy of combustion. Combustion efficiency. Dissociation and equilibrium, emissions.

NOTE: Feedback and suggestions are invited till 20th January 2017

I.C.Engines: Classification of IC engines, Combustion of SI engine and CI engine, Detonation and factors affecting detonation, Performance analysis of I.C Engines, heat balance, Morse test, IC Engine fuels, Ratings and Alternate Fuels. Automotive Pollutions and its effects on environment.
10 Hours

Module –IV

Refrigeration Cycles: Vapour compression refrigeration system; description, analysis, refrigerating effect. Capacity, power required, units of refrigeration, COP, Refrigerants and their desirable properties, alternate Refrigerants. Any one case study on cold storage or industrial refrigerator. Air cycle refrigeration; reversed Carnot cycle, reversed Brayton cycle,Vapour absorption refrigeration system. Steam jet refrigeration.

Pscychrometrics and Air-conditioning Systems: Properties ofAtmospheric air, and Psychometric properties of Air, Psychometric Chart, Analyzing Air-conditioning Processes; Heating, Cooling, Dehumidification and Humidification, Evaporative Cooling. Adiabatic mixing of twomoist air streams. Cooling towers.

10 Hours

Module –V

Reciprocating Compressors: Operation of a single stage reciprocating compressors. Work input through p-v diagram and steady state steady flow analysis. Effect of Clearance and Volumetric efficiency. Adiabatic, Isothermal and Mechanical efficiencies. Multi-stage compressor, saving in work, Optimum intermediate pressure, Inter-cooling, Minimum work for compression.

Steam nozzles: Flow of steam through nozzles, Shape of nozzles, effect of friction, Critical pressure ratio, Supersaturated flow.

10 Hours

Course outcomes

Students will be able to

- Apply thermodynamic concepts to analyze the performance of gas power cycles including propulsion systems.
- Evaluate the performance of steam turbine components.
- Understand combustion of fuels and combustion processes in I C engines including alternate fuels and pollution effect on environment.
- Apply thermodynamic concepts to analyze turbo machines.
- Determine performance parameters of refrigeration and air-conditioning systems.
- Understand the principles and applications of refrigeration systems.

NOTE: Feedback and suggestions are invited till 20th January 2017

- Analyze air-conditioning processes using the principles of psychrometry and Evaluate cooling and heating loads in an air-conditioning system.
- Understand the working, applications, relevance of air and identify methods for performance improvement.

Text Books:

1. Thermodynamics an engineering approach, by Yunus A. Cenegal and Michael A. Boles. Tata McGraw hill Pub. Sixth edition, 2008.
2. Basic and Applied Thermodynamics" by P .K. Nag, Tata McGraw Hill, 2nd Edi. 2009
3. Fundamentals of Thermodynamics by G.J. Van Wylen and R.E. Sonntag, Wiley Eastern. Fourth edition 19993.

Reference Books:

1. Thermodynamics for engineers, Kenneth A. Kroos and Merle C. Potter, Cengage Learning, 2016
2. Principles of Engineering Thermodynamics, Michael J,Moran, Howard N. Shapiro, Wiley, 8th Edition
3. An Introduction to Thermo Dynamics byY.V.C.Rao, Wiley Eastern Ltd, 2003.
4. Thermodynamics by Radhakrishnan. PHI, 2nd revised edition.
5. I.C Engines by Ganeshan.V. Tata McGraw Hill, 4rth Edi. 2012.
6. I.C.Engines by M.L.Mathur& Sharma. DhanpatRai& sons- India

E- Learning

- Nptel.ac.in
- VTU, E- learning
- MOOCS
- Open courseware

Scheme of Examination:

Two question to be set from each module. Students have to answer five full questions, choosing at least one full question from each module.

NOTE: Feedback and suggestions are invited till 20th January 2017

IV- SEMESTER: MECHANICAL ENGINEERING

Course	Code	Credits	L-T-P	Assessment		Exam Duration
				SEE	CIA	
Fluid Mechanics	15ME44	04	3-2-0	80	20	3Hrs

Course objectives:

- To have a working knowledge of the basic properties of fluids and understand the continuum approximation
- To Calculate the forces exerted by a fluid at rest on submerged surfaces and understand the force of buoyancy
- To understand the flow characteristic and dynamics of flow field for various Engineering applications
- To know how velocity changes and energy transfers in fluid flows are related to forces and torques and to understand why designing for minimum loss of energy in fluid flows is so important.
- To discuss the main properties of laminar and turbulent pipe flow and appreciate their differences and the concept of boundary layer theory.
- Understand the concept ofdynamic similarity and how toapply it to experimentalmodeling
- To appreciate the consequences of compressibility in gas flow and understand the effects of friction and heat transferon compressible flows

MODULE -1

Basics:Introduction, Properties of fluids-mass density, weight density, specific volume, specific gravity, viscosity, surface tension, capillarity, vapour pressure, compressibility and bulk modulus. Concept of continuum, types of fluids etc,pressure at a point in the static mass of fluid, variation of pressure, Pascal's law,Absolute, gauge, atmospheric and vacuum pressurespressure measurement by simple, differential manometers and mechanical gauges.

Fluid Statics: Totalpressure and center of pressure for horizontal plane, vertical plane surface and inclined plane surface submerged in static fluid.Buoyancy, center of buoyancy, meta center and meta centric heightits application in shipping, stability of floating bodies.

10Hrs

NOTE: Feedback and suggestions are invited till 20th January 2017

MODULE -2

Fluid Kinematics and Dynamics:

Fluid Kinematics: Types of Flow-steady, unsteady, uniform, non-uniform, laminar, turbulent, one,two and three dimensional, compressible, incompressible, rotational, irrotational, stram lines, path lines, streak lines, velocity components, convective and local acceleration, velocity potential, stream function, continuity equation in Cartesian co-ordinates. Rotation, vorticity and circulation, Laplace equation in velocity potential and Poisson equation in stream function, flow net, Problems.

Fluid Dynamics:

Momentum equation, Impacts of jets- force on fixed and moving vanes, flat and curved. Numericals.Euler's equation, Integration of Euler's equation to obtain Bernoulli's equation, Bernoulli's theorem, Application of Bernoulli's theorem such as venture meter, orifice meter, rectangular and triangular notch, pitot tube, orifices etc., related numericals.

12 Hours

MODULE -3

Laminar and turbulent flow:Reynods Number, Entrance flow and Developed flow,Navier- Stokes Equation (no derivation),Laminar flow between parallel plates,Poiseuille equation – velocity profile, Couette flow,Fully developed laminar flow in circular pipes, Hagen - Poiseuille equation,related numericals.

Energy consideration in pipe flow, Loss of Pressure Head due to Fluid Friction, DarcyWeishach formula, major and minor losses in pipes,Commercial pipe, Colebrook equation, Moody equation/ diagram. Pipes in series, parallel, equivalent pipe, Related Numericals and simple pipe design problems.

10Hrs

MODULE -4

Flow over bodies: Development of boundary layer**,** Prandtl'sboundary layer equations, Blasius solution, laminar layer over a flat plate, boundary layer separation and its control.

Basic concept of Lift and Drag, Types of drag, Co-efficient of drag and lift,streamline body and bluff body, flow around circular bodies and airfoils,Lift and drag on airfoil, Numericals.

NOTE: Feedback and suggestions are invited till 20th January 2017

Dimensional analysis: Need for dimensional analysis, Dimensions and units, Dimensional Homogeneity and dimensionless ratios, methods of dimensional analysis, Rayleigh's method, Buckingham Pi theorem, Similitude and Model studies. Numericals.

10Hrs

MODULE -5

Compressible Flows: Introduction, thermodynamicrelations of perfect gases, internal energy andenthalpy, speed of sound, pressure field due to a moving source,basic Equations for one-dimensional flow, stagnation and sonic Properties, normal and oblique shocks.

Introduction to CFD: Necessity, limitations, philosophy behind CFD, applications.

08Hrs

Course outcomes:

Students will be able to

- CO1: Identify and calculate the key fluid properties used in the analysis of fluid behavior.
- CO2: Understand and apply the principles of pressure, buoyancy and floatation
- CO3:Apply the knowledge of fluid statics, kinematics and dynamics while addressing problems of mechanical and chemical engineering.
- CO4:Understand and apply the principles of fluid kinematics and dynamics.
- CO5:Understand the concept of boundary layer in fluid flow and apply dimensional analysis to form dimensionless numbers in terms of input output variables.
- CO6: Understand the basic concept of compressible flow and CFD

Text Books:

1. Fluid Mechanics (SI Units), Yunus A. Cengel John M.Cimbala, 3rd Ed., Tata McGraw Hill, 2014.
2. Fluid Mechanics, F M White, McGraw Hill Publications Eighth edition. 2016
3. Mechanics of Fluids, Merle C. Potter, Devid C. Wiggerrt, Bassem H. Ramadan, Cengage learning, Fourth editions 2016.

Reference Books:

1. Fundamentals of Fluid Mechanics by Munson, Young, Okiishi& Huebsch, John Wiley Publications.7th edition.
2. Fluid Mechanics, Pijush.K.Kundu, IRAM COCHEN, ELSEVIER, 3rd Ed. 2005.

NOTE: Feedback and suggestions are invited till 20th January 2017

3. Fluid Mechanics, John F.Douglas, Janul and M.Gasiosek and john A.Swaffield,Pearson Education Asia, 5th ed., 2006.
4. Introduction to Fluid Mechanics by Fox, McDonald, John Wiley Publications,8th edition.

E- Learning

- Nptel.ac.in
- VTU, E- learning
- MOOCS
- Open courseware

Scheme of Examination:

Two question to be set from each module. Students have to answer five full questions, choosing at least one full question from each module.

NOTE: Feedback and suggestions are invited till 20th January 2017

MACHINE TOOLS AND OPERATIONS

[AS PER CHOICE ASED CREDIT SYSTEM (CBCS) SCHEME] SEMESTER – III / IV

Subject Code	15 ME 45 B	IA Marks	20
Number of Lecture Hrs / Week	04	Exam Marks	80
Total Number of Lecture Hrs	50	Exam Hours	03
CREDITS – 04			

COURSE OBJECTIVES:

- To introduce students to different machine tools in order to produce components having different shapes and sizes.
- To enrich the knowledge pertaining to relative motion and mechanics required for various machine tools.
- To develop the knowledge on mechanics of machining process and effect of various parameters on economics of machining.

COURSE OUTCOMES:

- Explain the construction & specification of various machine tools.
- Describe various machining processes pertaining to relative motions between tool & work piece.
- Discuss different cutting tool materials, tool nomenclature & surface finish.
- Apply mechanics of machining process to evaluate machining time.
- Analyze tool wear mechanisms and equations to enhance tool life and minimize machining cost.

MODULE 1 MACHINE TOOLS

Introduction, Classification, construction and specifications of lathe, drilling machine, milling machine, boring machine, broaching machine, shaping machine, planing machine, grinding machine [**Simple sketches showing major parts of the machines**]

10 hours

MODULE 2

MACHINING PROCESSES

Introduction, Types of motions in machining, turning and Boring, Shaping, Planing and Slotting, Thread cutting, Drilling and reaming, Milling, Broaching, Gear cutting and Grinding, Machining parameters and related quantities.

[Sketches pertaining to relative motions between tool and work piece only]

10 Hours

MODULE 3

CUTTING TOOL MATERIALS, GEOMETRY AND SURFACE FINISH

Introduction, desirable Properties and Characteristics of cutting tool materials, cutting tool geometry, cutting fluids and its applications, surface finish, effect of machining parameters on surface finish.

NOTE: Feedback and suggestions are invited till 20th January 2017

Machining equations for cutting operations: Turning, Shaping, Planing, slab milling, cylindrical grinding and internal grinding, Numerical Problems

10 Hours

MODULE 4

MECHANICS OF MACHINING PROCESSES

Introduction, Chip formation, Orthogonal cutting, Merchants model for orthogonal cutting, Oblique cutting, Mechanics of turning process, Mechanics of drilling process, Mechanics of milling process, Numerical problems. 10 Hours

MODULE 5

TOOL WEAR, TOOL LIFE: Introduction, tool wear mechanism, tool wear equations, tool life equations, effect of process parameters on tool life, machinability, Numerical problems

ECONOMICS OF MACHNING PROCESSES: Introduction, choice of feed, choice of cutting speed, tool life for minimum cost and minimum production time, machining at maximum efficiency, Numerical problems 10 Hours

TEXT BOOKS:

1. Fundamentals of metal cutting and Machine Tools, B.L. Juneja, G.S. Sekhon and Nitin Seth, New Age International Publishers 2nd Edition, 2003
2. All about Machine Tools, Heinrich Gerling, New Age International Publishers revised 2nd Edition, 2006

REFERENCE BOOKS:

1. Fundamental of Machining and Machine Tools, Geoffrey Boothroyd and Winston A. Knight, CRC Taylor & Francis, Third Edition.
2. **"Manufacturing Technology,** Vol 2, P N Rao, McGraw Hill Education, 3rd Edition
3. Metal cutting principles, Milton C. Shaw, Oxford University Press, Second Edition,2005.

Scheme of Examination:

Two question to be set from each module. Students have to answer five full questions, choosing at least one full question from each module.

NOTE: Feedback and suggestions are invited till 20th January 2017

MACHINE SHOP

[AS PER CHOICE ASED CREDIT SYSTEM (CBCS) SCHEME] SEMESTER – III / IV

Subject Code	15MEL48 B	IA Marks	20
Number of Lecture Hrs / Week	01	Exam Marks	80
No of Practical Hours / Week	02	Exam Hours	03
CREDITS – 02			

COURSE OBJECTIVES

- To provide an insight to different machine tools, accessories and attachments
- To train students into machining operations to enrich their practical skills
- To inculcate team qualities and expose students to shop floor activities
- To educate students about ethical , environmental and safety standards

COURSE OUTCOMES

At the end of the course, the students will be able to

COs	Description	CL	POs
CO1	Perform turning , facing , knurling , thread cutting, tapering , eccentric turning and allied operations	A	PO1, PO6, PO9
CO2	Perform keyways / slots , grooves etc using shaper	A	PO1, PO6, PO9
CO3	Perform gear tooth cutting using milling machine	A	PO1, PO6, PO9
CO4	Understand the formation of cutting tool parameters of single point cutting tool using bench grinder / tool and cutter grinder	U	PO1, PO6
CO5	Understand Surface Milling/Slot Milling	U	PO1, PO6
CO6	Demonstrate precautions and safety norms followed in Machine Shop	U	PO8
CO7	Exhibit interpersonal skills towards working in a team	U	PO9

PART – A

Preparation of three models on lathe involving

Plain turning, Taper turning, Step turning, Thread cutting, Facing, Knurling, Drilling, Boring, Internal Thread cutting and Eccentric turning.

PART – B

Cutting of V Groove/ dovetail / Rectangular groove using a shaper

Cutting of Gear Teeth using Milling Machine

NOTE: Feedback and suggestions are invited till 20th January 2017

PART –C

For demonstration

Demonstration of formation of cutting parameters of single point cutting tool using bench grinder / tool & cutter grinder. Demonstration of surface milling /slot milling

One Model from Part – A	40 Marks
One Model from Part – B	20 Marks
Viva – Voce	20 Marks
Total	80 Marks

NOTE: Feedback and suggestions are invited till 20th January 2017

NON TRADITIONAL MACHINING

(Professional Elective-I)

[AS PER CHOICE BASED CREDIT SYSTEM (CBCS) SCHEME]
SEMESTER – V

Subject Code			15ME554	
Teaching Hours / Week			IA Marks	20
Lecture	Tutorial	Practical	Exam Marks	80
03	00	00	Exam Hours	03
CREDITS – 03				

Course Outcomes

On completion of the course, the students will be able to

1. Understand the compare traditional and non-traditional machining process and recognize the need for Non-traditional machining process.
2. Understand the constructional features, performance parameters, process characteristics, applications, advantages and limitations of USM, AJM and WJM.
3. Identify the need of Chemical and electro-chemical machining process along with the constructional features, process parameters, process characteristics, applications, advantages and limitations.
4. Understand the constructional feature of the equipment, process parameters, process characteristics, applications, advantages and limitations EDM & PAM.
5. Understand the LBM equipment, LBM parameters, and characteristics. EBM equipment and mechanism of metal removal, applications, advantages and limitations LBM & EBM.

MODULE 1

INTRODUCTION

Introduction to Non-traditional machining, Need for Non-traditional machining process, Comparison between traditional and non-traditional machining, general classification Non-traditional machining processes, classification based on nature of energy employed in machining, selection of non-traditional machining processes, Specific advantages, limitations and applications of non-traditional machining processes. **08 hours**

MODULE 2

Ultrasonic Machining (USM): Introduction, Equipment and material process, Effect of process parameters: Effect of amplitude and frequency, Effect of abrasive grain diameter, effect of slurry, tool & work material. Process characteristics: Material removal rate, tool wear, accuracy, surface finish, applications, advantages & limitations of USM.

Abrasive Jet Machining (AJM): Introduction, Equipment and process of material removal, process variables: carrier gas, type of abrasive, work material, stand-off distance (SOD).Process characteristics-Material removal rate, Nozzle wear, accuracy & surface finish. Applications, advantages & limitations of AJM.

Water Jet Machining (WJM): Equipment & process, Operation, applications, advantages and limitations of WJM. **08 hours**

NOTE: Feedback and suggestions are invited till 20th January 2017

MODULE 3

ELECTROCHEMICAL MACHINING (ECM)

Introduction, Principle of electro chemical machining: ECM equipment, elements of ECM operation, Chemistry of ECM. ECM Process characteristics: Material removal rate, accuracy, surface finish.

Process parameters: Current density, Tool feed rate, Gap between tool & work piece, velocity of electrolyte flow, type of electrolyte, its concentration temperature, and choice of electrolytes. ECM Tooling: ECM tooling technique & example, Tool & insulation materials.

Applications ECM: Electrochemical grinding and electrochemical honing process. Advantages, disadvantages and application of ECG, ECH.

CHEMICAL MACHINING (CHM)

Elements of the process: Resists (maskants), Etchants. Types of chemical machining process-chemical blanking process, chemical milling process.

Process characteristics of CHM: material removal rate, accuracy, surface finish, advantages, limitations and applications of chemical machining process. **10 hours**

MODULE 4

ELECTRICAL DISCHARGE MACHINING (EDM)

Introduction, mechanism of metal removal, EDM equipment: spark erosion generator (relaxation type), dielectric medium-its functions & desirable properties, electrode feed control system. Flushing types; pressure flushing, suction flushing, side flushing, pulsed flushing. EDM process parameters: Spark frequency, current & spark gap, surface finish, Heat Affected Zone. Advantages, limitations & applications of EDM, Electrical discharge grinding, Traveling wire EDM.

PLASMA ARC MACHINING (PAM)

Introduction, non-thermal generation of plasma, equipment mechanism of metal removal, Plasma torch, process parameters, process characteristics. Safety precautions. Safety precautions, applications, advantages and limitations. **08 hours**

MODULE 5

LASER BEAM MACHINING (LBM)

Introduction, generation of LASER, Equipment and mechanism of metal removal, LBM parameters and characteristics, Applications, Advantages & limitations.

ELECTRON BEAM MACHINING (EBM)

Introduction, Principle, equipment and mechanism of metal removal, applications, advantages and limitations. **08 hours**

Text Books:

1. Modern Machining Process by P.C Pandey and H S Shah, McGraw Hill Education India Pvt. Ltd. 2000
2. Production technology, HMT, McGraw Hill Education India Pvt. Ltd. 2001

Reference Books

1. New Technology, Dr. Amitabha Bhattacharyya, The Institute of Engineers (India), 2000

NOTE: Feedback and suggestions are invited till 20th January 2017

2. Modern Machining process, Aditya, 2002.

FINITE ELEMENT METHOD

Sub Code	**:**	**15ME61**	**IA Marks**	**:**	**20**
Hrs/ Week	**:**	**03L+ 02T,**	**Exam Hours**	**:**	**03**
Credits	**:**	**04**			
Total Hrs.	**:**	**54**	**Exam Marks**	**:**	**80**

Course Objectives:

1. To learn basic principles of finite element analysis procedure .
2. To learn the theory and characteristics of finite elements that represent engineering structures.
3. To learn and apply finite element solutions to structural, thermal, dynamic problem to develop the knowledge and skills needed to effectively evaluate finite element analyses.

Course outcomes:

Upon successful completion of this course you should be able to:

1. Understand the concepts behind formulation methods in FEM.
2. Identify the application and characteristics of FEA elements such as bars, beams, plane and iso-parametric elements.
3. Develop element characteristic equation and generation of global equation.
4. Able to apply suitable boundary conditions to a global equation for bars, trusses, beams, circular shafts, heat transfer, fluid flow, axi symmetric and dynamic problems and solve them displacements, stress and strains induced.

Module I

Introduction to Finite Element Method : General description of the finite element method. Engineering applications of finite element method. Boundary conditions: homogeneous and nonhomogeneous for structural, heat transfer and fluid flow problems. Potential energy method, Rayleigh Ritz method, Galerkin's method, Displacement method of finite element

NOTE: Feedback and suggestions are invited till 20th January 2017

formulation. Convergence criteria, Discretisation process, Types of elements: 1D, 2D and 3D, Node numbering, Location of nodes. Strain displacement relations, Stress strain relations, Plain stress and Plain strain conditions, temperature effects.

NOTE: Feedback and suggestions are invited till 20th January 2017

Interpolation models: Simplex, complex and multiplex elements, Linear interpolation polynomials in terms of global coordinates 1D, 2D, 3D Simplex Elements.

12Hours

Module II

One-Dimensional Elements-Analysis of Bars and Trusses,
Linear interpolation polynomials in terms of local coordinate's for 1D, 2D elements. Higher order interpolation functions for 1D quadratic and cubic elements in natural coordinates, , , Constant strain triangle, Four-Nodded Tetrahedral Element (TET 4), Eight-Nodded Hexahedral Element (HEXA 8), 2D isoparametric element, Lagrange interpolation functions, Numerical integration: Gaussian quadrature one point, two point formulae, 2D integrals. Fore terms: Body force, traction force and point loads,

Numerical Problems: Solution for displacement, stress and strain in 1D straight bars, stepped bars and tapered bars using elimination approach and penalty approach, Analysis of trusses.

12 Hours

Module III

Beams and Shafts: Boundary conditions, Load vector, Hermite shape functions, Beam stiffness matrix based on Euler-Bernoulli beam theory, Examples on cantilever beams, propped cantilever beams, Numerical problems on simply supported, fixed straight and stepped beams using direct stiffness method with concentrated and uniformly distributed load.

Torsion of Shafts: Finite element formulation of shafts, determination of stress and twists in circular shafts.

08 Hours

Module IV

Heat Transfer: Basic equations of heat transfer: Energy balance equation, Rate equation: conduction, convection, radiation, energy generated in solid, energy stored in solid, 1D finite element formulation using vibrational method, Problems with temperature gradient and heat fluxes, heat transfer in composite sections, straight fins.

Fluid Flow: Flow through a porous medium, Flow through pipes of uniform and stepped sections, Flow through hydraulic net works.

10 Hours

Module V

Axi-symmetric Solid Elements: Derivation of stiffness matrix of axisymmetric bodies with triangular elements, Numerical solution of axisymmetric triangular element(s) subjected to surface forces, point loads, angular velocity, pressure vessels.

NOTE: Feedback and suggestions are invited till 20th January 2017

Dynamic Considerations: Formulation for point mass and distributed masses, Consistent element mass matrix of one dimensional bar element, truss element, axisymmetric triangular element, quadrilateral element, beam element. Lumped mass matrix of bar element, truss element, Evaluation of eigen values and eigen vectors, Applications to bars, stepped bars, and beams.

12 Hours

Text Books:

1. Logan, D. L., A first course in the finite element method,6^{th} Edition, Cengage Learning, 2016.
2. Rao, S. S., Finite element method in engineering, 5^{th} Edition, Pergaman Int. Library of Science, 2010.
3. Chandrupatla T. R., Finite Elements in engineering**,** 2nd Edition, PHI, 2013.

Reference Books:

1. J.N.Reddy, "**Finite Element Method"-** McGraw -Hill International Edition.Bathe K. J. Finite Elements Procedures, PHI.
2. Cook R. D., et al. "**Concepts and Application of Finite Elements Analysis"-** 4^{th} Edition, Wiley & Sons, 2003.

NOTE: Feedback and suggestions are invited till 20th January 2017

Computer Integrated Manufacturing

[AS PER CHOICE BASED CREDIT SYSTEM (CBCS)]

SEMESTER – VI

Subject Code	**15ME62**	**IA Marks**	**20**
No. Of Credits	**04**	**Exam Marks**	**80**
Hrs/Week	**04**	**Exam Hours**	**03**
Total Hours	**50**		

Course Objectives:

CLO1	To impart knowledge of CIM and Automation and different concepts of automation by developing mathematical models.
CLO2	To make students to understand the Computer Applications in Design and Manufacturing [CAD / CAM) leading to Computer integrated systems. Enable them to perform various transformations of entities on display devices.
CLO3	To expose students to automated flow lines, assembly lines, Line Balancing Techniques, and Flexible Manufacturing Systems.
CLO4	To expose students to computer aided process planning, material requirement planning, capacity planning etc.
CLO5	To expose the students to CNC Machine Tools, CNC part programming, and industrial robots.
CLO6	To introduce the students to concepts of Additive Manufacturing, Internet of Things, and Industry 4.0 leading to Smart Factory.

Course Outcomes:

After studying this course, students will be able to:

CO1	Able to define Automation, CIM, CAD, CAM and explain the differences between these concepts. Solve simple problems of transformations of entities on computer screen.
CO2	Explain the basics of automated manufacturing industries through mathematical models and analyze different types of automated flow lines.
CO3	Analyze the automated flow lines to reduce down time and enhance productivity.
CO4	Explain the use of different computer applications in manufacturing, and able to prepare part programs for simple jobs on CNC machine tools and robot programming.
CO5	Visualize and appreciate the modern trends in Manufacturing like additive manufacturing, Industry 4.0 and applications of Internet of Things leading to Smart Manufacturing.

Module - 1

1. **Introduction to CIM and Automation:**
   Automation in Production Systems, automated manufacturing systems- types of automation, reasons for automating, Computer Integrated Manufacturing, computerized elements of a CIM system, CAD/CAM and CIM.

NOTE: Feedback and suggestions are invited till 20th January 2017

Mathematical models and matrices: production rate, production capacity, utilization and availability, manufacturing lead time, work-in- process, numerical problems.

5 Hours

2. **Automated Production Lines and Assembly Systems:** Fundamentals, system configurations, applications, automated flow lines, buffer storage, control of production line, analysis of transfer lines, analysis of flow lines without storage, partial automation, analysis of automated flow lines with storage buffer, fundamentals of automated assembly systems, numerical problems. **5 Hours**

Module – 2

3. **CAD and Computer Graphics Software:** The design process, applications of computers in design, software configuration, functions of graphics package, constructing the geometry.
   Transformations: 2D transformations, translation, rotation and scaling, homogeneous transformation matrix, concatenation, numerical problems on transformations.

5 Hours

4. **Computerized Manufacture Planning and Control System:** Computer Aided Process Planning, Retrieval and Generative Systems, benefits of CAPP, Production Planning and Control Systems, typical activities of PPC System, computer integrated production management system, Material Requirement Planning, inputs to MRP system, working of MRP, outputs and benefits, Capacity Planning, Computer Aided Quality Control, Shop floor control. **5 Hours**

Module - 3

5. **Flexible Manufacturing Systems:** Fundamentals of Group Technology and Flexible Manufacturing Systems, types of FMS, FMS components, Material handling and storage system, applications, benefits, computer control systems, FMS planning and design issues, Automated Storage and Retrieval Systems, AS/RS and Automatic parts identification systems and data capture. **5 Hours**

6. **Line Balancing:** Line balancing algorithms, methods of line balancing, numerical problems on largest candidate rule, Kilbridge and Wester method, and Ranked Positional Weights method, Mixed Model line balancing, computerized line balancing methods. **5 Hours**

Module - 4.

7. **Computer Numerical Control:** Introduction, components of CNC, CNC programming, manual part programming, G Codes, M Codes, programming of simple components in turning, drilling and milling systems, programming with canned cycles. Cutter radius compensations. **5 Hours**

8. **Robot Technology:** Robot anatomy, joints and links, common robot configurations, robot control systems, accuracy and repeatability, end effectors, sensors in robotics. Robot programming methods: on-line and off-line methods.
   Robot industrial applications: material handling, processing and assembly and inspection.

5 Hours

NOTE: Feedback and suggestions are invited till 20th January 2017

Module – 5

9. **Additive Manufacturing Systems:** Basic principles of additive manufacturing, slicing CAD models for AM, advantages and limitations of AM technologies, Additive

manufacturing processes: Photo polymerization, material jetting, binder jetting, material extrusion, Powder bed sintering techniques, sheet lamination, direct

NOTE: Feedback and suggestions are invited till 20th January 2017

energy deposition techniques, applications of AM. Recent trends in manufacturing, Hybrid manufacturing. **5 Hours**

10. **Future of Automated Factory:** Industry 4.0, functions, applications and benefits. Components of Industry 4.0, Internet of Things (IOT), IOT applications in manufacturing, Big-Data and Cloud Computing for IOT, IOT for smart manufacturing, influence of IOT on predictive maintenance, industrial automation, supply chain optimization, supply-chain & logistics, cyber-physical manufacturing systems. **5 Hours**

Text Books:

1. Automation, Production Systems and Computer-Integrated Manufacturing, by Mikell P Groover, 4th Edition, 2015, Pearson Learning.
2. CAD / CAM Principles and Applications by P N Rao, 3rd Edition, 2015, Tata McGraw-Hill.
3. CAD/CAM/CIM, Dr. P. Radhakrishnan, 3rd edition, New Age International Publishers, New Delhi.

Reference Books:

1. "CAD/CAM" by Ibrahim Zeid, Tata McGraw Hill.
2. "Principles of Computer Integrated Manufacturing", S.Kant Vajpayee, 1999, Prentice Hall of India, New Delhi.
3. "Work Systems And The Methods, Measurement And Management of Work", Groover M. P.,Pearson/Prentice Hall, Upper Saddle River, NJ, 2007.
4. "Computer Automation in Manufacturing", Boucher, T. O., Chapman & Hall, London, UK, 1996.
5. "Introduction to Robotics: Mechanics And Control", Craig, J. J., 2nd Ed., Addison-Wesley Publishing Company, Readong, MA, 1989.
6. Internet of Things (IoT): Digitize or Die: Transform your organization. Embrace the digital evolution. Rise above the competition, by Nicolas Windpassinger, Amazon.
7. "Internet of Things: A Hands-on Approach", by Arshdeep Bahga and Vijay Madisetti (Universities Press)
8. Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, 2nd Ed. (2015), Ian Gibson, David W. Rosen, Brent Stucker
9. "Understanding Additive Manufacturing", Andreas Gebhardt, Hanser Publishers, 2011
10. Industry 4.0: The Industrial Internet of Things, Apress, 2017, by Alasdair Gilchrist

NOTE: Feedback and suggestions are invited till 20th January 2017

VI - SEMESTER: MECHANICAL ENGINEERING

Course	Code	Credits	L-T-P	Assessment		Exam Duration
				SEE	CIA	
Heat Transfer	15ME63	04	3-2-0	80	20	3Hrs

Pre-requisites: Basic and Applied Thermodynamics

Course learning objectives:

- Study the modes of heat transfer.
- Learn how to formulate and solve 1-D steady and unsteady heat conduction problems.
- Apply empirical correlations for fully-developed laminar, turbulent internal flows and external boundary layer convective flow problems.
- Study the basic principles of heat exchanger analysis and thermal design.
- Understand the principles of boiling and condensation including radiation heat transfer related engineering problems.

Module – I

Introductory concepts and definitions: Modes of heat transfer: Basic laws governing conduction, convection, and radiation heat transfer; Thermal conductivity; convective heat transfer coefficient; radiation heat transfer combined heat transfer mechanism, Types of boundary conditions. General Heat Conduction Equation: Derivation of the equation in (i) Cartesian, (ii) Polar and (iii) Spherical Co-ordinate Systems.

Steady-state one-dimensional heat conduction problems in Cartesian System: Steady-state one-dimensional heat conduction problems (i) with and without heat generation and (ii) with and without varying thermal conductivity - in Cartesian system with various possible boundary conditions, Thermal Resistances in Series and in Parallel. **8 Hours**

Module – II

Critical Thickness of Insulation: Concept, Derivation, Extended Surfaces or Fins: Classification, Straight Rectangular and Circular Fins, Temperature Distribution and Heat Transfer Calculations, Fin Efficiency and Effectiveness, Applications

Transient [Unsteady-state] heat conduction: Definition, Different cases - Negligible internal thermal resistance, negligible surface resistance, comparable internal thermal and surface resistance, Lumped body, Infinite Body and Semi-infinite Body, Numerical Problems, Heisler and Grober charts.

9 Hours

Module – III

Numerical Analysis of Heat Conduction: Introduction, one-dimensional steady conduction, one dimensional unsteady conduction, two-dimensional steady and unsteady conduction, the difference equation, boundary conditions, solution methods, cylindrical coordinates and irregular boundaries.

Thermal Radiation: Fundamental principles - Gray, White, Opaque, Transparent and Black bodies, Spectral emissive power, Wien’s, Rayleigh-Jeans’ and Planck’s laws, Hemispherical Emissive Power, Stefan-Boltzmann law for the total emissive power of a black body, Emissivity and Kirchhoff’s Laws, View factor, Net radiation exchange in a two-body enclosure, Typical examples for these enclosures, Radiation Shield. **9 Hours**

Module – IV

NOTE: Feedback and suggestions are invited till 20th January 2017

Forced Convection: Boundary Layer Theory, Velocity and Thermal Boundary Layers, Prandtl number, Governing Equations – Continuity, Navier-Stokes and Energy equations, Boundary layer assumptions, Integral and Analytical solutions to above equations, Turbulent flow, Various empirical solutions, Forced convection flow over cylinders and spheres, Internal flows –laminar and turbulent flow solutions, Forced Convection Cooling of Electronic Devices.

NOTE: Feedback and suggestions are invited till 20th January 2017

Free convection: Laminar and Turbulent flows, Vertical Plates, Vertical Tubes and Horizontal Tubes, Empirical solutions. **8 Hours**

Module – V

Heat Exchangers: Definition, Classification, applications, LMTD method, Effectiveness - NTU method, Analytical Methods, Fouling Factors, Chart Solution Procedures for solving Heat Exchanger problems: Correction Factor Charts and Effectiveness-NTU Charts, compact heat exchangers.

Heat Transfer with Phase Change: Introduction to boiling, pool boiling, Bubble Growth Mechanisms, Nucleate Pool Boiling, Critical Heat Flux in Nucleate Pool Boiling, Pool Film Boiling, Critical Heat Flux, Heat Transfer beyond the Critical Point, filmwise and dropwise Condensation, heat pipes, entrainment, wicking and boiling limitations. **9 Hours**

Course Outcomes

At the end of the course, the student will be able to:

- Understand the basic modes of heat transfer.
- Compute temperature distribution in steady-state and unsteady-state heat conduction
- Understand and interpret heat transfer through extended surfaces.
- Interpret and compute forced and free convective heat transfer.
- Explain the principles of radiation heat transfer and understand the numerical formula for heat conduction problems.
- Design heat exchangers using LMTD and NTU methods.

TEXT BOOKS:

1. Principals of heat transfer, Frank Kreith, Raj M. Manglik, Mark S. Bohn, Seventh Edition, Cengage learning, 2011.
2. Yunus A. Cengel - Heat transfer, a practical approach, Fifth edition,Tata Mc Graw Hill.

REFERENCE BOOKS:

1. Heat nd mass transfer, Kurt C, Rolle, second edition, Cengage learning.
2. Heat Transfer, M. Necati Ozisik, A Basic Approach, McGraw Hill, New York, 2005.
3. Fundamentals of Heat and Mass Transfer, Incropera, F. P. and De Witt, D. P., 5th Edition, John Wiley and Sons, New York, 2006.
4. Heat Transfer, Holman, J. P., 9th Edition, Tata McGraw Hill, New York, 2008.

E-Books/Web references:

1. A Text book of Heat Transfer, John H Lienhard, 4th Edition,
2. NPTEL Heat Transfer course for Mechanical Engineering, http://nptel.ac.in/courses/112101097/
3. Heat Transfer, Chris Long & Naser Sayma, Bookboon.com

MOOCs:

1. Fluid flow, Heat and Mass Transfer- http://ocw.tudelft.nl/courses/applied-earth- sciences/fluid-flow-heat-mass-transfer/course
2. Heat transfer course- https://legacy.saylor.org/me204/Intro/

Scheme of Examination:

Two question to be set from each module. Students have to answer five full questions, choosing at least one full question from each module.

V - SEMESTER: MECHANICAL ENGINEERING

Course	Code	Credits	L-T-P	Assessment		Exam Duration
				SEE	CIA	
Heat Transfer Lab	15MEL67	02	1-0-2	80	20	3Hrs

Co□requisite Courses: Heat Transfer

Course Objectives:

- The primary objective of this course is to provide the fundamental knowledge necessary to understand the behavior of thermal systems.
- This course provides a detailed experimental analysis, including the application and heat transfer through solids, fluids, and vacuum. Convection, conduction, and radiation heat transfer in one and two dimensional steady and unsteady systems are examined.

PART – A

1. Determination of Thermal Conductivity of a Metal Rod.
2. Determination of Overall Heat Transfer Coefficient of a Composite wall.
3. Determination of Effectiveness on a Metallic fin.
4. Determination of Heat Transfer Coefficient in a free Convection on a
5. Determination of Heat Transfer Coefficient in a Forced Convention Flow through a Pipe.
6. Determination of Emissivity of a Surface.
7. Analysis of steady and transient heat conduction, temperature distribution of plane wall and cylinder using Numerical approach (ANSYS/CFD package).

PART – B

1. Determination of Steffan Boltzmann Constant.
2. Determination of LMDT and Effectiveness in a Parallel Flow and Counter Flow Heat Exchangers.
3. Experiments on Boiling of Liquid and Condensation of Vapour.
4. Performance Test on a Vapour Compression Refrigeration.
5. Performance Test on a Vapour Compression Air – Conditioner.
6. Experiment on Transient Conduction Heat Transfer.
7. Determination of temperature distribution along a rectangular and circular fin subjected to heat loss through convection using Numerical approach (ANSYS/CFD package)

Course Outcomes: At the end of this course students are able to,

- Perform experiments to determine the thermal conductivity of a metal rod
- Conduct experiments to determine convective heat transfer coefficient for free and forced convection and correlate with theoretical values.
- Estimate the effective thermal resistance in composite slabs and efficiency in pin-fin
- Determine surface emissivity of a test plate
- Estimate performance of a refrigerator and effectiveness of fin

- Calculate temperature distribution of study and transient heat conduction through plane wall, cylinder and fin using numerical approach.

Reading:

1. M. Necati Ozisik, Heat Transfer – A Basic Approach, McGraw Hill, New York, 2005.
2. Incropera, F. P. and De Witt, D. P., Fundamentals of Heat and Mass Transfer, 5th Edition, John Wiley and Sons, New York, 2006.
3. Holman, J. P., Heat Transfer, 9th Edition, Tata McGraw Hill, New York, 2008.

Scheme of Examination:

ONE question from part -A: 25 Marks

ONE question from part -B: 40 Marks

Viva –Voice : 15 Marks

Total: 80 Marks

MECHATRONICS

Course	Code	Credits	L-T-P	Assessment		Exam Duration
				SEE	CIA	
Mechatronics	15ME753	03	3-0-0	80	20	3 Hrs

Course objectives:

1. Understand the evolution and development of Mechatronics as a discipline.
2. Substantiate the need for interdisciplinary study in technology education.
3. Understand the applications of microprocessors in various systems and to know the functions of each element
4. Demonstrate the integration philosophy in view of Mechatronics technology

MODULE -1

Introduction: Definition, Multidisciplinary Scenario, Evolution of Mechatronics,Design of Mechatronics system, Objectives, advantages and disadvantages ofMechatronics.

Transducers and sensors: Definition and classification of transducers, Differencebetween transducer and sensor, Definition and classification of sensors, Principleof working and applications of light sensors, proximity switches and Hall Effectsensors.

MODULE -2

Microprocessor &Microcontrollers: Introduction, Microprocessor systems,Basic elements of control systems, Microcontrollers, Difference betweenMicroprocessor and Microcontrollers.

Microprocessor Architecture: Microprocessor architecture and terminology-CPU,memory and address, I/O and Peripheral devices, ALU, Instruction andProgram, Assembler, Data, Registers, Program Counter, Flags, Fetch cycle, writecycle, state, bus interrupts. Intel's 8085A Microprocessor.

MODULE -3

Programmable logic controller: Introduction to PLC's, basic structure, Principleof operation, Programming and concept of ladder diagram, concept of latching &selection of a PLC.

Integration: Introduction & background, Advanced actuators, Pneumaticactuators, Industrial Robot, different parts of a Robot-Controller, Drive, Arm, EndEffectors, Sensor & Functional requirements of robot.

MODULE -4

Mechanical actuation systems: Mechanical systems, types of motion, Cams, Gear trains, Ratchet & Pawl, belt and chain drives, mechanical aspects of motorselection.

Electrical actuation systems: Electrical systems, Mechanical switches, Solenoids,Relays, DC/AC Motors, Principle of Stepper Motors & servomotors.

10 Hours

MODULE -5

Pneumatic and hydraulic actuation systems: Actuating systems, Pneumatic andhydraulic systems, Classifications of Valves, Pressure relief valves, Pressureregulating/reducing valves, Cylinders and rotary actuators.

DCV & FCV: Principle & construction details, types of sliding spool valve,

solenoid operated, Symbols of hydraulic elements, components of hydraulicsystem, functions of various units of hydraulic system. Design of simple hydrauliccircuits for various applications.

Course outcomes:

On completion of this subject, students will be able to:

1. Illustrate various components of Mechatronics systems.
2. Assess various control systems used in automation.
3. Develop mechanical, hydraulic, pneumatic and electrical control systems.

TEXT BOOKS:

1. NitaigourPremchandMahalik , Mechatronics-Principles, Concepts and Applications, Tata McGraw Hill, 1st Edition, 2003 ISBN.No. 0071239243,9780071239240.
2. W.Bolton-Pearson Education, Mechatronics – Electronic Control Systems in Mechanicaland Electrical Engineering, 1st Edition, 2005 ISBN No. 81-7758-284-4.

REFERENCE BOOKS:

1. Mechatronics by HMT Ltd. – Tata McGrawHill, 1st Edition, 2000. ISBN:9780074636435.
2. Anthony Esposito, Fluid Power , Pearson Education, 6th Edition, 2011, ISBN No.9789332518544.

E- Learning

- VTU, E- learning

Scheme of Examination:

Two question to be set from each module. Students have to answer five full questions, choosing at least one full question from each module.

MANAGEMENT & ORGANIZATIONAL BEHAVIOUR

SubjectCode	:16MBA11	IA Marks	: 20
No. of Lecture Hours / Week: 03		Exam Hours	: 03
Number ofLectureHours	56	Exam Marks	: 80
PracticalComponent	: 02 Hours /Week		

Course Objectives:

- To make students understand fundamental concepts and principles of management, including the basic roles, skills, and functions of management
- To make students knowledgeable of historical development, theoretical aspects and practice applications of managerialprocess
- To understand the basic concepts and theories underlying individual behavior besides developing better insights into one's own self
- To make students aware of Individual behavior in groups, dynamics of groups and team building besides developing a better awareness of how they can be better facilitators for building effective teams as leadersthemselves

Course Outcomes:

At the end of the course students are able to:

- Comprehend & correlate all the management activities which are happening around them with fundamental concepts and principles ofmanagement.
- Get an overview of management, theory of management and practical applications of thesame.
- Effectively use their individual skill to work in groups to achieve organizational goals and ability to leadgroups/teams.
- Demonstrate their acumen in applying managerial and behavioral concept in realworld/situation.

Part A - Principles of Management

Unit1: (8Hours)

Introduction: Management: Introduction, Definition of management, Nature, Purpose and Functions, Levels and types of managers, managerial roles, skills for managers, evolution of management thought, Fayol's fourteen principles of management, Recent trends in management.

Unit2: (12 Hours)

Planning and Organizing:

Planning: Nature of Planning, Planning Process, Objectives, MBO, Strategies, level of strategies, policies, methods and programs, Planning Premises, Decision-making, Process of decision-making, Types of decisions, Techniques in decision-making.

Organizing: Organization structure, Formal and informal organizations, Principles of organizations-chain of command, span of control, delegation, decentralization, and empowerment. Functional, divisional, geographical, customer based and matrix organizations, tram based structures, virtual organizations, boundary less organizations.

Unit3: (5 Hours)

Controlling: Controlling, importance of controlling, controlling process, types of control, factors influencing control effectiveness.

RECOMMENDED BOOKS

- Essentials of Management-Koontz, 8/e, McGrawHill
- Management: Text and Cases-VSP Rao, ExcelBooks
- MGMT, An Innovative approach to teaching and learning Principles of Management, Chuck Williams, Cengage Publications,2010
- Principles and practices of Management, Kiran Nerkar, Vilas Chopde, Dreamtech Press,2011
- Management Theory & practice – Chandan J. S, Vikas Publishing House.
- Management Theory & Practice Text & Cases – Subba Rao P &HimaBindu, HimalayaPublication.

REFERENCE BOOKS:

- Masters of Management Thought – MahanandCharati& M MMunshi, Sapna Book House, Bangalore, 2015.

Part B - Organizational Behaviour

Unit4: (6hours)

Introduction: Organizational Behaviour: Introduction, definition, historical development, fundamental principles of OB, contributing disciplines, challenges and opportunities.

Unit5: (15Hours)

Foundations of Individual Behaviour: Individual behaviour: Foundations of individual behaviour. Ability: Intellectual abilities, Physical ability, the role of disabilities.
Personality: Meaning, formation, determinants, traits of personality, big five and MBTI, personality attributes influencing OB.
Attitude: Formation, components of attitudes, relation between attitude and behaviour.
Perception: Process of perception, factors influencing perception, link between perception and individual decision-making.

Unit6: (10 Hours)

Motivation: Meaning, theories of motivation-needs theory, two factor theory, Theory X and Y, application of motivational theories.
Leadership: Meaning, styles of leadership, leadership theories, trait theory, behavioural theories, managerial grid, situational theories.

Note: Related case studies to be discussed.

Practical Components:

- Studying organizational structures of any 10 companies and classifying them into different types of organizations which are studied in Unit 2 and justifying why such structures are chosen by those organizations.
- Preparing the leadership profiles of any 5 business leaders and studying their leadership qualities and behaviours with respects to the trait, behavioural and contingency theoriesstudied.

- Identifying any five job profiles and listing the various types, abilities required for those jobs and also the personality traits/attributes required for the jobsidentified.

Note: Faculty can either identify the organizations/ leaders/jobs or students can be allowed to choose the same.

RECOMMENDED BOOKS:

- Organizational behaviour, Stephen P Robbins, Timothy A. Judge, Neharika Vohra, 14th Edition, Pearson,2012.
- Introduction to OrganisationalBehaviour – Michael Butler, Jaico Publishing House,
- Organization Behaviour – Ashwathappa, Himalaya Publication House
- ORGB - Nelson, Quick, Khanelwal, 2/e, Cengage Learning,2012.
- Organizational Behaviour - Anada Das Gupta, Biztantra,2011.
- Organizational Behaviour: A modern approach - Arun Kumar and Meenakshi, Vikas Publishing House,2011.
- Organizational Behaviour – Rao V. S. P, Excel BOOKS,2009.

REFERENCE BOOKS:

- Organizational Behaviour - Fred Luthans, 12/e, McGraw Hill International,2011.
- Management and Organizational Behaviour - Laurie J Mullins, Pearson education

ACCOUNTING FOR MANAGERS

SubjectCode	:16MBA13	IA Marks	: 20
No. of Lecture Hours / Week: 03		Exam Hours	: 03
Number ofLectureHours	56	Exam Marks	: 80
PracticalComponent	: 02 Hours /Week		

Objectives:

- To explain fundamental accounting concepts andconventions.
- To explain and use the accountingequation.
- To prepare basic journal entries for business transactions and present the data in an accuratemanner
- To present financial statements in vertical and horizontalformat.
- To analyze a company's financial statements using various ratios for decisionmaking.
- To understand emerging issues in accounting andtaxation.

Course Outcomes:

At the end of the course students are able to:

- Acquire the knowledge about the concepts and fundamental principles ofaccounting.
- Demonstrate theoretical knowledge and its application in real time accounting.
- Capable of preparing financial statement of sole trading concerns and companies.
- Independently undertake financial statement analysis and take decisions.
- Comprehend emerging trends in accounting andtaxation.

Unit1: **(6Hours)**
Introduction to Accounting: Need and Types of Accounting, Users of Accounting, concepts and conventions of Accounting, Accounting Equation (problems on accounting equation).

Unit2: **(10 Hours)**
Preparation of books of Accounts: Journals, three column cash book, ledgers and trial balance. Depreciation- Straight line and Written down Value Methods.

Unit3: **(14 Hours)**
Preparation of Financial Statements: Preparation of final accounts of sole traders. Preparation of final accounts of companies, vertical form of financial statements. (Basic problems Final Accounts)

Unit4: **(12 Hours)**
Analysis of Financial Statements: Ratio Analysis, Preparation of financial statements using ratios, Preparation of Cash flow Statement (only indirect method).

Unit5: **(8 Hours)**
Emerging issues in Accounting: Human Resource Accounting, Forensic Accounting, Sustainability Reporting -**Accounting Standards and IFRS:** Nature andsignificance

Unit6: **(6 Hours)**
Fundamentals of Taxation: Heads of Income, Deductions u/s 80C, Income Tax Rates and Returns for Individuals only (only theory)

Practical Components:

- Collecting Annual reports of the companies and analyzing the financial statements using different techniques and presenting the same in theclass.
  - Analyzing the companies' cash flow statements and presenting the same in theclass.=
- Exposing the students to usage of accounting software's (Preferably Tally)
- Filling up of ITRforms
- Identify the sustainability report of a company and study the contents.

Note 1: Related case studies to be discussed.
Note 2: 25 percent theory and 75 percent problems

RECOMMENDED BOOKS:

- Financial Accounting: A Managerial Perspective, Narayanaswamy R, 5/e , PHI,2014
- A Text book of Accounting For Management, Maheswari S. N,MaheswariSharadK.Maheswari,2/e,VikasPublishinghouse (P) Ltd.
- Financial Accounting, Tulsian P. C, 1/e, PearsonEducation.
- Accounting for managers, Madegowda J, Himalaya Publishing House.
- Advanced Accountancy, Gupta R. L &Radhaswamy M, Sultan Chand Publications.
- Financial Accounting, Jain S. P and Narang K L, KalyaniPublishers.
- Business Taxation, Akhileshwar Pathak and SavanGodiawala, 2/e, McGraw Hill Education (India) Pvt. Ltd,2013.

REFERENCE BOOKS:

- Financial Accounting for Management: An Analytical Perspective, Ambrish Gupta, 4/e, Pearson Education.
- Introduction to Financial Statement Analysis, Ashish K Bhattacharya, ElsevierIndia.
- Financial Accounting – Raman B. S,Vol I & Vol II, 1/e, United Publishers,2011.
- Financial Accounting (IFRS update), Gary A. Porter & Curtis L. Norton, 6/e, CengageLearning.

- Accounting For Management, Arora M. N, Himalaya Publishing House.
- Essentials of Financial Accounting (Based on IFRS), Bhattacharya, 3/e, Prentice HallIndia.
- Comdex (Computer and Financial Accounting with Tally 9.0 Course Kit), DreamTech.
- Comdex – Tally 9, Namrata Agrawal - DreamTech.
- IFRS: A Practical approach, Jasmine Kaur, McGrawHill.

MANAGERIAL COMMUNICATION

SubjectCode	:16MBA16	IA Marks	: 20
No. of Lecture Hours / Week: 03		Exam Hours	: 03
Number ofLectureHours	56	Exam Marks	: 80
PracticalComponent	: 02 Hours /Week		

Objective:
To enhance students communication skills through verbal, non-verbal, correspondence, presentations, interviews and negotiation.

Course Outcomes:
At the end of the course students are able to:

- Describe and develop written and oralcommunication.
- Independently prepare business letters andreports.
- Exhibit, develop and apply negotiationstrategies.
- Gain exposure to media management and demonstrate the skill in analyzing businesssituation.

Unit1: **(10Hours)**
Introduction: Meaning & Definition, Role, Classification – Purpose of communication – Communication Process – Characteristics of successful communication – Importance of communication in management – Communication structure in organization – Communication in conflict resolution - Communication in crisis. Communication and negotiation - Communication in a cross-cultural setting

Unit 2: **(8 Hours)**
Oral Communication: Meaning – Principles of successful oral communication – Barriers to communication – Conversation control – Reflection and Empathy: two sides of effective oralcommunication.

Modes of Oral Communication - Listening as a Communication Skill, Non-verbal communication

Unit3: **(8Hours)**

Written Communication: Purpose of writing – Clarity in writing – Principles of effective writing – Approaching the writing process systematically: The 3X3 writing process for business communication: Pre writing – Writing – Revising – Specific writing features – CoherenceElectronic writingprocess.

Unit4: **(12 Hours)**

Business Letters and Reports: Introduction to business letters – Types of Business Letters - Writing routine and persuasive letters – Positive and Negative messages Writing Reports: Purpose, Kinds and Objectives of reports – Organization & Preparing reports, short and long reports Writing Proposals: Structure & preparation - Writingmemos

Media Management: The press release – Press conference – Media interviews

Group Communication: Meetings – Planning meetings – objectives – participants – timing – venue of meetings.

Meeting Documentation: Notice, Agenda, and Resolution & Minutes

Unit5: **(10 Hours)**

Presentation skills: What is a presentation – Elements of presentation – Designing & Delivering Business Presentations – Advanced Visual Support for managers.

Case Methods of learning: Understanding the case method of learning. **Negotiation skills:** What is negotiation – Nature and need for negotiation – Factors affecting negotiation – Stages of negotiation process – Negotiation strategies.

Unit6: **(8Hours)**

Employment communication: Introduction – Composing Application Messages - Writing CVs – Group discussions – Interview skills

Impact of Technological Advancement on Business Communication
– Technology-enabled Communication-**Communication networks**– Intranet–Internet–E-mails–SMS– teleconferencing –videoconferencing

Practical Components:

- Demonstrate the effect of noise as a barrier tocommunication
- Make students enact and analyze the non-verbalcues
- Give exercises for clarity and conciseness in writtencommunication.
- Demonstrating using Communication Equipments like Fax, Telex, Intercoms, etc,
- Demonstrating Video conferencing & teleconferencing in theclass.
- Conduct a mock meeting of students in the class identifying an issue of their concern. The students should prepare notice, agenda and minutes of themeeting.
- Each student to give presentation of 5 minutes (this can be spread throughout the semester)and to be evaluated by thefaculty

RECOMMENDED BOOKS:

- Business Communication : Concepts, Cases And Applications – Chaturvedi P. D, &MukeshChaturvedi ,2/e, PearsonEducation,2011
- Business Communication: Process and Product – Mary Ellen Guffey, 3/e, Cengage Learning,2002.
- Business Communication – Renuka Murthy T P and YathishChandra M S,HPH.
- Business Communication – Lesikar, Flatley, Rentz&Pande, 11/e, TMH, 2010
- Advanced Business Communication – Penrose, Rasberry, Myers, 5/e, Cengage Learning,2004.
- BCOM – Lehman, DuFrene, Sinha, Cengage Learning, 2/e,2012

- Business Communication – Madhukar R. K, 2/e, Vikas Publishing House.

REFERENCE BOOKS:

- Effective Technical Communication - Ashraf Rizvi M, TMH,2005.
- Business Communication - Sehgal M. K &Khetrapal V, Excel Books.
- Business Communication – Krizan, Merrier, Jones, 8/e, Cengage Learning, 2012.
- Basic Business Communication – Raj Kumar, Excel Books,2010.

FINANCIAL MANAGEMENT

Subject Code	: 16MBA22	IA Marks	: 20
No. of Lecture Hours / Week	: 03	Exam Hours	: 03
Total Number of Lecture Hours	: 56	Exam Marks	: 80
Practical Component	: 02 Hours / Week		

Course Objectives:

- To familiarize the students with basic concepts of financialmanagement.
- To understand time value of money and cost ofcapital.
- To analyze capital structure, capital budgeting and dividenddecision.
- To understand the short term and long term financing and working capitalmanagement.

Course Outcome:

At the end of the course studentswillbe able to:

- Understand the basic financialconcepts
- Apply time value ofmoney
- Evaluate the investmentdecisions
- Analyze the capital structure and dividenddecisions.
- Estimate working capitalrequirements.

Unit 1: **(8Hours)**

Financial management – Introduction to financial management, objectives of financial management – profit maximization and wealth maximization. Changing role of finance managers. Interface of Financial Management with other functionalareas.

SourcesofFinancing: Shares, Debentures, Term loans, Lease financing, Hybrid financing, Venture Capital, Angel investing and private equity, Warrants and convertibles (Theory Only) **Emerging Issues:** Risk management, Behavioral finance and Financialengineering.

Unit 2: **(10Hours)**

Time value of money –Future value of single cash flow & annuity, present value of single cash flow, annuity & perpetuity.Simple interest & Compound interest, Capital recovery & loan amortization.

Unit 3: **(10Hours)**

Cost of Capital Cost of capital – basic concepts. Cost of debenture capital, cost of preferential capital, cost of term loans, cost of equity capital (Dividend discounting and CAPM model) - Cost of retained earnings - Determination of Weighted average cost of capital (WACC) and Marginal cost of capital.

Unit 4: **(12Hours)**

Investment decisions – Capital budgeting process, Investment evaluation techniques – Net present value, Internal rate of return, Modified internal rate of return, Profitability index, Payback period, discounted payback period, accounting rate ofreturn.

Unit 5: **(8Hours)**
Working capital management – factors influencing working capital requirements - Current asset policy and current asset finance policy- Determination of operating cycle and cash cycle - Estimation of working capital requirements of a firm (Does not include Cash, Inventory & ReceivablesManagement)

Unit 6: **(8Hours)**
Capital structure and dividend decisions – Planning the capital structure. (No capital structure theories to be covered) Leverages – Determination of operating leverage, financial leverage and total leverage. Dividend policy – Factors affecting the dividend policy - Dividend Policies- Stable Dividend, Stable Payout (No dividend theories to becovered)

Practical Components:

- Identifying the small or medium sized companies and understanding the Investment evaluation techniques used bythem.
- Using the annual reports of selected companies, students can study the working capital management employed by them. Students can also compare the working capital management of companies in the samesector.
- Students can choose the companies that have gone for stock split and Bonus issue in the last few years and study the impact of the same on the stockprice.

RECOMMENDED BOOKS:

- Financial Management -Prasanna Chandra, 8/e, TMH,2011.
- Financial Management,Shashi K Gupta and R K Sharma, 8th Revised Edition, Kalyani Publishers,-2014
- Financial Management,Khan M. Y.& Jain P. K, 6/e, TMH,2011.
- Financial Management,Rajiv Srivastava and Anil Misra, Second edition, Oxford UniversityPress,2011
- Financial Management ,I M Pandey, 10th Edition, Vikas Publishing House-2014
- Financial Management & Policy-Vanhorne, James C., 12/e, Pearson,2002
- Financial Management, PralhadRathod, Babitha&S.HarishBabu, Himalaya Publishing House,2015

REFERENCE BOOKS:

- Financial Management,V K Bhalla ,1st Edition- S.Chand2014,
- Fundamentals of Financial Management,Brigham& Houston, 10/e, CengageLearning.
- Corporate Finance,Damodaran , 2/e, Wiley India (P) Ltd.,2004
- Financial Management,Paresh P., Shah 2/e,Biztantra.
- Fundamentals of Financial Management,Sheeba Kapil,Pearson,2013
- Financial Management, Sumit Gulati & Y P Singh,McGraw Hill, New Delhi –2013

RESEARCH METHODS

SubjectCode	:16MBA23	IAMarks	20
No. of Lecture Hours/Week	:03	Exam Hours	03
Total Number ofLectureHours	:56	Exam Marks	80
PracticalComponent	: 02 Hours /Week		

Objectives:

- To understandthe basic components of researchdesign
- To Gain an insight into the applications of researchmethods
- To equip students with various research analytical tools used in businessresearch

Course outcome:

At the end of the course students are able to:

- Understand various research approaches, techniques and strategies in theappropriate in business.
- Apply a range of quantitative / qualitative research techniques tobusiness and day to day managementproblems
- Demonstrate knowledge and understanding of data analysis, interpretation and report writing
- Develop necessary critical thinking skills in order to evaluate different researchapproaches inBusiness.

Unit 1: (8hours)

Business Research – Meaning, types, process of research- management problem, defining the research problem, formulating the research Hypothesis, developing the research proposals, research design formulation, sampling design, planning and collecting the data for research, data analysis and interpretation. Research Application in business decisions, Features of good research study.

Unit 2: (10hours)

Business Research Design: Meaning and significance - **Types**: Exploratory and Conclusive Research Design.

Exploratory Research: Meaning, purpose, methods- Literature search, experience survey, focus groups and comprehensive case methods.

Conclusive Research Design - Descriptive Research - Meaning, Types – Cross sectional studies and longitudinalstudies.

Experimental Research Design – Meaning and classification of experimental designs- formal and informal, Pre experimental design, Quasi-experimental design, True experimental design, statistical experimentaldesign.

Unit 3: (8hours)

Sampling: Concepts- Types of Sampling - Probability Sampling – simple random sampling, systematic sampling, stratified random sampling, cluster sampling -Non Probability Sampling –

convenience sampling- judgemental sampling, snowball sampling- quota sampling - Errors in sampling.

Unit 4: (12hours)

Data Collection: Primary and Secondary data

Primary data collection methods - Observations, survey, Interview and Questionnaire, Qualitative Techniques of data collection, Questionnaire design – Meaning - process of designing questionnaire. Secondary data -Sources – advantages anddisadvantages.

Measurement and Scaling Techniques: Basic measurement scales-Nominal scale, Ordinal scale, Interval scale, Ratio scale. Attitude measurement scale - Likert's Scale, Semantic Differential Scale, Thurstone scale, Multi-DimensionalScaling

Unit5: (10 hours)

Hypothesis - types, characteristics, source, formulation of hypotheses, errors in hypotheses. Parametric and Non-Parametric Tests- t-test, z-test, f-test, u-test, K-W Test (problems on all tests) Statistical analysis- Bivariate and Multivariate Analysis- (only theory). ANOVA-one-way and two-way classification (theoryonly)

Unit6: (8 hours)

Data Analysis and Report Writing: Editing, Coding, Classification, Tabulation, Validation Analysis and Interpretation- **Report writing and presentation of results:** Importance of report writing, types of research report, report structure, guidelines for effective documentation.

Practical Components:

- To identify research problem and collect relevant literatures for dataanalysis
- To write the research design by using Exploratory and Descriptive Researchmethods
- To prepare the questionnaire on brand awareness, effectiveness of training in public sector organization, Investors attitude towards Mutual funds in any financialinstitutions.
- To conduct Market survey and to investigate consumer perception towards anyFMCG.
- To demonstrate Report writing and Presentationmethods

RECOMMENDED BOOKS

- Business Research Methods: A South-Asian Perspective with course Mate William G.Zikmund/Barry J.Babin/Jon C.Carr/AtanuAdhikari/Mitch Griffin, Cengagelearning
- Business Research Methods: S.N.Murthy&U.Bhojanna. ExcelBooks
- Business Research Methods. Donald R. Cooper & Pamela s Schindler, 9/e, TMH/2007
- Research Methods – M MMunshi& K Gayathri Reddy, Himalaya Publishing House, 2015
- Research Methods for Business, Uma Sekaran& Roger Bougie, 6th Edition, Wiley,2013
- Business Research Methods-SL Guptah and HeteshGuptha, McGraw hill -2012
- Marketing Research- Naresh K Malhotrs- 5th Edition, Pearson Education /PHI2007

REFERENCE BOOKS

- Research Methods- William M C Trochi,- 2/e, Biztantra,2007

- Methodology of Research in social Sciences- O R Krishnaswami, M Ranganatham, HPH, 2007
- Research Methodology – C.R.Kothari,VishwaPrakashan
- Business Research Methodology – J K Sachdeva – 2nd Edition - HPH,2011
- Research Methodology – concepts and cases – Deepak Chawla and NeenaSondhi - Vikas Publication -2014

INDUSTRIAL RELATIONS AND

LEGISLATIONS

Subject Code	: 16MBA HR301	IA Marks :20
Number of Lecture Hours/Week	: 03	Exam Hours: 03
Number of Lecture Hours	: 56	Exam Marks: 80
Practical Component	: 02 Hours/ Week	

Course Objectives:

- To enable students to understand and apply the principles of IR and develop an awareness of the significance of industrialpeace.
- To provide a conceptual basis of IndustrialRelations.
- To give an understanding of the components and meaning of sustaining Industrial peace anchored on harmonious Employee-Managementrelations.
- To discuss the various Industrialacts.

Course Outcomes:

The students should be able to

- Gain the insights of IR practices in theindustry.
- Develop the knowledge related to employee-managementrelations
- Implementation of various industrialacts

PART A:
INDUSTRIALRELATIONS (32hours)

Unit 1 (8hours)
Introduction:
Background of Industrial Relations – Definition, scope, objectives, factors affecting IR, participants of IR, importance of IR. Approaches to Industrial relations, system of IR in India –Historical perspective & post-independence period, Code of Discipline and historical initiatives for harmonious IR, Government policies relating to labor, ILO and its influence on Legal enactments inIndia.

Unit2 (8Hours)
Collective Bargaining & Negotiation:
Collective Bargaining: Definition, Meaning, Nature, essential conditions for the success of collective bargaining, functions of collective bargaining, importance of Collective Bargaining, collective bargaining process, prerequisites for collective bargaining, implementation and administration ofagreements.

Negotiations-Types of Negotiations-Problem solving attitude, Techniques of negotiation, negotiation process, essential skills for negotiation, Workers Participation in Management

Unit3 **(8Hours)**
Trade Union
Trade Unions: Meaning, trade union movement in India, Objective, role and functions of the Trade Unions in Modern Industrial Society of India, Procedure for registration of Trade Unions, Grounds for the withdrawal and cancellation of registration, union structure, Rights and responsibilities of TUs, Problems of trade unions, Employee relations in ITsector

Unit5 **(8Hours)**
Grievance procedure and Discipline management:
Grievance - Meaning and forms, sources of grievance, approaches to grievance machinery, Grievance procedures, model grievance procedure. Disciplinary procedures, approaches to manage discipline in Industry, Principles of Hot stoverule.

RECOMMENDED BOOKS:

- Employee Relations Management, P N Singh, Singh P. N., - Pearson Publications,2011.
- Dynamics of Industrial Relations, Mamoria&Mamoria, Himalaya Publications,2012
- Human Resource Management Principles & Practice, Aquinas, VikasPublication.
- Personnel Management & Industrial Relations, Nair N G, Nair L, S. Chand Limited,2001
- Essentials of Human Resource Management and Industrial Relations, Subba Rao, 3rd Revised edition, Himalaya Publishing House,2010.

REFERENCE BOOKS:

Industrial Relations, Trade Unions &Labour Legislation, P R N Sinha et al, Pearson Education, 2004.

- BareActs
- Industrial Relations and labor laws, ArunMonappa, RanjeetNambudiri, PatturajuSelvaraj, TMH, 1997.
- Industrial relations, trade unions and labor legislations, P R N Sinha, InduBala Sinha, Seema PriyadarshiniShekar, Pearson Education, 2013, ISBN:9788131731642

PARTB: **(24Hours)**

Unit 5

INDUSTRIALLEGISLATIONS **(16hours)**

Only basic objectives and major provisions of the following legislations:

- Factories Act1948,
- Industrial Employment (Standing orders) Act,1946
- Employees' State Insurance (ESI) Act,1948,
- Maternity Benefit Act,1961
- Contract LabourAct,
- Shops and EstablishmentsAct
- Child Labour (Prohibition & Regulation) Act,1986
- Industrial disputes act of1947

Unit6 **(8Hours)**

- Minimum Wages Act, 1948
- Payment of Wages Act,1936

- Payment of Gratuity Act1972,
- Employees' Provident Fund and Miscellaneous Provisions Act1952;
- Payment of Bonus Act,1965.
- Employees Compensation Act in2013

NO PRACTICAL COMPONENT

RECOMMENDED BOOKS:

- Labor Laws for Managers, BD Singh, Excel Books,2009
- Industrial Relations and Labor laws, SC Srivatava, 5th Edition, VikasPublications.
- Elements of Mercantile Law - N. D Kapoor, Sultan Chand,2004.
- Industrial Relations and Labour Legislations, Piyali Ghosh &ShefaliNandan,TMH.
- Labor Industrial Laws, Dr. V. G. Goswami, Eighth Edition, Central Law Agency,Allahabad

REFERENCE BOOKS:

- Industrial Relations, Trade Unions &Labour Legislation, P R N Sinha et al, Pearson Education,2004.
- BareActs
- Industrial Relations and labor laws, ArunMonappa, RanjeetNambudiri, PatturajuSelvaraj, TMH,1997.
- Industrial relations, trade unions and labor legislations, P R N Sinha, InduBala Sinha, Seema PriyadarshiniShekar, Pearson Education,2013.

RECRUITMENT & SELECTION

Subject Code	: 16MBA HR302	IAMarks 20
Number of Lecture Hours/Week	: 03	Exam Hours:03
Number of Lecture Hours	: 56	Exam Marks: 80
Practical Component	: 02 Hours/ Week	

Course Objectives:

To understand and apply the policies and procedures of recruitment
- To provide a conceptual framework of Selection Procedure in theIndustry.
- To understand the new concepts and techniques of recruitment and Selection in the Corporate.

Course Outcomes:

The students should be able to

- Learn the various recruitment policies andprocedures.
- Equip with conceptual framework of selectionprocedures.
- Gain insights of the latest concepts and techniques used in recruitment andselection.

Unit1: (6 Hours)

Job Analysis: Meaning, definition and purpose. Methods of job analysis: job analysis interviews, job analysis questionnaire, task analysis inventory, position analysis questionnaire, subject expert workshops, critical incident technique, F1eisclunann job analysis survey, functional job analysis, job element method, repertory grid, critical incident technique

Unit2: (9 Hours)
Hiring Process & Hiring decision: Nature of hiring: regular, temporary, full time, part time, apprentice, contractual, and outsourcing, Existing post or new post to be created, Need analysis, cost analysis and job analysis.

Unit3: (7Hours)
Hiring internally: Meaning and definition of internal recruitment, Advantages and disadvantages in terms of cost, time, quality and suitability. Sources of internal recruitment: - circulars, intranet advertisements, employee referrals, Appointment or promotion, Policy guidelines and union settlements.

Unit4: (10 Hours)
External Hiring: Meaning and definition of external recruitment. Sources of recruitment:- advertisement, in newspaper, TV/Radio, Internet, search on the internet, wanted signboards, consultants, employment exchange, campus recruitment, employee referrals and unsolicited applications. Advantages and disadvantages of the above sources in terms of cost, time, convenience, reach of the targeted population, and quality of applicant pool.
Job advertisement: drafting, size and contents. Contents of public sector recruitment: single or multiple sources and choosing the best source
Unit5: (8Hours)
Screening the candidates: Application Forms: bio-data / resume / curriculum vitae and Weighted application blanks: meaning definition, purpose, advantages and disadvantages – taking a Behavioral approach to recruitment: spotting personality patterns, making basic assumptions, Predicting the future, strategy Vs. Technique, Pinning down what is needed: targeted interviewing, focusing on behavior, assessing how person performs, assuming they have been hired. – Identifying the ingredients of success: the winning candidate's profile, challenges in the Interview, the starting point, day to day execution, dealing with people, the inner person, additional characteristics. Studying the CV.

Unit6: (16Hours)
Testing,Reference checking & Appointment orders: Meaning, definition, purpose, advantages and disadvantages, Ability tests clerical ability test, mechanical ability test, mental ability test, physical ability test, personality assessment test, typing test, shorthand test, computer proficiency test Interviewing: Planning the interview, Interview process - Interview in public sector undertaking. Statutory requirements.
Reference checking: meaning, definition and purpose. Verification of character, criminal antecedents, previous work behavior and education qualifications. Verification of community certificates in public sectorcompanies.
Appointment orders: Meaning, definition, and purpose. Contents of appointment letter, hard copy (or softcopy),

Practical Components:

- Students need to identify two jobs in the college and need to do job analysis for those positions using any of the job analysismethods.

- In teams students can be asked to give presentations about various types of jobs (regular, temporary, full time, part time, apprentice, contractual, and outsourcing) in different industries along with its advantages anddisadvantages
- In Teams, select and analyze any two of the Job postings advertisements in Newspapers to know more about job description and job specification mentioned in each advertisement for every post.
- Obtain online access to the resume data base of Naukri.com or Monsterindia.com for a week give at least four Job Descriptions and specification to each student, to search and download from the data base at least five resumes for eachpositions.
- Students can identify 4 or 5 jobs of their interest and can create Advertisements for the same imaging that they are Proprietors of the companies and hiring for thesepositions.
- Debate on Advantages and disadvantages of hiring external and Internal for the selected jobs like
- Police Constable, Doctor, CEO, Mechanical Engineer, Professoretc.,
- Role play: Students can do the role play for the entire process of hiring and selecting 3 or 4 selected roles in a specificindustry.

RECOMMENDED BOOKS:

- Human Resource Selection, Robert D. Gatewood and Hubert S. I, South western Cengage Learning, Mason, Ohio,2001.
- Recruitment and Selection -Theory and Practice. Dipak kumar Bhattacharya Cengage Learning.
- StaffingOrganization,HerbertG.HenemanIII,TimothyA.Judge,5th Edition,McGraw Hill International.
- Recruitment and Selection, Elearn, Revised Edition, Routledge,2009.
- Online Recruiting and Selection: Innovations in Talent Acquisition, Douglas H. Reynolds, John A. Weiner, John Wiley & Sons,2009.
- Effective Recruitment and Selection Practices, R. L. Compton, William J. Morrissey, Alan R. Nankervis, Bill Morrissey, CCH Australia Limited,2009.

REFERENCE BOOKS:

- Employee Selection, Lilly M Berry, 1 edition, Cengage Learning,2002.
- Hiring & keeping the best people, HBS Press, 2013, ISBN: 1422131785,9781422131787
- Human Resource Planning, Dipak Kumar Bhattacharyya, 2nd edition, Excel Books, 2009, ISBN: 8174464980,9788174464989
- High performance hiring by Robert W. Wendover, Crisp Publication, California,1991.

CONCRETE TECHNOLOGY
(COMMON TO CV/TR/CTM)

Sub Code	**:**	**10 CV 42**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

Unit- 1
Cement, Chemical composition, hydration of cement, Types of cement, manufacture of OPC by wet and dry, process (flow charts only) Testing of cement - Field testing, Fineness by sieve test and Blaine's air permeability test, Normal consistency, testing time, soundness, Compression strength of cement and grades of cement, Quality of mixing water. –7 Hours

Unit-2
Fine aggregate - grading, analysis, Specify gravity, bulking, moisture content, deleterious materials. Coarse aggregate – Importance of size, shape and texture.Grading of aggregates - Sieve analysis, specific gravity, Flakiness and elongation index, crushing, impact and abrasion tests. - 6 Hours

Unit-3

Workability - factors affecting workability, Measurement of workability - slump, flow tests, Compaction factor and vee-bee consistometer tests, Segregation and bleeding, Process of manufactures of concrete : Batching, Mixing, Transporting, Placing, Compaction, Curing. -7 Hours

Unit-4

Chemical admixtures - plasticizers, accelerators, retarders and air entraining agents, Mineral admixtures - Fly ash, Silica fumes and rice husk ash.

-6 Hours

Part-B

Unit-5

Factors affecting strength, w/c ratio, gel/space ratio, maturity concept, Effect of aggregate properties, relation between compressive strength, and tensile strength, bond strength, modulus of rupture, Accelerated curing, aggregate - cement bond strength, Testing of hardened concrete - compressive strength, split tensile strength, Flexural strength, factors influencing strength test results. - 6Hours

Unit-6

Elasticity - Relation between modulus of elasticity and Strength, factors affecting modulus of elasticity, Poisson , Ratio, Shrinkage - plastic shrinkage and drying shrinkage, Factors affecting shrinkage, Creep - Measurement of creep, factors affecting creep, effect of creep, - 7 Hours

Unit-7

Durability - definition, significance, permeability, Sulphate attack, Chloride attack, carbonation, freezing and thawing, Factors contributing to cracks in concrete - plastic shrinkage, settlement cracks, construction joints, Thermal expansion, transition zone, structural design deficiencies, - 6 Hours

Unit-8

Concept of Concrete Mix design, variables in proportioning , exposure conditions, Procedure of mix design as per IS 10262-1982, Numerical examples of Mix Design - 7 Hours

TEXT BOOKS:

1. "Concrete Technology" - Theory and Practice, M.S.Shetty, S.Chand and Company, New Delhi, 2002.

REFERENCES :

1. "Properties of Concrete"Neville, A.M. : , ELBS, London
2. "Concrete Technology" – A.R.Santakumar. Oxford University Press (2007)'
3. "Concrete Manual" - Gambhir Dhanpat Rai & Sons, New Delhi.
4. "Concrete Mix Design" - N.Krishna Raju, Sehgal - publishers.
5. "Recommended guidelines for concrete mix design" - IS:10262,BIS Publication

2. **Fundamentals of Surveying** - S.K. Roy – Prentice Hall of India
3. **Surveying**, Arther Bannister et al., Pearson Education, India

STRUCTURAL ANALYSIS –I
(COMMON TO CV/TR)

Sub Code	**:**	**10 CV 43**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:
STRUCTURAL SYSTEMS AND ENERGY CONCEPT
1.1 Forms of structures, 1.2 Conditions of equilibrium, 1.3 Degree of freedom, 1.4 Linear and Non linear structures, 1.5 One, two, three dimensional structural systems, 1.6 Determinate and indeterminate structures [Static and Kinematics]. 1.7 Strain energy and complimentary strain energy, 1.8 Strain energy due to axial load, bending and shear, 1.9 Theorem of minimum potential energy, 1.10 Law of conservation of energy, 1.11 Principle of virtual work,

7 Hours

UNIT 2:
DEFLECTION OF BEAMS
2.1 Moment area method, 2.2 Conjugate beam method

6 Hours

UNIT 3:
DEFLECTION OF BEAMS AND FRAMES BY STRAIN ENERGY
3.1 The first and second theorem of Castigliano, problems on beams, frames and trusses, 3.2 Betti's law, 3.3 Clarke - Maxwell's theorem of reciprocal deflection.

7 **Hours**

UNIT 4:
ANALYSIS OF BEAMS AND PLANE TRUSSES BY STRAIN ENERGY
4.1 Analysis of beams (Propped cantilever and Fixed beams) and trusses using strain energy and unit load methods

7 Hours

PART – B

UNIT 5:
ARCHES AND CABLES
5.1 Three hinged circular and parabolic arches with supports at same levels and different levels, 5.2 Determination of thrust, shear and bending moment, 5.3 Analysis of cables under point loads and UDL, length of cables (Supports at same levels and at different levels).

6 Hours

UNIT 6:
ANALYSIS OF BEAMS
6.1 Consistent deformation method – Propped cantilever and fixed beams

6 Hours

UNIT 7:
7.1 Clapeyron's theorem of three moments – continuous beams and fixed beams

6 Hours

UNIT 8:
ANALYSIS OF ARCHES
8.1 Two hinged parabolic arch, 8.2 Two hinged Circular Arch

7 Hours

TEXT BOOKS:

1. **Theory of Structures**, Pandit and Guptha, Vol. – I, Tata McGraw Hill, New Delhi.
2. **Basic Structural Analysis** Reddy C. S., Tata McGraw Hill, New Delhi.
3. **Strength of Materials and theory of structures** Vol I & II, B.C. Pumia , R.K., Jain Laxmi Publication New Delhi

REFERENCE BOOKS:

1. **Elementary Structural Analysis**, Norris and Wilbur, International Student Edition. McGraw Hill Book Co: New York
2. **Structural Analysis**, 4th SI Edition by Amit Prasanth & Aslam Kassimali, Thomson Learning.
3. **Analysis of Structures**, Thandava Murthy, Oxford University Press, Edition 2005.

SURVEYING – II
(COMMON TO CV/TR/EV/CTM)

Sub Code	:	**10 CV 44**	**IA Marks**	:	**25**
Hrs/ Week	:	**04**	**Exam Hours**	:	**03**
Total Hrs.	:	**52**	**Exam Marks**	:	**100**

PART – A

UNIT 1:
THEODOLITE SURVEY
1.1 Thedolite and types, 1.2 Fundamental axes and parts of a transit theodolite, 1.3 Uses of theodolite, 1.4 Temperary adjustments of a transit thedolite, 1.5 Measurement of horizontal angles – Method of repetitions and reiterations, 1.6 Measurements of vertical angles, 1.7 Prolonging a straight line by a theodolite in adjustment and theodolite not in adjustment

6 Hours

UNIT 2:
PERMANENT ADJUSTMENT OF DUMPY LEVEL AND TRANSIT THEODOLITE
2.1 Interrelationship between fundamental axes for instrument to be in adjustment and step by step procedure of obtaining permanent adjustments

7 Hours

UNIT 3:
TRIGONOMETRIC LEVELING
3.1 Determination of elevation of objects when the base is accessible and inaccessible by single plane and double plane method, 3.2 Distance and difference in elevation between two inaccessible objects by double plane method. Salient features of Total Station, Advantages of Total Station over conventional instruments, Application of Total Station.

8 Hours

UNIT 4:
TACHEOMETRY
4.1 Basic principle, 4.2 Types of tacheometric survey, 4.3 Tacheometric equation for horizontal line of sight and inclined line of sight in fixed hair method, 4.4 Anallactic lens in external focusing telescopes, 4.5 Reducing the constants in internal focusing telescope, 4.6 Moving hair method and

tangential method, 4.7 Subtance bar, 4.8 Beaman stadia arc.

7 Hours

PART – B

UNIT 5:
CURVE SETTING (Simple curves)
5.1 Curves – Necessity – Types, 5.2 Simple curves, 5.3 Elements, 5.4 Designation of curves, 5.5 Setting out simple curves by linear methods, 5.6 Setting out curves by Rankines deflection angle method.

6 Hours

UNIT 6:
CURVE SETTING (Compound and Reverse curves)
6.1 Compound curves 6.2 Elements 6.3 Design of compound curves 6.4 Setting out of compound curves 6.5 Reverse curve between two parallel straights (Equal radius and unequal radius).

6 Hours

UNIT 7:
CURVE SETTING (Transition and Vertical curves)
7.1 Transition curves 7.2 Characteristics 7.3 Length of Transition curve 7.4 Setting out cubic Parabola and Bernoulli's Lemniscates, 7.5 Vertical curves – Types – Simple numerical problems.

6 Hours

UNIT 8:
AREAS AND VOLUMES
8.1 Calculation of area from cross staff surveying, 8.2 Calculation of area of a closed traverse by coordinates method. 8.3 Planimeter – principle of working and use of planimeter to measure areas, digital planimter, 8.4 Computations of volumes by trapezoidal and prismoidal rule, 8.5 Capacity contours

6 Hours

TEXT BOOKS:
1.'**Surveying'** Vol 2 and Vol 3 - B. C. Punmia, Laxmi Publications
2**.'Plane Surveying'** A. M. Chandra – New age international (P) Ltd
3**.'Higher Surveying'** A.M. Chandra New age international (P) Ltd

REFERENCE BOOKS:
1. **Fundamentals of Surveying** - Milton O. Schimidt – Wong, Thomson Learning.

DESIGN OF RCC STRUCTURAL ELEMENTS

Subject Code	**: 10CV52**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

GENERAL FEATURES OF REINFORCED CONCRETE: Introduction, Design Loads, Materials for Reinforced Concrete and Code requirements. Design Philosophy – Limit State Design principles. Philosophy of limit state design, Principles of limit states, Factor of Safety, Characteristic and design loads, Characteristic and design strength.

6 Hours

UNIT - 2

PRINCIPLES OF LIMIT STATE DESIGN AND ULTIMATE STRENGTH OF R.C. SECTION: General aspects of Ultimate strength, Stress block parameters for limit state of collapse, Ultimate flexural strength of singly reinforced rectangular sections, Ultimate flexural strength of doubly reinforced rectangular sections, Ultimate flexural strength of flanged sections, Ultimate shear strength of RC sections, Ultimate torsional strength of RC sections, Concepts of development length and anchorage, Analysis examples of singly reinforced, doubly reinforced, flanged sections, shear strength and development length.

7 Hours

UNIT - 3

FLEXURE AND SERVICEABILITY LIMIT STATES: General Specification for flexure design of beams-practical requirements, size of beam, cover to reinforcement-spacing of bars. General aspects of serviceability-Deflection limits in IS: 456 – 2000-Calculation of deflection (Theoretical method), Cracking in structural concrete members, Calculation of deflections and crack width.

6 Hours

UNIT - 4

DESIGN OF BEAMS: Design procedures for critical sections for moment and shears. Anchorages of bars, check for development length, Reinforcement requirements, Slenderness limits for beams to ensure lateral stability, Design examples for Simply supported and Cantilever beams for rectangular and flanged sections.

8 Hours

PART - B

UNIT - 5

DESIGN OF SLABS: General consideration of design of slabs, Rectangular slabs spanning one direction, Rectangular slabs spanning in two directions for various boundary conditions. Design of simply supported, cantilever and continuous slabs as per IS: 456 – 2000.

8 Hours

UNIT - 6

DESIGN OF COLUMNS: General aspects, effective length of column, loads on columns, slenderness ratio for columns, minimum eccentricity, design of short axially loaded columns, design of column subject to combined axial load and uniaxial moment and biaxial moment using SP – 16 charts.

5 Hours

UNIT - 7

DESIGN OF FOOTINGS: Introduction, load for footing, Design basis for limit state method, Design of isolated rectangular footing for axial load and uniaxial moment, design of pedestal.

6 Hours

UNIT - 8

DESIGN OF STAIR CASES: General features, types of stair case, loads on stair cases, effective span as per IS code provisions, distribution of loading on stairs, Design of stair cases. With waistslabs.

6 Hours

REFERENCE BOOKS:

1. **Limit State Design of Reinforced concrete-**by P.C. Varghese, PHI Learning Private Limited 2008-2009
2. **Fundamentals of Reinforced concrete Design-**by M.L.Gambhir, PHI Learning Private Limited 2008-2009.
3. **Reinforced concrete Design-**by Pallai and Menon, TMH Education Private Limited,
4. **Reinforced concrete Design-**by S.N.Shinha, TMH Education Private Limited,

5. **Reinforced concrete Design**-by Karve & Shaha, Structures Publishers Pune.
6. **Design of RCC Structural Elements** S. S. Bhavikatti, Vol-I, New Age International Publications, New Delhi.
7. **IS-456-2000 and SP-16**

GEOTECHNICAL ENGINEERING – I

Subject Code	**: 10CV54**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT- 1

INTRODUCTION: History of soil mechanics, Definition, origin and formation of soil. Phase Diagram, Voids ratio, Porosity, Percentage Air Voids, Air content, Degree of saturation, Water content, Specific Gravity of soil solids and soil mass, Densities and Unit weights - Bulk, Dry, Saturated & Submerged and their inter relationships.

6 Hours

UNIT - 2

INDEX PROPERTIES OF SOIL AND THEIR DETERMINATION: Index Properties of soil- Water content , Specific Gravity, Particle size distribution, Relative Density, Consistency limits and indices, in-situ density, Activity of Clay, Laboratory methods of determination of index properties of soil: Water content (Oven Drying method & Rapid Moisture method), Specific gravity of soil solids (Pycnometer and density bottle method), Particle size distribution (Sieve analysis and Hydrometer analysis only), Liquid Limit- (Casagrande and Cone penetration methods), Plastic limit and shrinkage limit.

7 Hours

UNIT - 3

CLASSIFICATION OF SOILS: Purpose of soil classification, Particle size classification – MIT classification and IS classification, Textural classification. IS classification - Plasticity chart and its importance, Field identification of soils.

CLAY MINERALOGY AND SOIL STUCTURE: Single grained, honey combed, flocculent and dispersed structures, Valence bonds, Soil-Water system, Electrical diffuse double layer, adsorbed water, base-exchange capacity, Isomorphous substitution. Common clay minerals in soil and their structures- Kaolinite, Illite and Montmorillonite.

8 Hours

UNIT - 4

FLOW OF WATER THROUGH SOILS: Darcy's law- assumption and validity, coefficient of permeability and its determination (laboratory and field), factors affecting permeability, permeability of stratified soils, Seepage

velocity, Superficial velocity and coefficient of percolation, quick sand phenomena, Capillary Phenomena**.**

6 Hours

PART - B

UNIT - 5

SHEAR STRENGTH OF SOIL: Concept of shear strength, Mohr-coulomb theory, conventional and modified failure envelops, Effective stress concept-total stress, effective stress and Neutral stress, Concept of pore pressure, Total and effective shear strength parameters, factors affecting shear strength of soils, Sensitivity and Thixotropy of clay.

7 Hours

UNIT - 6

COMPACTION OF SOIL: Definition, Principle of compaction, Standard and Modified proctor's compaction tests, factors affecting compaction, effect of compaction on soil properties, Field compaction control – compactive effort & method, lift thickness and number of passes, Proctor's needle, Compacting equipment.

6 Hours

UNIT - 7

CONSOLIDATION OF SOIL: Definition, Mass-spring analogy, Terzaghi's one dimensional consolidation theory-assumption and limitations (no derivation), Normally consolidated, under consolidated and over consolidated soils, pre-consolidation pressure and its determination by Casagrande's method. Consolidation characteristics of soil (C_c, a_v, m_v and C_v).

UNIT- 8

DETERMINATION OF SHEAR STRENGTH AND CONSOLIDATION OF SOIL: Measurement of shear parameters- Direct shear test, unconfined compression test, Triaxial compression test and vane shear test, Test under different drainage conditions.

Laboratory one dimensional consolidation test, Determination of consolidation characteristics of soils-compression index and coefficient of consolidation (square root of time fitting method, logarithmic time fitting method).

6 Hours

TEXT BOOKS:

1. **Soil Mechanics and Foundation Engg**.- Punmia B.C. (2005), 16th Edition Laxmi Publications Co. , New Delhi.
2. **Principles of Soil Mechanics and Foundation Engineering**-Murthy V.N.S. (1996), 4th Edition, UBS Publishers and Distributors, New Delhi.

3. **Geotechnical Engineering**; Braja, M. Das (2002), Fifth Edition, Thomson Business Information India (P) Ltd., India

REFERENCES BOOKS:

1. **Foundation Analysis and Design**- Bowles J.E. (1996), 5th Edition, McGraw Hill Pub. Co. New York.
2. **Soil Engineering in Theory and Practice**- Alam Singh and Chowdhary G.R. (1994), CBS Publishers and Distributors Ltd., New Delhi.
3. **Basic and Applied Soil Mechanics**- Gopal Ranjan and Rao A.S.R. (2000), New Age International (P) Ltd., Newe Delhi.
4. **Geotechnical Engineering**- Donold P Coduto Phi Learning Private Limited, New Delhi
5. **Geotechnical Engineering**- Shashi K. Gulathi & Manoj Datta. (2009), " Tata Mc Graw Hill.
6. **Text Book of Geotechnical Engineering**- Iqbal H. Khan (2005),, 2nd Edition, PHI, India.
7. **Numerical Problems, Examples and objective questions in Geotechnical Engineering**- Narasimha Rao A. V. & Venkatrahmaiah C. (2000), Universities Press., Hyderabad.

Hydrology and Irrigation Engineering

Sub Code	**:**	**10CV55**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART-A
HYDROLOGY

UNIT 1: INTRODUCTION & PRECIPITATION

Introduction ,Hydrologic cycle (Horton's representation). Water budget equation

Precipitation: introduction, forms of precipitation, types of precipitation, measurement of precipitation (Simon's gauge & Syphon gauge only), selection of rain gauge station. Adequacy of raingauges, methods of computing average rainfall, interpolation of missing data, adjustment of missing data by double mass curve method. Hyetograph and mass curve of rainfall, 07 hrs

UNIT 2 : LOSSES FROM PRECIPITATION

Evaporation: Definition, factors affecting, measurement (Class A pan). Estimation using empirical methods (Meyer's and Rohwer's equation), evaporation control.
Evapo-transpiration: Definition, factors affecting, measurement, estimation (Blaney criddle method)
Infiltration: Definition, factors affecting, measurement (double ring infiltrometer), infiltration indices, Horton's equation of infiltration. 07 hrs

UNIT 3: HYDROGRAPHS
Definition, components of hydrographs, unit hydrograph and its derivation from simple storm hydrograph, base flow separation, Prepositions of unit hydrograph- problems
06 hrs

UNIT 4: ESTIMATION OF FLOOD & FLOOD ROUTING
Definition of flood, factors affecting flood, methods of estimation (envelope curves, empirical formulae, rational method).
Flood routing: Introduction to hydrological routing, relationship of out flow and storage, general storage equation, Muskingum routing method. 07 hrs

PART-B
IRRIGATION ENGINEERING

UNIT 5 : INTRODUCTION
Introduction, need for irrigation, advantages and disadvantages of irrigation, environmental impacts of irrigation, Systems of irrigation: Gravity irrigation, lift irrigation, well irrigation, tube well irrigation, infiltration galleries, sewage irrigation, supplemental irrigation.
06 hrs

UNIT 6: SOIL-WATER-CROP RELATIONSHIP

Introduction, soil profile, physical properties of soil, soil classification. Indian soils, functions of irrigation soils, maintaining soil fertility, soil-water-plant relationship, soil-moisture. Irrigation relationship, frequency of irrigation.
06 hrs

UNIT 7: WATER REQUIREMENT OF CROPS
Introduction, definitions, crop seasons of India, water requirement of a crop, duty, delta, base period. Consumptive use. Irrigation efficiencies. Assessment of irrigation water.

07 hrs

Unit 8: Canals
Definition, Types of canals, Alignment of canals, Design of canals by Kenedy's and Lacey's methods- Problems
06 hrs

TEXT BOOKS:

1. Engineering Hydrology – Subramanya.K; Tata Mcgraw Hill NewDelhi-2008 (Ed)

2. Hydrology- Madan Mohan Das, Mim Mohan Das-PHI Learning private Ltd. New Delhi-2009 (Ed)

3. A Text Book Of Hydrology- Jayarami Reddy, Laksmi Publications, New Delhi-2007 (Ed)

4. Irrigation, water Resources and water power Engineering- P.N.Modi- standard book house, New Delhi.

5. Irrigation and Water Power Engineering-Madan Mohan Das & Mimi Das Saikia; PHILearning pvy. Ltd. New Delhi 2009 (Ed).

REFERENCE BOOKS:

1. Hydrology & Soil Conservation Engineering- Ghanshyam Das- PHI Learning Private Ltd., New Delhi- 2009 (Ed)

2. Hydrology & Water Resources Engineering- Patra K.C. Narosa Book Distributors Pvt. Ltd. New Delhi-2008 (Ed)

3. Hydrology & Water Resources Engineering- R.K.Sharma & Sharma, Oxford and Ibh, New Delhi

4. Irrigation Engineering and Hydraulic structures- S. K. garg- Khanna Publication, New Delhi.

TRANSPORTATION ENGINEERING I

Subject Code	:10CV56
I A Marks	:25
No. of lecture Hours/week	:04
Exam Hours	:03
Total No. of Lecture Hours	:52
Exam Marks	:100

PART – A

UNIT – 1

PRINCIPLES OF TRANSPORTATION ENGINEERING: Importance of transportation, Different modes of transportation and comparison, Characteristics of road transport Jayakar committee recommendations, and implementation – Central Road Fund, Indian Roads Congress, Central Road Research Institute

04 Hrs

UNIT – 2

HIGHWAY DEVELOPMENT AND PLANNING: Road types and classification, road patterns, planning surveys, master plan – saturation system of road planning, phasing road development in India, problems on best alignment among alternate proposals Salient Features of 3rd and 4th twenty year

road development plans and Policies, Present scenario of road development in India (NHDP & PMGSY) and in Karnataka (KSHIP & KRDCL) Road development plan - vision 2021.
06 Hrs

UNIT – 3

HIGHWAY ALIGNMENT AND SURVEYS: Ideal Alignment, Factors affecting the alignment, Engineering surveys-Map study, Reconnaissance, Preliminary and Final location & detailed survey, Reports and drawings for new and re-aligned projects **04 Hrs**

HIGHWAY GEOMETRIC DESIGN – I: Importance, Terrain classification, Design speed, Factors affecting geometric design, **Cross sectional elements**-Camber- width of pavement-Shoulders-, Width of formation- Right of way, Typical cross sections **05 Hrs**

UNIT – 4

HIGHWAY GEOMETRIC DESIGN – II: Sight Distance-Restrictions to sight distance- Stopping sight distance-Overtaking sight distance- overtaking zones- Examples on SSD and OSD- Sight distance at intersections, **Horizontal alignment**-Radius of Curve- Superelevation – Extra widening-Transition curve and its length, setback distance – Examples, **Vertical alignment**-Gradient-summit and valley curves with examples. **07 Hrs**

PART - B

UNIT – 5

PAVEMENT MATERIALS: Subgrade soil - desirable properties-HRB soil classification-determination of CBR and modulus of subgrade reaction-Examples on CBR and Modulus of subgrade reaction, **Aggregates-** Desirable properties and list of tests, **Bituminous materials**-Explanation on Tar, bitumen,cutback and emulsion-List of tests on bituminous materials **06 Hrs**

UNIT – 6

PAVEMENT DESIGN: Pavement types, component parts of flexible and rigid pavements and their functions,design factors, ESWL and its determination-Examples, **Flexible pavement**-Design of flexible pavements as per IRC;37-2001-Examples, **Rigid pavement**- Westergaard's equations for load and temperature stresses- Examples- Design of slab thickness only as per IRC:58-2002

06 Hrs

UNIT – 7

PAVEMENT CONSTRUCTION: Earthwork –cutting-Filling, Preparation of subgrade, Specification and construction of i) Granular Subbase, ii) WBM Base, iii) WMM base, iv) Bituminous Macadam, v) Dense Bituminous Macadam vi) Bituminous Concrete, vii) Dry Lean Concrete sub base and PQC viii) concrete roads **05 Hrs**

HIGHWAY DRAINAGE: Significance and requirements, Surface drainage system and design-Examples, sub surface drainage system, design of filter materials

03 Hrs

UNIT – 8

HIGHWAY ECONOMICS: Highway user benefits, VOC using charts only-Examples, Economic analysis - annual cost method-Benefit Cost Ratio method-NPV-IRR methods-Examples, Highway financing-BOT-BOOT concepts

06 Hrs

TEXT BOOKS:

1. **Highway Engineering –** S K Khanna and C E G Justo, Nem Chand Bros, Roorkee

2. **Highway Engineering** - L R Kadiyali, Khanna Publishers, New Delhi
3. **Transportation Engineering** – K P Subramanium, Scitech Publications, Chennai
4. **Transportation Engineering – James** H Banks, Mc. Graw. Hill Pub. New Delhi
5. **Highway Engineeering** –R. Sreenivasa Kumar, University Press. Pvt.Ltd. Hyderabad

REFERENCE BOOKS:

1. **Relevant IRC Codes**
2. **Specifications for Roads and Bridges-MoRT&H, IRC, New Delhi.**
3. **Transportation Engineering** – C. Jotin Khisty, B. Kent lal, PHI Learning Pvt. Ltd. New Delhi.

VI SEMESTER

ENVIRONMENTAL ENGINEERING-I

Subject Code	: 10CV61	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

Part - A

Unit - 1

INTRODUCTION: Human activities and environmental pollution. Water for various beneficial uses and quality requirement. Need for protected water supply.

2 Hours

DEMAND OF WATER: Types of water demands- domestic demand in detail, institutional and commercial, public uses, fire demand. Per capita consumption –factors affecting per capita demand, population forecasting, different methods with merits &demerits- variations in demand of water. Fire demand – estimation by Kuichling's formula, Freeman formula & national board of fire underwriters formula, peak factors, design periods & factors governing the design periods

6 Hours

Unit - 2

SOURCES: Surface and subsurface sources – suitability with regard to quality and quantity.

3 Hours

COLLECTION AND CONVEYANCE OF WATER: Intake structures – different types of intakes; factor of selection and location of intakes. Pumps- Necessity, types – power of pumps; factors for the selection of a pump. Pipes – Design of the economical diameter for the rising main; Nomograms – use; Pipe appurtenances.

6 Hours

Unit - 3

QUALITY OF WATER: Objectives of water quality management. wholesomeness & palatability, water borne diseases. Water quality parameters – Physical, chemical and Microbiological. Sampling of water for examination. Water quality analysis (IS: 3025 and IS: 1622) using analytical and instrumental techniques. Drinking water

standards BIS & WHO guidelines. Health significance of Fluoride, Nitrates and heavy metals like Mercury, Cadmium, Arsenic etc. and toxic / trace organics.

6 Hours

Unit - 4

WATER TREATMENT: Objectives – Treatment flow-chart. Aeration-Principles, types of Aerators.

2 Hours

SEDIMENTATION: Theory, settling tanks, types, design. Coagulant aided sedimentation, jar test, chemical feeding, flash mixing, and clari-flocculator.

4 Hours

Part - B

Unit - 5

FILTRATION: Mechanism – theory of filtration, types of filters, slow sand, rapid sand and pressure filters including construction, operation, cleaning and their design – excluding under drainage system – back washing of filters. Operational problems in filters.

6 Hours

Unit - 6

DISINFECTION: Theory of disinfection, types of disinfection, Chlorination, chlorine demand, residual chlorine, use of bleaching powder. UV irradiation treatment – treatment of swimming pool water

4 Hours

SOFTENING – definition, methods of removal of hardness by lime soda process and zeolite process RO & Membrane technique.

3 Hours

Unit - 7

MISCELLANEOUS TREATMENT: Removal of color, odor, taste, use of copper sulfate, adsorption technique, fluoridation and defluoridation.

4 Hours

DISTRIBUTION SYSTEMS: System of supply, service reservoirs and their capacity determination, methods of layout of distribution systems.

4
Hours

Unit - 8
MISCELLANEOUS: Pipe appurtenances, various valves, type of fire hydrants, pipefitting, Layout of water supply pipes in buildings.
2
Hours

TEXT BOOKS:
1. Water supply Engineering –S.K.Garg, Khanna Publishers
2. Environmental Engineering I –B C Punima and Ashok Jain
3. Manual on Water supply and treatment –CPHEEO, Minstry of Urban Development, New Delhi

REFERENCES

1. Hammer, M.J., (1986), **Water and Wastewater Technology** –SI Version, 2nd
Edition, John Wiley and Sons.

2. Karia, G.L., and Christian, R.A., (2006), **Wastewater Treatment – Concepts and Design Approach,** Prentice Hall of India Pvt. Ltd., New Delhi.

3. Metcalf and Eddy, (2003), **Wastewater Engineering, Treatment and Reuse ,** 4th Edition, Tata McGraw Hill Edition, Tata McGraw Hill Publishing Co. Ltd.

4. Peavy, H.S., Rowe, D.R., and Tchobanoglous, G., (1986),**Environmental Engineering**–Mc Graw Hill Book Co.

5. Raju, B.S.N., (1995), **Water Supply and Wastewater Engineering, T**ata McGraw Hill Pvt. Ltd., New Delhi.

6. Sincero, A.P., and Sincero, G.A., (1999), **Environmental Engineering – A Design Approach**–Prentice Hall of India Pvt. Ltd., New Delhi.

GEOTECHNICAL ENGINEERING – II

Subject Code	**: 10CV64**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

SUBSURFACE EXPLORATION: Importance of exploration program, Methods of exploration: Boring, Seismic refraction method of grophysical exploration, Types of samples - undisturbed, disturbed and representative samples, Samplers, sample disturbance, area ratio, Recovery ratio, clearance, Stabilisation of boreholes - Typical bore log. Number and depth of borings for various civil engineering structures, soil exploration report.

DRAINAGE AND DEWATERING: Determination of ground water level by Hvorselev's method, Control of ground water during excavation: Dewatering - Ditches and sumps, well point system, Vacuum method, Electro- Osmosis method.

8 Hours

UNIT - 2

STRESSES IN SOILS: Boussinesq's and Westergaard's theories for concentrated, circular and rectangular loads. Comparison of Boussinesq's and westergaard's analysis. Pressure distribution diagrams, Contact pressure, Newmark's chart.

6 Hours

UNIT - 3

FLOWNETS: Laplace equation (no derivation) assumptions and limitations only, characteristics and uses of flownets, Methods of drawing flownets for Dams and sheet piles. Estimating quantity of seepage and Exit gradient. Determination of phreatic line in earth dams with and without filter. Piping and protective filter.

5 Hours

UNIT - 4

LATERAL EARTH PRESSURE: Active and Passive earth pressures, Earth pressure at rest. Rankine's and Coulomb's Earth pressure theories-–assumptions and limitations, Graphical solutions for active earth pressure (cohesionless soil only) – Culmann's and Rebhann's methods, Lateral earth pressure in cohesive and cohesionless soils, Earth pressure distribution.

7 Hours

PART - B

UNIT - 5

STABILITY OF EARTH SLOPES: Types of slopes, causes and type of failure of slopes. Definition of factor of safety, Stability of infinite slopes, Stability of finite slopes by Method of slices and Friction Circle method, Taylor's stability number, Fellineous method,.

7 Hours

UNIT - 6

BEARING CAPACITY: Definitions of ultimate, net and safe bearing capacities, Allowable bearing pressure. Terzaghi's and Brinch Hansen's bearing capacity equations - assumptions and limitations, Bearing capacity of footing subjected to eccentric loading. Effect of ground water table on bearing capacity. Field methods of evaluation of bearing capacity - Plate load test, Standard penetration test and cone penetration test.

8 Hours

UNIT - 7

FOUNDATION SETTLEMENT: Importance and Concept of Settlement Analysis, Immediate, Consolidation and Secondary settlements (no derivations, but, computation using relevant formula for Normally Consolidated soils), Tolerance. BIS specifications for total and differential settlements of footings and rafts.

5 Hours

UNIT – 8

PROPORTIONING SHALLOW AND PILE FOUNDATIONS

Allowable Bearing Pressure, Factors influencing the selection of depth of foundation, Factors influencing Allowable Bearing Pressure, Factors influencing the choice of foundation, Proportioning isolated, combined, strip and mat foundations, Classification of pile foundation, Pile load capacity, Proportioning pile foundation.

6 Hours

TEXT BOOKS:

1. **Soil Engineering in Theory and Practice**- Alam Singh and Chowdhary G.R. (1994), CBS Publishers and Distributors Ltd., New Delhi.
2. **Soil Mechanics and Foundation Engg.**- Punmia B.C. (2005), 16th Edition Laxmi Publications Co. , New Delhi.

REFERENCES BOOKS:

1. **Foundation Analysis and Design**- Bowles J.E. (1996), 5th Edition, McGraw Hill Pub. Co. New York.

2. **Soil Mechanics and Foundation Engineering**- Murthy V.N.S. (1996), 4th Edition, UBS Publishers and Distributors, New Delhi.
3. **Basic and Applied Soil Mechanics**- Gopal Ranjan and Rao A.S.R. (2000), New Age International (P) Ltd., Newe Delhi.
4. **Geotechnical Engineering**- Venkatrahmaiah C. (2006), 3rd Edition New Age International (P) Ltd., Newe Delhi.
5. **Soil Mechanics**- Craig R.F. (1987), Van Nostrand Reinhold Co. Ltd.
6. **Principles of Geotechnical Engineering**- Braja M. Das (2002), 5th Edition, Thomson Business Information India (P) Ltd., India.
7. **Text Book of Geotechnical Engineering**- Iqbal H. Khan (2005), 2nd Edition, PHI, India.

ALTERNATIVE BUILDING MATERIALS AND TECHNOLOGIES

Subject Code	**: 10CV662**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1
INTRODUCTION:

1. Energy in building materials
2. Environmental issues concerned to building materials
3. Global warming and construction industry
4. Environmental friendly and cost effective building technologies.
5. Requirements for building of different climatic regions.
6. Traditional building methods and vernacular architecture.

6 Hours

UNIT - 2
ALTERNATIVE BUILDING MATERIALS:

1. Characteristics of building blocks for walls
2. Stones and Laterite blocks
3. Bricks and hollow clay blocks
4. Concrete blocks
5. Stabilized blocks: Mud Blocks, Steam Cured Blocks, Fal-G Blocks and Stone Masonry Block

6 Hours

UNIT - 3
LIME-POZZOLANA CEMENTS

1. Raw materials
2. Manufacturing process
3. Properties and uses
4. Fibre reinforced concretes
5. Matrix materials
6. Fibers : metal and synthetic
7. Properties and applications
8. Fibre reinforced plastics
9. Matrix materials
10. Fibers : organic and synthetic
11. Properties and applications
12. Building materials from agro and industrial wastes
13. Types of agro wastes

14. Types of industrial and mine wastes
15. Properties and applications
16. Field quality control test methods

6 Hours

UNIT - 4
ALTERNATIVE BUILDING TECHNOLOGIES

1. Alternative for wall construction
2. Types
3. Construction method
4. Masonry mortars
5. Types
6. Preparation
7. Properties
8. Ferrocement and ferroconcrete building components
9. Materials and specifications
10. Properties
11. Construction methods
12. Applications
13. Alternative roofing systems
14. Concepts
15. Filler slabs
16. Composite beam panel roofs
17. Masonry vaults and domes

8 ours

PART - B

UNIT - 5
STRUCTURAL MASONRY

1. Compressive strength of masonry elements
2. Factors affecting compressive strength
3. Strength of units, prisms / wallettes and walls
4. Effect of brick work bond on strength
5. Bond strength of masonry : Flexure and shear
6. Elastic properties of masonry materials and masonry

6 Hours

UNIT - 6

1. IS Code provisions
2. Design of masonry compression elements
3. Concepts in lateral load resistance

8 Hours

UNIT - 7
COST EFFECTIVE BUILDING DESIGN
1. Cost concepts in buildings
2. Cost saving techniques in planning, design and construction
3. Cost Analysis : Case studies using alternatives.

6 Hours

UNIT - 8
EQUIPMENT FOR PRODUCTION OF ALTERNATIVE MATERIALS
1. Machines for manufacture of concrete
2. Equipments for production of stabilized blocks
3. Moulds and methods of production of precast elements.

6 Hours

TEXT BOOKS:
1. **Alternative building methodologies for engineers and architects, lecture notes edited**: K.S. Jagadish and B.V. Venkatarama Reddy, Indian Institute of cience, Bangalore.
2. **Structural Masonry** by Arnold W. Hendry.

REFERENCE BOOKS:
1. **Relevant IS Codes.**
2. **Alternative building materials and technologies.**
3. **Proceedings of workshop on Alternative building material and technology,** 19th to 20th December 2003 @ BVB College of Engineering. & Tech., Hubli.

GROUND WATER HYDROLOGY

Subject Code	**: 10CV665**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1
INTRODUCTION: Importance. Vertical distribution of sub-surface water. Occurrence in different types of rocks and soils. Definition of aquifer, Aquifuge, Aquitard and Aquiclude. Confined and unconfined aquifers.

6 Hours

UNIT - 2
AQUIFER PROPERTIES: Aquifer parameters – Specific yield, Specific retention, Porosity, Storage coefficient, derivation of the expression. Determination of specific yield. Land subsidence due to ground water withdrawals.

6 Hours

UNIT - 3
DARCY'S LAW AND HYDRAULIC CONDUCTIVITY: Introduction. Darcy's law. Hydraulic conductivity. Coefficient of permeability and Intrinsic permeability, Transmissibility, Permeability in Isotropic, Unisotropic layered soils. Steady one dimensional flow, different cases with recharge.

7 Hours

UNIT - 4
WELL HYDRAULICS – STEADY FLOW: Introduction. Steady radial flow in confined and unconfined aquifers. Pumping tests.

7 Hours

PART - B

UNIT - 5
WELL HYDRAULICS – UNSTEADY FLOW: Introduction. General equation derivation; Theis method, Cooper and JaCob method, Chow's method. Solution of unsteady flow equations.

7 Hours

UNIT - 6

GROUND WATER DEVELOPMENT: Types of wells. Methods of constructions. Tube well design. Dug wells. Pumps for lifting water: Working principles, Power requirements.

7 Hours

UNIT - 7

GROUND WATER EXPLORATION: Seismic method, Electrical resistivity method, Bore hole geo-physical techniques; Electrical logging, Radio active logging, Induction logging, Sonic logging and Fluid logging.

6 Hours

UNIT - 8

GROUND WATER RECHARGE AND RUNOFF: Recharge by vertical leakage. Artificial recharge. Ground water runoff. Ground water budget.

6 Hours

TEXT BOOKS:

1. **Ground Water**- H.M. Raghunath, - Wiley Eastern Limited, New Delhi.
2. **Ground Water Hydrology**- K. Todd, - Wiley and Sons, New Delhi.
3. **Numerical Ground Water Hydrology**- A.K. Rastogi, - Penram, International Publishing (India), Pvt. Ltd., Mumbai.

REFERENCE BOOKS:

1. **Ground Water Hydrology**- Bower H.- McGraw Hill, New Delhi.
2. **Ground Water and Tube Wells**- Garg Satya Prakash, - Oxford and IBH, New Delhi.
3. **Ground Water Resource Evaluation**- W.C. Walton, - McGraw Hill - Kogakusha Ltd., New Delhi.
4. **Water wells and Pumps** – Michel D.M., Khepar. S.D., Sondhi. S.K., McGraw Hill Education – 2nd Edition.

TRAFFIC ENGINEERING

Subject Code	**: 10CV667**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1
INTRODUCTION: Definition, objectives of Traffic Engineering and scope of Traffic Engineering.

2

Hours

UNIT - 2
TRAFFIC CHARACTERISTICS: Road user characteristics, vehicular characteristics – static and dynamic characteristics, power

performance of vehicles, Resistance to the motion of vehicles – Reaction time of driver – Problems on above.

6 Hours

UNIT - 3

TRAFFIC STUDIES: Various types of traffic engineering studies, data collection, analysis objectives and method of study – Definition of study area – Sample size and analysis.

6 Hours

UNIT - 4

INTERPRETATION OF TRAFFIC STUDIES: Classified traffic Volume at mid block and intersections, PCU, origin and destination, spot speed, speed and delay, parking – on street parking, off street parking, Accident – causes, analysis measures to reduce accident – problems on above.

6 Hours

PART - B

UNIT - 5

TRAFFIC FLOW THEORIES: Traffic flow theory, Green shield theory – Goodness of fit, - correlation and regression analysis (linear only) – Queuing theory, Car following theory and relevant problems on above.

8 Hours

UNIT - 6

STATISTICAL ANALYSIS: Poisson's distribution and application to traffic engineering. Normal Distribution – Significance tests for observed traffic data, Chi Square test – problems on above. Traffic forecast – simulation technique.

12 Hours

UNIT - 7

TRAFFIC REGULATION AND CONTROL: Driver, vehicle and road controls – Traffic regulations – one way – Traffic markings, Traffic signs, Traffic signals – Vehicle actuated and synchronized signals – Signals co-ordination. Webster's method of signal design, IRC method, traffic rotary elements and designs, traffic operation – Street lighting, Road side furniture, Relevant problems on above.

10 Hours

UNIT - 8

INTELLIGENT TRANSPORT SYSTEM: Definition, Necessities, Application in the present traffic scenario

2 Hours

TEXT BOOKS:

1. **Traffic Engineering & Transport Planning** – L.R. Kadiyali-Khanna Publishers.
2. **Highway Engineering Nemchand & Bros**- Khanna & Justo-Roorkee (UA).
3. **Traffic Engg.** - Matson & Smith:-Mc.Graw Hill and Co.
4. **Traffic flow theory** – Drew- Mc. Graw Hill and Co.

REFERENCE BOOKS:

1. **Traffic Engineering.** Pignataro- Prentice Hall.
2. **Highway Capacity Manual** – 2000.
3. **An introduction to traffic engineering**- Jotin Khistey and Kentlal- PHI.
4. **Traffic Engineering**- Mc Shane & Roess- PHI.

ESTIMATION & VALUATION

Subject Code	**: 10CV73**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

ESTIMATION: Study of various drawings with estimates, important terms, units of measurement, abstract Methods of taking out quantities and cost – center line method, long and short wall method or crossing method. Preparation of detailed and abstract estimates for the following Civil Engineering works – Buildings – RCC framed structures with flat, sloped RCC roofs with all Building components.

16 Hours

PART - B

ESTIMATE: Different type of estimates, approximate methods of estimating buildings, cost of materials. Estimation of wooden joineries such as doors, windows & ventilators.

5 Hours

ESTIMATES: Steel truss (Fink and Howe truss), manhole and septic tanks, RCC Culverts.

6 Hours

SPECIFICATIONS: Definition of specifications, objective of writing specifications, essentials in specifications, general and detail specifications of common item of works in buildings.

5 Hours

PART - C

RATE ANALYSIS: Definition and purpose. Working out quantities and rates for the following standard items of works – earth work in different types of soils, cement concrete of different mixes, bricks and stone masonry, flooring, plastering, RCC works, centering and form work for different RCC items, wood and steel works for doors, windows and ventilators.

6 Hours

MEASUREMENT OF EARTHWORK FOR ROADS: Methods for computation of earthwork – cross sections – mid section formula or average end area or mean sectional area, trapezoidal & prismoidal formula with and without cross slopes.

6 Hours

CONTRACTS: Types of contract – essentials of contract agreement – legal aspects, penal provisions on breach of contract. Definition of the terms – Tender, earnest money deposit, security deposit, tender forms, documents and types. Acceptance of contract documents. Termination of contract, completion certificate, quality control, right of contractor, refund of deposit. Administrative approval – Technical sanction. Nominal muster roll, measurement books – procedure for recording and checking measurements – preparation of bills.
Valuation- Definitions of various terms, method of valuation, Freehold & Leasehold properties, Sinking fund, depreciation and method of estimating depreciation, Outgoings.

8 Hours

REFERENCE BOOKS:

1. **Estimating & Costing**, B. N. Dutta, Chand Publisher
2. **Quantity Surveying**- P.L. Basin S. Chand : New Delhi.
3. **Estimating & Specification** - S.C. Rangwala :: Charotar publishing house, Anand.
4. **Text book of Estimating & Costing**- G.S. Birde, Dhanpath Rai and sons : New Delhi.
5. **A text book on Estimating, Costing and Accounts**- D.D. Kohli and R.C. Kohli S. Chand : New Delhi.
6. **Contracts and Estimates,** B. S. Patil, University Press, 2006.

DESIGN OF PRE-STRESSED CONCRETE STRUCTURES

Subject Code	**: 10CV74**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1
MATERIALS: High strength concrete and steel, Stress-Strain characteristics and properties.

2 Hours

BASIC PRINCIPLES OF PRESTRESSING: Fundamentals, Load balancing concept, Stress concept, centre of Thrust. Pre-tensioning and post-tensioning systems, tensioning methods and end anchorages.

4 Hours

UNIT - 2

ANALYSIS OF SECTIONS FOR FLEXURE: Stresses in concrete due to pre-stress and loads, stresses in steel due to loads, Cable profiles.

8 Hours

UNIT - 3

LOSSES OF PRE-STRESS: Various losses encountered in pre-tensioning and post tensioning methods, determination of jacking force.

6 Hours

UNIT - 4

DEFLECTIONS: Deflection of a pre-stressed member – Short term and long term deflections, Elastic deflections under transfer loads and due to different cable profiles. Deflection limits as per IS 1343. Effect of creep on deflection, load verses deflection curve, methods of reducing deflection

6 Hours

PART - B

UNIT - 5

LIMIT STATE OF COLLAPSE: Flexure -IS Code recommendations – Ultimate flexural strength of sections.

5 Hours

UNIT - 6

LIMIT STATE OF COLLAPSE (cont…): Shear - IS Code recommendations, shear resistance of sections, shear reinforcement. Limit state of serviceability – control of deflections and cracking.

7 Hours

UNIT - 7

DESIGN OF END BLOCKS: Transmission of prestress in pretensioned members, transmission length, Anchorage stress in post-tensioned members. Bearing stress and bursting tensile force-stresses in end blocks-Methods, I.S. Code, provision for the design of end block reinforcement.

6 Hours

UNIT - 8

DESIGN OF BEAMS: Design of pre-tensioned and post-tensioned symmetrical and asymmetrical sections. Permissible stress, design of prestressing force and eccentricity, limiting zone of pre-stressing force cable profile.

8 Hours

REFERENCE BOOKS:

1. **Pre-stressed Concrete**- N. Krishna Raju - Tata Mc. Graw Publishers.
2. **Pre-stressed Concrete**- P. Dayarathnam : Oxford and IBH Publishing Co.

3. **Design of pre-stressed concrete structures**- T.Y. Lin and Ned H. Burns - John Wiley & Sons, New York.
4. **Fundamental of pre-stressed concrete**- N.C. Sinha & S.K. Roy
5. IS : 1343 : 1980
6. **Pre-stressed Concrete**- N. Rajgopalan

PAVEMENT MATERIALS AND CONSTRUCTION

Subject Code	**: 10CV763**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A
PAVEMENT MATERIALS

UNIT - 1

AGGREGATES: Origin, classification, requirements, properties and tests on road aggregates, concepts of size and gradation – design gradation, maximum aggregate size, aggregate blending by different methods to meet specification.

6 Hours

UNIT - 2

BITUMEN AND TAR: Origin, preparation, properties and chemical constitution of bituminous road binders; requirements.

4 Hours

UNIT - 3

BITUMINOUS EMULSIONS AND CUTBACKS: Preparation, characteristics, uses and tests. Adhesion of Bituminous Binders to Road Aggregates: Adhesion failure, mechanism of stripping, tests and methods of improving adhesion.

8 Hours

UNIT - 4

BITUMINOUS MIXES: Mechanical properties, dense and open textured mixes, flexibility and brittleness, (no Hveem Stabilometer & Hubbar – Field Tests) bituminous mix, design methods using Rothfuch's Method only and

specification, Marshal mixed design criteria- voids in mineral aggregates, voids in total mix, density, flow, stability, percentage voids filled with bitumen.

6 Hours

PART - B

PAVEMENT CONSTRUCTION

UNIT - 5

EQUIPMENT IN HIGHWAY CONSTRUCTION: Various types of equipment for excavation, grading and compaction – their working principle, advantages and limitations. Special equipment for bituminous and cement concrete pavement and stabilized soil road construction.

6 Hours

UNIT - 6

SUBGRADE: Earthwork grading and construction of embankments and cuts for roads. Preparation of subgrade, quality control tests.

6 Hours

UNIT - 7

FLEXIBLE PAVEMENTS: Specifications of materials, construction method and field control checks for various types of flexible pavement layers.

8 Hours

UNIT - 8

CEMENT CONCRETE PAVEMENTS: Specifications and method of cement concrete pavement construction (PQC Importance of providing DLC as sub-base and polythene thin layer between PQC and sub-base); Quality control tests; Construction of various types of joints.

8 Hours

TEXT BOOKS:

1. **Highway Engineering**- Khanna, S.K., and Justo, C.E.G., : Nem Chand and Bros. Roorkee
2. **Construction Equipment and its Management**- Sharma, S.C. : Khanna Publishers.
3. **Hot Mix Asphalt Materials, Mixture Design and Construction**- Freddy L. Roberts, Kandhal, P.S. : University of Texas Austin, Texas. NAPA Education Foundation Lanham, Maryland.

REFERENCES BOOKS:

1. RRL, DSIR, '**Bituminous Materials in Road Construction**', HMSO Publication.
2. RRL, DSIR, '**Soil Mechanics for Road Engineers**', HMSO Publication.
3. Relevant IRC codes and MoRT & H specifications.

CONCRETE AND HIGHWAY MATERIALS LABORATORY

Subject Code	: **10CVL78**	IA Marks	: 25
No. of Practical Hours/Week	: 03	Exam Hours	: 03
Total No. of Practical Hours	: 42	Exam Marks	: 50

PART - A

CEMENT: Normal Consistency, Setting time, Soundness by Autoclave method, Compression strength test and Air permeability test for fineness, Specific gravity of cement.

FRESH CONCRETE: Workability – slump, Compaction factor and Vee Bee tests.

HARDENED CONCRETE: Compression strength and Split tensile tests. Test on flexural strength of RCC beams, Permeability of concrete.

PART - B

SOIL: Density of Soil by Sand replacement method, CBR Text.

AGGREGATES: Crushing, abrasion, impact and Shape tests (Flaky, Elongation, Angularity number) Specific gravity and water absorption.

BITUMINOUS MATERIALS AND MIXES: Specific Gravity, Penetration,Ductility, Softening point, Flash and fire point, Viscosity, proportioning of aggregate mixes by Rothfutch Method, Marshall Stability tests.

REFERENCE BOOK:

1. Relevant IS Codes and IRC Codes.

2. **Highway Material Testing Laboratory Manual** by Khanna S K and Justo, – CEG Nemi Chand & Bros.
3. M. L. Gambhir : Concrete Manual : Dhanpat Rai & sons New – Delhi.

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VIII -SEMESTER

ADVANCED CONCRETE TECHNOLOGY

Subject Code	**: 10CV81**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

Importance of Bogue's compounds, Structure of a Hydrated Cement Paste, Volume of hydrated product, porosity of paste and concrete, transition Zone, Elastic Modulus, factors affecting strength and elasticity of concrete, Rheology of concrete in terms of Bingham's parameter.

7 Hour

UNIT - 2

CHEMICAL ADMIXTURES- Mechanism of chemical admixture, Plasticizers and super Plasticizers and their effect on concrete property in fresh and hardened state, Marsh cone test for optimum dosage of super plasticizer, retarder, accelerator, Air-entraining admixtures, new generation superplasticiser.

MINERAL ADMIXTURE-Fly ash, Silica fume, GCBS, and their effect on concrete property in fresh state and hardened state.

6 Hours

UNIT - 3

MIX DESIGN - Factors affecting mix design, design of concrete mix by BIS method using IS10262 and current American (ACI)/ British (BS) methods. Provisions in revised IS10262-2004.

6 Hours

UNIT - 4

DURABILITY OF CONCRETE - Introduction, Permeability of concrete, chemical attack, acid attack, efflorescence, Corrosion in concrete. Thermal conductivity, thermal diffusivity, specific heat. Alkali Aggregate Reaction, IS456-2000 requirement for durability.

7 Hours

PART - B

UNIT - 5

RMC concrete - manufacture, transporting, placing, precautions, Methods of concreting- Pumping, under water concreting, shotcrete, High volume fly ash concrete concept, properties, typical mix

Self compacting concrete concept, materials, tests, properties, application and Typical mix.

6 Hours

UNIT - 6

Fiber reinforced concrete - Fibers types and properties, Behavior of FRC in compression, tension including pre-cracking stage and post-cracking stages, behavior in flexure and shear, Ferro cement - materials, techniques of manufacture, properties and application

7 Hours

UNIT - 7

Light weight concrete-materials properties and types. Typical light weight concrete mix High density concrete and high performance concrete-materials, properties and applications, typical mix.

6 Hours

UNIT - 8

Test on Hardened concrete-Effect of end condition of specimen, capping, H/D ratio, rate of loading, moisture condition. Compression, tension and flexure tests. Tests on composition of hardened concrete-cement content, original w/c ratio. NDT tests concepts-Rebound hammer, pulse velocity methods.

7 Hours

TEXT / REFERENCE BOOKS:

1. **Properties of Concrete**- Neville, A.M. - ELBS Edition, Longman Ltd., London
2. **Concrete Technology-** M.S. Shetty
3. **Concrete Technology**- A.R. Santhakumar,-Oxford University Press.
4. **Concrete**- P.K. Mehta, P J M Monteiro,- Prentice Hall, New Jersey (Special Student Edition by Indian Concrete Institute Chennai)
5. ACI Code for Mix Design
6. IS 10262-2004
7. **Concrete Mix Design**- N. Krishna Raju - Sehgal Publishers
8. **Concrete Manual**- Gambhir M.L.- Dhanpat Rai & Sons, New Delhi
9. **Advanced Concrete Technology Processes**- John Newman, Ban Seng Choo, - London.
10. **Advanced Concrete Technology Constituent materials**- John Newman, Ban Seng Choo- London
11. **Non-Destructive Test and Evaluation of Materials**- J.Prasad, C G K Nair,-Mc Graw Hill.
12. **High Performance Concrete**- Prof Aitcin P C- E and FN, London.
13. **Properties of Fresh Concrete**- Power T.C.- E and FN, London

ENVIRONMENTAL IMPACT ASSESSMENT

Subject Code	**: 10CV847**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

Development Activity and Ecological Factors EIA, Rapid and Comprehensive EIA, EIS, FONSI. Need for EIA Studies, Baseline Information,

6 Hours

UNIT - 2

Step-by-step procedures for conducting EIA, Limitations of EIA.

6 Hours

UNIT - 3

Frame work of Impact Assessment. Development Projects-Environmental Setting, Objectives and Scope, Contents of EIA, Methodologies, Techniques of EIA.

8 Hours

UNIT - 4

Assessment and Prediction of Impacts on Attributes Air, Water, Noise, Land Ecology, Soil, Cultural and Socio-economic Environment. EIA guidelines for Development Projects, Rapid and Comprehensive EIA.

6 Hours

PART - B

UNIT - 5

EIA guidelines for Development Projects, Rapid and Comprehensive EIA.

6 Hours

UNIT - 6

Public Participation in Environmental Decision making. Practical Considerations in preparing Environmental Impact Assessment and Statements.

6 Hours

UNIT - 7

Salient Features of the Project Activity-Environmental Parameter Activity Relationships- Matrices.

4 Hours

UNIT - 8

EIA for Water resource developmental projects, Highway projects: Nuclear-Power plant projects, Mining project (Coal, Iron ore), Thermal Power Plant, Infrastructure Construction Activities.

10 Hours

REFERENCES

1. **Environmental Impact Analysis**-Jain R.K.-Van Nostrand Reinhold Co.
2. **Environment Impact Assessment.-** Anjaneyalu. Y.
3. Guidelines for EIA of developmental Projects Ministry of Environment and Forests, GOI.
4. **Environment Impact Assessment** - Larry W. Canter - McGraw Hill Publication.

ADVANCED DESIGN OF RCC STRUCTURES

Subject Code	**: 14CSE12**	IA Marks	: 50
No. of Lecture Hrs./ Week	: 04	Exam Hrs	: 03
Total No. of Lecture Hrs.	: 50	Exam Marks	: 100

Objectives:

The objectives of this course is to make students to learn principles of Structural Design, To design different types of structures and to detail the structures. To evaluate performance of the structures.

Course Outcomes: On completion of this course, students are able to

- **Achieve Knowledge of design and development of problem solving skills.**
- **Understand the principles of Structural Design**
- **Design and develop analytical skills.**
- **Summarize the principles of Structural Design and detailing**
- **Understands the structural performance.**

1. Yield line method of design of slabs. Design of flat slabs.
2. Design of grid floors.
3. Design of continuous beams with redistribution of moments
4. Design of Chimneys, Design of silos and bunkers.
5. Art of detailing earthquake resistant structures. Expansion and contraction joints

REFERENCE BOOKS:

1. A Park and Paulay, **“Reinforced Reinforced and Prestressed Concrete**”
2. Lin TY and Burns N H, “**Reinforced Concrete Design**".
3. Kong KF and Evans T H “**Design of Prestressed Concrete Structures**
4. P.C.Varghese, "**Advanced Reinforced Concrete Design**”, Prentice-Hall of India, New Delhi, 2005.
5. Dr.B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, **“Comprehensive RCC Design”**

STRUCTURAL DYNAMICS

Subject Code	**: 14CSE14**	IA Marks	: 50
No. of Lecture Hrs./ Week	: 04	Exam Hrs	: 03
Total No. of Lecture Hrs.	: 50	Exam Marks	: 100

Objectives:

The objectives of this course is to make students to learn principles of Structural Dynamics, To implement these principles through different methods and to apply the same for free and forced vibration of structures. To evaluate the dynamic characteristics of the structures.

Course Outcomes: On completion of this course, students are able to

- **Achieve Knowledge of design and development of problem solving skills.**
- **Understand the principles of Structural Dynamics**
- **Design and develop analytical skills.**
- **Summarize the Solution techniques for dynamics of Multi-degree freedom systems**
- **Understand the concepts of damping in structures.**

1. Introduction: Introduction to Dynamic problems in Civil Engineering, Concept of degrees of freedom, D'Alembert's principle, principle of virtual displacement and energy principles Dynamics of Single-degree-of-freedom systems: Mathematical models of Single-degree-of-freedom systems system, Free vibration response of damped and undamped systems. Methods of evaluation of damping.

2. Response of Single-degree-of-freedom systems to harmonic loading (rotation unbalance, reciprocating unbalance) including support motion, vibration isolation, transmissibility, Numerical methods applied to Single-degree-of-freedom systems - Duhamel integral, principle of vibration-measuring instruments – seismometer and accelerometer.

3. Dynamics of Multi-degree freedom systems: Mathematical models of multi-degree-of-freedom systems, Shear building concept, free vibration of undamped multi-degree-of-freedom systems - Natural frequencies and mode shapes – orthogonality property of modes.

4. Response of Shear buildings for harmonic loading without damping using normal mode approach. Response of Shear buildings for forced vibration for harmonic loading with damping using normal mode approach, condition of damping uncoupling.

5. Approximate methods: Rayleigh's method Dunkarley's method, Stodola's method. Dynamics of Continuous systems: Free longitudinal vibration of bars, flexural vibration of beams with different end conditions,. Stiffness matrix, mass matrix (lumped and consistent); equations of motion for the discretised beam in matrix form.

Books for Reference:

1. **Dynamics of Structures – Theory and Application to Earthquake Engineering"- 2nd ed., Anil K. Chopra, Pearson Education.**
2. **Earthquake Resistant Design of Building Structures, Vinod Hosur, WILEY (india)**
3. **Vibrations, structural dynamics- M. Mukhopadhaya : Oxford IBH**
4. **Structural Dynamics- Mario Paz : CBS publishers.**
5. **Structural Dynamics- Clough & Penzien : TMH**
6. **Vibration Problems in Engineering Timoshenko, S, Van-Nostrand Co.**

ELECTIVE - I

SPECIAL CONCRETE

Subject Code	**: 14CSE152**	IA Marks	: 50
No. of Lecture Hrs./ Week	: 04	Exam Hrs	: 03
Total No. of Lecture Hrs.	: 50	Exam Marks	: 100

The objectives of this course is to make students to learn principles of Concrete mix design, To differentiate between different types of concrrete . To characterize the high Performance concrete.

Course Outcomes: On completion of this course, students are able to

- **Achieve Knowledge of design and development of problem solving skills.**
- **Understand the principles of Concrete mix design**
- **Design and develop analytical skills.**
- **Summerize the Light Weight concrete, Fibre reinforced concrete and High Performance concrete:**
- **Understand the concepts of high Performance concrete.**

1. Components of modern concrete and developments in the process and constituent materials : Role of constituents, Development in cements and cement replacement materials, pozzolona, fly ash, silica fume, rice husk ash, recycled aggregates, chemical admixtures. Mix proportioning of Concrete: Principles and methods.

2. Light Weight concrete: Introduction, classification, properties, strength and durability, mix proportioning and problems. High density concrete: Radiation shielding ability of concrete, materials for high density concrete, mix proportioning, properties in fresh and hardened state, placement methods.

3. Ferro cement: Ferrocement materials, mechanical properties, cracking of ferrocement, strength and behaviour in tension, compression and flexure, Design of ferrocement in tension, ferrocement constructions, durability, and applications.

4. ***Fibre reinforced concrete:*** Fibre materials, mix proportioning, distribution and orientation, interfacial bond, properties in fresh state, strength and behavior in tension, compression and flexure of steel fibre reinforced concrete, mechanical properties, crack arrest and toughening mechanism, applications.

5. High Performance concrete: constituents, mix proportioning, properties in fresh and hardened states, applications and limitations. Ready Mixed Concrete, Self Compacting Concrete, Reactive powder concrete, bacterial concrete.

REFERENCE BOOKS:

1. Neville A.M, “**Properties of Concrete”** Pearson Education Asis, 2000
2. P. Kumar Mehta, Paul J.N.Monterio, CONCRETE, “**Microstructure, Properties and Materials”-** Tata McGraw Hill
3. A.R.Santhakumar, (2007) “**Concrete Technology**”-Oxford University Press, New Delhi, 2007
4. Gambhir “Concrete Technology” TMH.
5. Short A and Kinniburgh.W, “**Light Weight Concrete”-** Asia Publishing House, 1963
6. Aitcin P.C**. “High performance concrete”**-E and FN, Spon London 1998
7. Rixom.R. and Mailvaganam.N., “**Chemical admixtures in concrete”-** E and FN, Spon London 1999
8. Rudnai.G., “**Light Wiehgt concrete”-** Akademiaikiado, Budapest, 1963.

STRUCTURAL ENGINEERING LAB-1

Subject Code	**: 14CSE16**	IA Marks	: 25
No. of Lab Hrs./ Week	: 03	Exam Hrs	: 03
Total No. of Lab Hrs.	**: 48**	Exam Marks	:50

The objectives of this course is to make students to learn principles of design of experiments, To investigate the performance of structural elements . To evaluate the different testing methods and equipments. .

Course Outcomes: On completion of this course, students are able to

- **Achieve Knowledge of design and development of experimenting skills.**
- **Understand the principles of design of experiments**
- **Design and develop analytical skills.**
- **Summerize the testing methods and equipments.**

1. Testing of beams for deflection, flexure and shear 12 Hrs
2. Experiments on Concrete, including Mix design 12 Hrs
3. Experiments on vibration of multi storey frame models for Natural frequency and modes. 12Hrs
4. Use of Non destructive testing (NDT) equipments – Rebound hammer, Ultra sonic pulse velocity meter and Profometer 12 Hrs

EARTHQUAKE RESISTANT STRUCTURES

Subject Code	: **14CSE22**	IA Marks	: 50
No. of Lecture Hrs./ Week	: 04	Exam Hrs	: 03
Total No. of Lecture Hrs.	: 50	Exam Marks	: 100

The objectives of this course is to make students to learn principles of engineering seismology, To design the reinforced concrete buildings for earthquake resistance. To evaluate the seismic response of the structures.

Course Outcomes: On completion of this course, students are able to

- **Achieve Knowledge of design and development of problem solving skills.**
- **Understand the principles of engineering seismology**
- **Design and develop analytical skills.**
- **Summarize the Seismic evaluation and retrofitting of structures.**
- **Understand the concepts of earthquake resistance of reinforced concrete buildings.**

1. Introduction to engineering seismology, Geological and tectonic features of India, Origin and propagation of seismic waves, characteristics of earthquake and its quantification – Magnitude and Intensity scales, seismic instruments. Earthquake Hazards in India, Earthquake Risk Evaluation and Mitigation. Structural behavior under gravity and seismic loads, Lateral load resisting structural systems, Requirements of efficient earthquake resistant structural system, damping devises, base isolation systems.
2. The Response history and strong motion characteristics. Response Spectrum – elastic and inelastic response spectra, tripartite (D-V-A) response spectrum, use of response spectrum in earthquake resistant design.Computation of seismic forces in multi-storeyed buildings – using procedures (Equivalent lateral force and dynamic analysis) as per IS-1893.
3. Structural Configuration for earthquake resistant design, Concept of plan irregularities and vertical irregularities, Soft storey, Torsion in buildings. Design provisions for these in IS-1893. Effect of infill masonry walls on frames, modeling concepts of infill masonry walls. Behaviour of masonry buildings during earthquakes, failure patterns, strength of masonry in shear and flexure, Slenderness concept of masonry walls, concepts for earthquake resistant masonry buildings – codal provisions.
4. Design of Reinforced concrete buildings for earthquake resistance-Load combinations, Ductility and energy absorption in buildings. confinement of concrete for ductility, design of columns and beams for ductility, ductile detailing provisions as per IS-1893. Structural behavior, design and ductile detailing of shear walls.
5. Seismic response control concepts – Seismic demand, seismic capacity, Overview of linear and nonlinear procedures of seismic analysis. Performance Based Seismic Engineering methodology, Seismic evaluation and retrofitting of structures.

Books for Reference:

1. **Dynamics of Structures – Theory and Application to Earthquake Engineering- 2nd ed. – Anil K. Chopra, Pearson Education.**
2. **Earthquake Resistant Design of Building Structures, Vinod Hosur, WILEY (india)**
3. **Earthquake Resistant Design of Structures, Duggal, Oxford University Press**
4. **Earthquake resistant design of structures - Pankaj Agarwal, Manish Shrikande - PHI India**
5. **IS – 1893 (Part I): 2002, IS – 13920: 1993, IS – 4326: 1993, IS-13828: 1993**
6. **Design of Earthquake Resistant Buildings, Minoru Wakabayashi, McGraw Hill Pub.**
7. **Seismic Design of Reinforced Concrete and Masonry Buildings, T Paulay and M J N Priestley, John Wiley and Sons**

FINITE ELEMENT METHOD OF ANALYSIS

Subject Code	**: 14CSE23**	IA Marks	: 50
No. of Lecture Hrs./ Week	: 04	Exam Hrs	: 03
Total No. of Lecture Hrs.	: 50	Exam Marks	: 100

The objectives of this course is to make students to learn principles of Analysis of Stress and Strain, To apply the Finite Element Method for the analysis of one and two dimensional problems. To evaluate the stress and strain parameters and their inter relations of the continuum.

Course Outcomes: On completion of this course, students are able to

- **Achieve Knowledge of design and development of problem solving skills.**
- **Understand the principles of stress-strain behaviour of continuum**
- **Design and develop analytical skills.**
- **Describe the state of stress in a continuum**
- **Understand the concepts of elasticity and plasticity.**

1. Basic concepts of elasticity – Kinematic and Static variables for various types of structural problems – approximate method of structural analysis – Rayleigh – Ritz method – Finite difference method – Finite element method. Variation method and minimization of Energy approach of element formulation.Principles of finite element method – advantages & disadvantages – Finite element procedure. Finite elements used for one, two & three dimensional problems – Element aspect ratio – mesh refinement vs. higher order elements – Numbering of nodes to minimize band width.

2. Nodal displacement parameters – Convergence criterion – Compatibility requirements – Geometric invariance – Shape function – Polynomial form of displacement function. Generalized and Natural coordinates – Lagrangian interpolation function – shape functions for one, two & three dimensional elements.

3. Isoparametric elements - Internal nodes and higher order elements – Serendipity and Lagrangian family of Finite Elements – Sub parametric and Super parametric elements – Condensation of internal nodes – Jacobian transformation Matrix. Development of strain – displacement matrix and stiffness matrix, consistent load vector, numerical integration.

4. Application of Finite Element Method for the analysis of one & two dimensional problems - Analysis of simple beams and plane trusses – Application to plane stress / strain / axisymmetric problems using CST & Quadrilateral Elements.

5. Application to Plates & Shells- Choice of displacement function (C^0, C^1 and C^2 type) – Techniques for Non – linear Analysis.

REFERENCE BOOKS:

1. Krishnamoorthy C S, "**Finite Element Analysis"-** Tata McGraw Hill
2. Desai C and Abel J F, "**Introduction to the Finite Element Method**"- East West Press Pvt. Ltd., 1972
3. Bathe K J, "**Finite Element Procedures in Engineering Analysis**"- Prentice Hall
4. Rajasekaran. S, "**Finite Element Analysis in Engineering Design"-**Wheeler Publishing
5. Cook R D, Malkan D S & Plesta M.E, "**Concepts and Application of Finite Element Analysis" -** 3rd Edition, John Wiley and Sons Inc., 1989
6. Shames I H and Dym C J, "**Energy and Finite Element Methods in Structural Mechanics**"- McGraw Hill, New York, 1985

DESIGN CONCEPTS OF SUBSTRUCTURES

Subject Code	**: 14CSE24**	IA Marks	: 50
No. of Lecture Hrs./ Week	: 04	Exam Hrs	: 03
Total No. of Lecture Hrs.	: 50	Exam Marks	: 100

The objectives of this course is to make students to learn principles of subsoil exploration, To design the sub structures. To evaluate the soil shear strength parameters.

Course Outcomes: On completion of this course, students are able to

- **Achieve Knowledge of design and development of problem solving skills.**
- **Understand the principles of subsoil exploration**
- **Design and develop analytical skills.**
- **Identify and evaluate the soil shear strength parameters .**
- **Understand the concepts of Settlement analysis.**

1. Introduction, Site investigation, In-situ testing of soils, Subsoil exploration, Classification of foundations systems.General requirement of foundations, Selection of foundations, Computations of Loads, Design concepts.
2. Concept of soil shear strength parameters, Settlement analysis of footings, Shallow foundations in clay, Shallow foundation in sand & C-Φ soils, Footings on layered soils and sloping ground, Design for Eccentric or Moment Loads.
3. Types of rafts, bearing capacity & settlements of raft foundation, Rigid methods, Flexible methods, soil-structure interaction, different methods of modeling the soil. Combined footings (rectangular & trapezoidal), strap footings & wall footings, Raft – super structure interaction effects & general concepts of structural design, Basement slabs.
4. Deep Foundations: Load Transfer in Deep Foundations, Types of Deep Foundations, Ultimate bearing capacity of different types of piles in different soil conditions, Laterally loaded piles, tension piles & batter piles, Pile groups: Bearing capacity, settlement, uplift capacity, load distribution between piles, Proportioning and design concepts of piles.
5. Types of caissons, Analysis of well foundations, Design principles, Well construction and sinking. Foundations for tower structures: Introduction, Forces on tower foundations, Selection of foundation type, Stability and design considerations, Ring foundations – general concepts.

IMPORTANT NOTE:

Only design principles of all type footings as per relevant BIS codes are to be covered, design of RC elements need not be covered

REFERENCE BOOKS:

1. Swami Saran – "**Analysis & Design of Substructures**"- Oxford & IBH Pub. Co. Pvt. Ltd., 1998.
2. Nainan P Kurian – "**Design of Foundation Systems**"- Narosa Publishing House, 1992.
3. R.B. Peck, W.E. Hanson & T.H. Thornburn – "**Foundation Engineering"-** Wiley Eastern Ltd.,Second Edition, 1984.
4. J.E. Bowles – "**Foundation Analysis and Design**"- McGraw-Hill Int. Editions, Fifth Ed., 1996.
5. W.C. Teng – "**Foundation Design"-** Prentice Hall of India Pvt. Ltd., 1983.
6. Bureau of Indian Standards:IS-1498, IS-1892, IS-1904, IS-6403, IS-8009, IS-2950, IS-11089, IS-11233, IS-2911 and all other relevant codes.

DESIGN OF TALL STRUCTURES

Subject Code	**: 14CSE252**	IA Marks	: 50
No. of Lecture Hrs./ Week	: 04	Exam Hrs	: 03
Total No. of Lecture Hrs.	: 50	Exam Marks	: 100

The objectives of this course is to make students to learn principles of stability of tall buildings, To design the tall buildings for earthquake and wind resistance. To evaluate the performance of tall structures for strength and stability.

Course Outcomes: On completion of this course, students are able to

- **Achieve Knowledge of design and development of problem solving skills.**
- **Understand the principles of strength and stability**
- **Design and develop analytical skills.**
- **Summarize the behavior of various structural systems.**
- **Understand the concepts of P-Delta analysis.**

1. **Design Criteria:** Design philosophy, loading, sequential loading, and materials – high performance concrete, fiber reinforced concrete, lightweight concrete, design mixes. Loading and Movement: Gravity loading: Dead and live load, methods of live load reduction, Impact, Gravity loading, Construction loads
2. **Wind loading**: static and dynamic approach, Analytical and wind tunnel experimentation method. Earthquake loading: Equivalent lateral force, modal analysis, combinations of loading, working stress design, Limit state design, Plastic design.
3. **Behavior of Various Structural Systems:** Factors affecting growth, Height and structural form; High rise behavior, Rigid frames, braced frames, in-filled frames, shear walls, coupled shear walls, wall-frames, tubular, cores, Futigger – braced and hybrid mega system.
4. **Analysis and Design:** Modeling for approximate analysis, accurate analysis and reduction techniques, analysis of building as total structural system considering overall integrity and major subsystem interaction, analysis for member forces; drift and twist, computerized general three dimensional analyses. .
5. **Stability of Tall Buildings:** Overall buckling analysis of frames, wall frames, approximate methods, second order effects of gravity of loading, P-Delta analysis, simultaneous first order and P-Delta analysis, Transnational, Torsional instability, out of plum effects, stiffness of member in stability, effect of foundation rotation. Structural elements: sectional shapes, properties and resisting capacities, design, deflection, cracking, pre-stressing, shear flow. Design for differential movement, creep and shrinkage effects, temperature effects and fire

REFERENCE BOOKS:

1. Taranath B.S, "**Structural Analysis and Design of Tall Buildings**"- McGraw Hill
2. Wilf gang Schuller, "**High rise building structures**"- John Wiley
3. Bryan Stafford Smith & Alexcoull, "**Tall building structures Analysis and Design**"- John Wiley
4. T.Y Lin & D.Stotes Burry, "**Structural concepts and system for Architects and Engineers"-** John Wiley
5. Lynn S.Beedle, "**Advances in Tall Buildings**"- CBS Publishers and Distributors.
6. Dr. Y.P. Gupta – Editor, "**Proceedings National Seminar on High Rise Structures- Design and Construction practices for middle level cities"-** New Age International Limited.
7.

STRUCTURAL ENGINEERING LAB-2

Subject Code	**: 14CSE26**	IA Marks	: 25
No. of Lab Hrs./ Week	: 03	Exam Hrs	: 03
Total No. of Lab Hrs.	**: 48**	Exam Marks	:50

The objectives of this course is to make students to learn the soft wares for structural analysis and design, To investigate the performance of structures for static and dynamic forces.

Course Outcomes: On completion of this course, students are able to

- **Achieve Knowledge of design and development of programming skills.**
- **Understand the principles of structural analysis and design**
- **Design and develop analytical skills.**
- **Summerize the performance of structures for static and dynamic forces..**

1. Static and Dynamic analysis of Building structure using software (ETABS / STAADPRO)	12 Hrs
2. Design of RCC and Steel structure using software (ETABS / STAADPRO)	12 Hrs
3. Analysis of folded plates and shells using software.	12 Hrs
4. Preparation of EXCEL sheets for structural design.	12 Hrs

Semester: I **Year: 2014-2015**

Course Title: Cloud Computing	**Course Code: 14SCS12**
Credits(L:T:P):3:0:1	**Core/Elective: Core**
Type of Course: Lecture & Practical	**Total Contact Hours: 50 Hrs**

COURSE OBJECTIVES

-To learn how to use Cloud Services.
-To implement Virtualization
- To implement Task Scheduling algorithms.
-Apply Map-Reduce concept to applications.
-To build Private Cloud.

Topics:

Module I

Introduction, Cloud Infrastructure

Cloud computing, Cloud computing delivery models and services, Ethical issues, Cloud vulnerabilities, Cloud computing at Amazon, Cloud computing the Google perspective, Microsoft Windows Azure and online services, Open-source software platforms for private clouds, Cloud storage diversity and vendor lock-in, Energy use and ecological impact, Service level agreements, User experience and software licensing. Exercises and problems.

10 Hours

Module II

Cloud Computing: Application Paradigms.

Challenges of cloud computing, Architectural styles of cloud computing, Workflows: Coordination of multiple activities, Coordination based on a state machine model: The Zookeeper, The Map Reduce programming model, A case study: The GrepTheWeb application , Cloud for science and engineering, High-performance computing on a cloud, Cloud computing for Biology research, Social computing, digital content and cloud computing.

10 Hours

Module III

Cloud Resource Virtualization.

Virtualization, Layering and virtualization, Virtual machine monitors, Virtual Machines, Performance and Security Isolation, Full virtualization and paravirtualization, Hardware support for virtualization, Case Study: Xen a VMM based paravirtualization, Optimization of network virtualization, vBlades, Performance comparison of virtual machines, The dark side of virtualization, Exercises and problems.

10 Hours

Module IV

Cloud Resource Management and Scheduling.

Policies and mechanisms for resource management, Application of control theory to task scheduling on a cloud, Stability of a two-level resource allocation architecture, Feedback control based on dynamic thresholds, Coordination of specialized autonomic performance managers, A utility-based model for cloud-based Web services, Resourcing bundling: Combinatorial auctions for cloud resources, Scheduling algorithms for computing clouds, Fair queuing, Start-time fair queuing, Borrowed virtual time, Cloud scheduling subject to deadlines, Scheduling Map Reduce applications subject to deadlines, Resource management and dynamic scaling, Exercises and problems.

10 Hours

Module V

Cloud Security, Cloud Application Development.

Cloud security risks, Security: The top concern for cloud users, Privacy and privacy impact assessment, Trust, Operating system security, Virtual machine Security, Security of virtualization, Security risks posed by shared images, Security risks posed by a management OS, A trusted virtual machine monitor, Amazon web services: EC2 instances, Connecting clients to cloud instances through firewalls, Security rules for application and transport layer protocols in EC2, How to launch an EC2 Linux instance and connect to it, How to use S3 in java, Cloud-based simulation of a distributed trust algorithm, A trust management service, A cloud service for adaptive data streaming, Cloud based optimal FPGA synthesis .Exercises and problems.

10 Hours

LAB EXPERIMENTS

NOTE: Simulate using object oriented programming, any available cloud environment **(Eg; Amazon cloud) and VM ware for resource virtualization.**

1. Create a Collaborative learning environment for a particular learning topic using Google Apps. Google Drive, Google Docs and Google Slides must be used for hosting e-books, important articles and presentations respectively. The instructor must use the Google Sheets to convey the timetable for different events and for analyzing the scores for individual assignment submission.

2. Modeling and simulation Cloud computing environments, including Data Centers, Hosts and Cloudlets and perform VM provisioning using CloudSim: Design a host with two CPU cores, which receives request for hosting two VMs, such that each one requires two cores and plans to host four tasks units. More specifically, tasks t1, t2, t3 and t4 to be hosted in VM1, while t5, t6, t7, and t8 to be hosted in VM2. Implement space-shared allocation policy and time-shared allocation policy. Compare the results.

3. Model a Cloud computing environment having Data center that had 100 hosts. The hosts are to be modeled to have a CPU core (1000 MIPS), 2 GB of RAM and 1 TB of storage. Consider the workload model for this evaluation included provisioning requests for 400 VMs, with each request demanding 1 CPU core (250 MIPS), 256 MB of RAM and 1 GB of storage. Each VM hosts a *web-hosting application service*, whose CPU utilization distribution was generated according to the uniform distribution. Each instance of a webhosting service required 150,000 MIPS or about 10 minutes to complete execution assuming 100% utilization. Simulate Energy-conscious model for power consumption and power management techniques such as Dynamic Voltage and Frequency Scaling (DVFS). Initially, VMs are to be allocated according to requested parameters (4 VMs on each host). The Cloud computing architecture that is to be considered for studying energy conscious resource management techniques/policies included a data center, CloudCoordinator, and Sensor component. The CloudCoordinator and Sensor perform their usual roles. Via the attached Sensors (which are connected with every host), CloudCoordinator must periodically monitor the performance status of active VMs such as load conditions, and processing share. This real time information is to be passed to VMM, which can use it for performing appropriate resizing of VMs and application of DVFS and soft scaling. CloudCoordinator continuously1 has to adapt allocation of VMs by issuing VM migration commands and changing power states of nodes according to its policy and current utilization of resources.

4. Model and simulate the environment consisting of a data center with 10,000 hosts where each host was modeled to have a single CPU core (1200MIPS), 4GB of RAM memory and 2TB of storage. Consider the provisioning policy for VMs as space-shared, which allows one VM to be active in a host at a given instance of time. Make a request from the end-user (through the Datacenter Broker) for creation and instantiation of 50 VMs that had following constraints: 1024MB of physical memory, 1 CPU core and 1GB of storage. The application granularity was modeled to be composed of 300 task units, with each task unit requiring 1,440,000 million instructions (20 minutes in the simulated hosts) to be executed on a host. Minimal data transfer (300 KB) overhead can be considered for the task units (to and from the data center). After the creation of VMs, task units were submitted in small groups of 50 (one for each VM) at inter-arrival delay of 10 minutes.

5. Implement Map Reduce concept for
a. Strassen's Matrix Multiplication for a huge matrix.
b. Computing the average number of citation index a researcher has according to age among some 1 billion journal articles. Consider a network of entities and relationships between them. It is required to calculate a state of each entity on

the basis of properties of the other entities in its neighborhood. This state can represent a distance to other nodes, indication that there is a neighbor
with the certain properties, characteristic of neighborhood density and so on. A network is stored as a set of nodes and each node contains a list of adjacent node IDs. Mapper emits messages for each node using ID of the adjacent node as a key. Reducer must re compute state and rewrite node with the new state. Implement this scenario.

Course Outcomes:

The students should be able to:

-Demonstrate and experiment simple Cloud Applications

-Apply resource allocation, scheduling algorithms.

- Implement Map-Reduce concept.
- Create virtual machines from available physical resources.
- Setup a private cloud.
- Familiarize with Open Stack.

Text Book:

1. Dan C Marinescu: Cloud Computing Theory and Practice. Elsevier(MK) 2013.

REFERENCES:

1. Rajkumar Buyya , James Broberg, Andrzej Goscinski: Cloud Computing Principles and Paradigms, Willey 2014.
2. John W Rittinghouse, James F Ransome:Cloud Computing Implementation, Management and Security, CRC Press 2013.

Semester: I **Year: 2014-2015**

Course Title: Embedded Computing Systems	**Course Code: 14SCS153**
Credits(L:T:P):4:0:0	**Core/Elective: Elective**
Type of Course: Lecture	**Total Contact Hours: 50 Hrs**

COURSE OBJECTIVES

- Provide a general overview of Embedded Systems
- Show current statistics of Embedded Systems
- Design a complete microprocessor-based hardware system
- Design, code, compile, and test real-time software
- Integrate a fully functional system including hardware and software
- Gain the ability to make intelligent choices between hardware/software tradeoffs.

Topics:

MODULE I

Introduction to embedded systems: Embedded systems, Processor embedded into a system, Embedded hardware units and device in a system, Embedded software in a system, Examples of embedded systems, Design process in embedded system, Formalization of system design, Design process and design examples, Classification of embedded systems, skills required for an embedded system designer.

` **7 Hours**

MODULE II

Devices and communication buses for devices network :IO types and example, Serial communication devices, Parallel device ports, Sophisticated interfacing features in device ports, Wireless devices, Timer and counting devices, Watchdog timer, Real time clock, Networked embedded systems, Serial bus communication protocols, Parallel bus device protocols-parallel communication internet using ISA, PCI, PCI-X and advanced buses, Internet enabled systems- network protocols, Wireless and mobile system protocols.

13 Hours

MODULE III

Device drivers and interrupts and service mechanism: Programming-I/O busy-wait approach without interrupt service mechanism, ISR concept, Interrupt sources, Interrupt servicing (Handling) Mechanism, Multiple interrupts, Context and the periods for context switching, interrupt latency and deadline, Classification of processors interrupt service mechanism from Context-saving angle, Direct memory access, Device driver programming.

10 Hours

MODULE IV

Interprocesses communication and synchronization of processes, Threads and tasks: Multiple process in an application, Multiple threads in an application, Tasks, Task states, Task and Data, Clear-cut distinction between functions. ISRS and tasks by their characteristics, concept and semaphores, Shared data, Inter-process communication, Signal function, Semaphore functions, Message Queue functions, Mailbox functions, Pipe functions, Socket functions, RPC functions. **10 Hours**

MODULE V

Real-time operating systems: OS Services, Process management, Timer functions, Event functions, Memory management, Device, file and IO subsystems management, Interrupt routines in RTOS environment and handling of interrupt source calls, Real-time operating systems, Basic design using an RTOS, RTOS task scheduling models, interrupt latency and response of the tasks as performance metrics, OS security issues**. Introduction to embedded**

software development process and tools, Host and target machines, Linking and location software.

10 Hours

Course Outcomes:

The students should be able to:

- Knowledge to distinguish the characteristics of embedded computer systems.
- Ability examines the various vulnerabilities of embedded computer systems.
- Ability to design embedded systems.
- Awareness of the changing landscape in embedded systems

Text Books:

1. **Raj Kamal**, "Embedded Systems: Architecture, Programming, and Design" 2nd edition , Tata McGraw hill-2013

Chapters: Chapter 1.1 to 1.5, 1.8 to 1.12, Chapter 3, 4, 7, 8 and 13.1 to 13.3.

References:

2. **Marilyn Wolf** ,"Computer as Components, Principles of Embedded Computing System Design" 3rd edition , Elsevier-2014 .

Semester: II **Year: 2014-2015**

Course Title: Managing Big Data	Course Code: 14SCS21
Credits(L:T:P):3:0:1	Core/Elective: Core
Type of Course: Lecture & Practical	Total Contact Hours: 50 Hrs

Course Objectives:

- To Understand big data for business intelligence
- To Learn business case studies for big data analytics
- To Understand Nosql big data management
- To manage Big data without SQL
- To understanding map-reduce analytics using Hadoop and related tools

TOPICS:

MODULE I
UNDERSTANDING BIG DATA **10 Hours**

What is big data – why big data –.Data!, Data Storage and Analysis, Comparison with Other Systems, Rational Database Management System , Grid Computing, Volunteer Computing, convergence of key trends – unstructured data – industry examples of big data – web analytics – big data and marketing – fraud and big data – risk and big data – credit risk management – big data and algorithmic trading – big data and healthcare – big data in medicine – advertising and big data – big data technologies – introduction to Hadoop – open source technologies – cloud and big data – mobile business intelligence – Crowd sourcing analytics – inter and trans firewall analytics

MODULE II
NOSQL DATA MANAGEMENT **10 Hours**

Introduction to NoSQL – aggregate data models – aggregates – key-value and document data models – relationships – graph databases – schema less databases – materialized views – distribution models – sharding –– version – Map reduce – partitioning and combining – composing map-reduce calculations

MODULE III
BASICS OF HADOOP **10 Hours**

Data format – analyzing data with Hadoop – scaling out – Hadoop streaming – Hadoop pipes – design of Hadoop distributed file system (HDFS) – HDFS concepts – Java interface – data flow – Hadoop I/O – data integrity – compression – serialization – Avro – file-based data structures

MODULE IV
MAPREDUCE APPLICATIONS **10 Hours**

MapReduce workflows – unit tests with MRUnit – test data and local tests – anatomy of MapReduce job run – classic Map-reduce – YARN – failures in classic Map-reduce and YARN – job scheduling – shuffle and sort – task execution – MapReduce types – input formats – output formats

MODULE V
HADOOP RELATED TOOLS **10 Hours**

Hbase – data model and implementations – Hbase clients – Hbase examples –praxis. Cassandra – Cassandra data model – cassandra examples – cassandra clients –Hadoop integration. Pig – Grunt – pig data model – Pig Latin – developing and testing Pig Latin scripts. Hive – data types and file formats – HiveQL data definition – HiveQL data manipulation – HiveQL queries.

LAB Experiments

Exercise 1 --- HDFS

Start by reviewing HDFS. You will find that its composition is similar to your local Linux file system. You will use the hadoop fs command when interacting with HDFS.

1. Review the commands available for the Hadoop Distributed File System:
2. Copy file foo.txt from local disk to the user's directory in HDFS
3. Get a directory listing of the user's home directory in HDFS
4. Get a directory listing of the HDFS root directory
5. Display the contents of the HDFS file user/fred/bar.txt
6. Move that file to the local disk, named as baz.txt
7. Create a directory called input under the user's home directory
8. Delete the directory input old and all its contents
9. Verify the copy by listing the directory contents in HDFS:

Exercise 2 --- MapReduce

1. Create a JOB and submit to cluster
2. Track the job information
3. Terminate the job
4. Counters in MR Jobs with example
5. Map only Jobs and generic map examples
6. Distributed cache example
7. Combiners, Secondary sorting and Job chain examples

Exercise 3 --- MapReduce (Programs)

Using movie lens data

1. List all the movies and the number of ratings
2. List all the users and the number of ratings they have done for a movie
3. List all the Movie IDs which have been rated (Movie Id with at least one user rating it)
4. List all the Users who have rated the movies (Users who have rated at least one movie)
5. List of all the User with the max, min, average ratings they have given against any movie
6. List all the Movies with the max, min, average ratings given by any user

Exercise4 – Extract facts using Hive

Hive allows for the manipulation of data in HDFS using a variant of SQL. This makes it excellent for transforming and consolidating data for load into a relational database. In this exercise you will use HiveQL to filter and aggregate click data to build facts about user's movie preferences. The query results will be saved in a staging table used to populate the Oracle Database.

The moveapp_log_json table contains an activity column. Activity states are as follows:

1. RATE_MOVIE
2. COMPLETED_MOVIE
3. PAUSE_MOVIE
4. START_MOVIE
5. BROWSE_MOVIE
6. LIST_MOVIE
7. SEARCH_MOVIE
8. LOGIN
9. LOGOUT
10. INCOMPLETE_MOVIE

```
hive> SELECT * FROM movieapp_log_json LIMIT 5;
hive> drop table movieapp_log_json;
hive> CREATE EXTERNAL TABLE movieapp_log_json (
custId INT,
movieId INT,
genreId INT,
time STRING,
recommended STRING,
activity INT,
rating INT,
price FLOAT
)
ROW FORMAT SERDE 'org.apache.hadoop.hive.contrib.serde2.JsonSerde'
LOCATION '/user/oracle/moviework/applog/';

hive> SELECT * FROM movieapp_log_json LIMIT 20;

hive> SELECT MIN(time), MAX(time) FROM movieapp_log_json
```

1. PURCHASE_MOVIE

Hive maps queries into Map Reduce jobs, simplifying the process of querying large datasets in HDFS. HiveQL statements can be mapped to phases of the Map Reduce framework. As illustrated in the following figure, selection and transformation operations occur in map tasks, while aggregation is handled by reducers. Join operations are flexible: they can be performed in the reducer or mappers depending on the size of the leftmost table.

1. Write a query to select only those clicks which correspond to starting, browsing, completing, or purchasing movies. Use a CASE statement to transform the RECOMMENDED column into integers where 'Y' is 1 and 'N' is 0. Also, ensure GENREID is not null. Only include the first 25 rows.

2. Write a query to select the customer ID, movie ID, recommended state and most recent rating for each movie.

3. Load the results of the previous two queries into a staging table. First, create the staging table:

4. Next, load the results of the queries into the staging table.

Exercise 5 Extract sessions using Pig

While the SQL semantics of HiveQL are useful for aggregation and projection, some analysis is better described as the flow of data through a series of sequential operations. For these situations, Pig Latin provides a convenient way of implementing data flows over data stored in HDFS. Pig Latin statements are translated into a sequence of Map Reduce jobs on the execution of any STORE or DUMP command. Job construction is optimized to exploit as much parallelism as possible, and much like Hive, temporary storage is used to hold intermediate results. As with Hive, aggregation occurs largely in the reduce
tasks. Map tasks handle Pig's FOREACH and LOAD, and GENERATE statements. The EXPLAIN command will show the execution plan for any Pig Latin script. As of Pig 0.10, the ILLUSTRATE command will provide sample results for each stage of the execution plan.

In this exercise you will learn basic Pig Latin semantics and about the fundamental types in Pig Latin, Data Bags and Tuples.

1. Start the Grunt shell and execute the following statements to set up a dataflow with the click stream data. Note: Pig Latin statements are assembled into Map Reduce jobs which are launched at execution of a DUMP or STORE statement.

2. Group the log sample by movie and dump the resulting bag.

3. Add a GROUP BY statement to the sessionize.pig script to process the click stream data into user sessions.

Course Outcomes:

The students should be able to:

- Describe big data and use cases from selected business domains
- Explain NoSQL big data management
- Install, configure, and run Hadoop and HDFS
- Perform map-reduce analytics using Hadoop
- Use Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data Analytics

TEXT BOOKS:

1. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012.
2. Eric Sammer, "Hadoop Operations", O'Reilley, 2012.

REFERENCES:

1. Vignesh Prajapati, Big data analytics with R and Hadoop, SPD 2013.
2. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.
3. Lars George, "HBase: The Definitive Guide", O'Reilley, 2011.
4. Alan Gates, "Programming Pig", O'Reilley, 2011.

Semester: II **Year: 2014-2015**

Course Title: Advances in Computer Networks	**Course Code: 14SCS22**
Credits(L:T:P):3:0:1	**Core/Elective: Core**
Type of Course: Lecture & Practical	**Total Contact Hours: 50 Hrs**

Course Objectives:

- To become familiar with the basics of Computer Networks
- To understand various Network architectures
- Concepts of fundamental protocols
- To understand the network traffic, congestion, controlling and resource allocation.

Topics:

MODULE I

Foundation

Building a Network, Requirements, Perspectives, Scalable Connectivity, Cost-Effective Resource sharing, Support for Common Services, Manageability, Protocol layering, Performance, Bandwidth and Latency, Delay X Bandwidth Product, Perspectives on Connecting, Classes of Links, Reliable Transmission, Stop-and-Wait , Sliding Window, Concurrent Logical Channels.

T1: **Chapter 1.1, 1.2, 1.5.1, 1.5.2**., **2.1, 2.5** **T2**: **Chapter 4** **10 Hours**

MODULE II

Internetworking- I

Switching and Bridging, Datagram's, Virtual Circuit Switching, Source Routing, Bridges and LAN Switches, Basic Internetworking (IP), What is an Internetwork ?, Service Model, Global Addresses, Datagram Forwarding in IP, sub netting and classless addressing, Address Translation(ARP), Host Configuration(DHCP), Error Reporting(ICMP), Virtual Networks and Tunnels.

T1: Chapter 3.1, 3.2, **10 Hours**

MODULE III

Internetworking- II

Network as a Graph, Distance Vector(RIP), Link State(OSPF), Metrics, The Global Internet, Routing Areas, Routing among Autonomous systems(BGP), IP Version 6(IPv6), Mobility and Mobile IP

T1: Chapter 3.3, 4.1.1,4.1.3 **T2**:Chapter 13.1 to 13.18 , Ch 18. **10 Hours**

MODULE IV

End-to-End Protocols

Simple Demultiplexer (UDP), Reliable Byte Stream(TCP), End-to-End Issues, Segment Format, Connecting Establishment and Termination, Sliding Window Revisited, Triggering Transmission, Adaptive Retransmission, Record Boundaries, TCP Extensions, Queuing Disciplines, FIFO, Fair Queuing, TCP Congestion Control, Additive Increase/ Multiplicative Decrease, Slow Start, Fast Retransmit and Fast Recovery.

T1: Chapter 5.1, 5.2.1 to 5.2.8, 6.2, 6.3 **10 Hours**

MODULE V

Congestion Control and Resource Allocation

Congestion-Avoidance Mechanisms, DEC bit, Random Early Detection (RED), Source-Based Congestion Avoidance. The Domain Name System(DNS),Electronic Mail(SMTP,POP,IMAP,MIME),World Wide Web(HTTP),Network Management(SNMP) .

T1: Chapter 6.4 **T2**: Chapter 23.1 to 23.16, Chapter 24, Chapter 25, Chapter 27.1 to 27.8 **10 Hours**

Laboratory Work:

PART A: Implement the following using C/C++:

1. Write a program to transfer the contents of a requested file from server to the client using TCP/IP Sockets (using TCP/IP Socket programming).
2. Write a program to archive Traffic management at Flow level by implementing Closed Loop Control technique. (Leaky Bucket Algorithm)
3. Write a program to implement dynamic routing strategy in finding optimal path for data transmission. (Bellman ford algorithm).
4. Write a program to implement Link State Routing (Dijkstra Algorithm).
5. Write a program for implementing the error detection technique while data transfer in unreliable network code using CRC (16-bits) Technique.
6. Write a program for providing security for transfer of data in the network. (RSA Algorithm)
7. Write a program for encrypting 64 bit playing text using DES algorithm.

PART B: Simulation Programs using OPNET /NS2 or any other equivalent software

1. Simulate a 3 node point to point network with duplex links between them. Set the Queue size and vary the bandwidth and find the number of packets dropped.
2. Simulate a four-node point-to-point network, and connect the links as follows: n0->n2, n1->n2 and n2->n3. Apply TCP agent changing the parameters and determine the number of packets sent/received by TCP/UDP
3. Simulate the different types of internet traffic such as FTP and TELNET over network and analyze the throughput.

Course Outcomes:

The students should be able to:

- List and classify network services, protocols and architectures, explain why they are layered.
- Choose key Internet applications and their protocols, and apply to develop their own applications (e.g. Client Server applications, Web Services) using the sockets API.
- Explain develop effective communication mechanisms using techniques like connection establishment, queuing theory, recovery Etc.
- Explain various congestion control techniques.

Text books:

1. **T1: Larry Peterson and Bruce S Davis** “Computer Networks :A System Approach” 5th Edition , Elsevier -2014
2. **T2: Douglas E Comer, “**Internetworking with TCP/IP, Principles, Protocols and Architecture” 6th Edition, PHI - 2014

References:

1. **Uyless Black** “Computer Networks, Protocols , Standards and Interfaces” 2nd Edition - PHI
2. **Behrouz A Forouzan** “TCP/IP Protocol Suite” 4th Edition – Tata McGraw-Hill

Semester: II **Year: 2014-2015**

Course Title: Advanced Algorithms	**Course Code: 14SCS23**
Credits(L:T:P):4:0:0	**Core/Elective: Core**
Type of Course: Lecture	**Total Contact Hours: 50 Hrs**

COURSE OBJECTIVES

- To learn the graph search algorithms.
- To study network flow and linear programming problems.
- To learn the hill climbing and dynamic programming design techniques.
- To develop recursive backtracking algorithms.
- To get an awareness of NP completeness and randomized algorithms.

Topics:

MODULE I

Review of Analysis Techniques: Growth of Functions: Asymptotic notations; Standard notations and common functions; Recurrences and Solution of Recurrence equations- The substitution method, The recurrence – tree method, The master method; Amortized Analysis: Aggregate, Accounting and Potential Methods.

10 Hours

MODULE II

Graph Algorithms: Bellman - Ford Algorithm; Single source shortest paths in a DAG; Johnson's Algorithm for sparse graphs; Flow networks and Ford-Fulkerson method; Maximum bipartite matching.
Polynomials and the FFT: Representation of polynomials; The DFT and FFT; Efficient implementation of FFT.

10 Hours

MODULE III

Number -Theoretic Algorithms: Elementary notions; GCD; Modular Arithmetic; Solving modular linear equations; The Chinese remainder theorem; Powers of an element; RSA cryptosystem; Primality testing; Integer factorization.

10 Hours

MODULE IV

String-Matching Algorithms: Naïve string Matching; Rabin - Karp algorithm; String matching with finite automata; Knuth-Morris-Pratt algorithm; Boyer – Moore algorithms.

10 Hours

MODULE V

Probabilistic and Randomized Algorithms: Probabilistic algorithms; Randomizing deterministic algorithms, Monte Carlo and Las Vegas algorithms; Probabilistic numeric algorithms.

10 Hours

Course Outcomes:

Upon completion of the course, the students will be able to

- Design and apply iterative and recursive algorithms.
- Design and implement optimization algorithms in specific applications.
- Design appropriate shared objects and concurrent objects for applications.

TEXT BOOKS:

1. T. H Cormen, C E Leiserson, R L Rivest and C Stein: Introduction to Algorithms, 3rd Edition, Prentice-Hall of India, 2010.
2. Kenneth A. Berman, Jerome L. Paul: Algorithms, Cengage Learning, 2002.

REFERENCE BOOKS:

1. Ellis Horowitz, Sartaj Sahni, S.Rajasekharan: Fundamentals of Computer Algorithms, 2nd Edition, Universities press, 2007.

Semester: II **Year: 2014-2015**

Course Title: Web Services	**Course Code: 14SCS251**
Credits(L:T:P):4:0:0	**Core/Elective: Elective**
Type of Course: Lecture	**Total Contact Hours: 50 Hrs**

Course objectives:

- To provide an in-depth knowledge of Web Services.
- To understand the fundamental concepts of Web services.
- To understand the fundamental concepts of WSDL Web Services.
- To design Web service Architecture.
- To Study Building Blocks of Web services.

TOPICS:

MODULE I

Middleware: Understanding the middle ware, RPC and Related Middle ware, TP Monitors, Object Brokers, Message-Oriented Middleware. **10 Hours**

MODULE II

Web Services: Web Services Technologies, Web Services Architecture. **10 Hours**

MODULE III

Basic Web Services Technology: WSDL Web Services Description Language, UDDI Universal Description Discovery and Integration, Web Services at work interactions between the Specifications, Related Standards.

10 Hours

MODULE IV

Service Coordination Protocols: Infrastructure for Coordination Protocols, WS- Coordination, WS-Transaction, Rosetta Net and Other Standards Related to Coordination Protocols. **10 Hours**

MODULE V

Service Composition: Basic of Service Composition, A New Chance of Success for Composition, Services Composition Models, Dependencies between Coordination and Composition, BPEL: Business Process Execution Language for Web Services, Outlook, Applicability of the Web Services, Web services as a Problem and a Solution : AN Example.

10 Hours

Course Outcomes:

The students should be able to:

- Bind and unbind services in UDDI.
- Develop WSDL document
- Implement web service client to call public service.
- Implement a service and exposing it as public service.

Text Books:

1. Gustavo Alonso, Fabio Casati, Harumi Kuno, Vijay Machiraju: Web Services(Concepts ,Architectures and Applications), Springer International Edition 2009.

Semester: II **Year: 2014-2015**

Course Title: Information And Network Security	**Course Code: 14SCS252**
Credits(L:T:P):4:0:0	**Core/Elective: Elective**
Type of Course: Lecture	**Total Contact Hours: 50 Hrs**

Course Objectives:

- To understand the fundamentals of Cryptography
- To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity.
- To understand the various key distribution and management schemes.
- To understand how to deploy encryption techniques to secure data in transit across data networks
- To design security applications in the field of Information technology

TOPICS:

MODULE I

Classical Encryption Techniques

Symmetric Cipher Model, Cryptography, Cryptanalysis and Brute-Force Attack, Substitution Techniques, Caesar Cipher, Monoalphabetic Cipher, Playfair Cipher, Hill Cipher, Polyalphabetic Cipher, One Time Pad. **Block Ciphers and the data encryption standard:** Traditional block Cipher structure, stream Ciphers and block Ciphers, Motivation for the feistel Cipher structure, the feistel Cipher, The data encryption standard, DES encryption, DES decryption, A DES example, results, the avalanche effect, the strength of DES, the use of 56-Bit Keys, the nature of the DES algorithm, timing attacks, Block cipher design principles, number of rounds, design of function F, key schedule algorithm.

10 Hours

MODULE II

Public-Key Cryptography and RSA: Principles of public-key cryptosystems. Public-key cryptosystems. Applications for public-key cryptosystems, requirements for public-key cryptosystems. public-key cryptanalysis. The RSA algorithm, description of the algorithm, computational aspects, the security of RSA. **Other Public-Key Cryptosystems:** Diffie-hellman key exchange, The algorithm, key exchange protocols, man in the middle attack, Elgamal Cryptographic systems, Elliptic curve arithmetic, abelian groups, elliptic curves over real numbers, elliptic curves over Zp, elliptic curves overGF(2m), Elliptic curve cryptography, Analog of Diffie-hellman key exchange, Elliptic curve encryption/ decryption, security of Elliptic curve cryptography, Pseudorandom number generation based on an asymmetric cipher, PRNG based on RSA. **10 Hours**

MODULE III

Key Management and Distribution: Symmetric key distribution using Symmetric encryption, A key distribution scenario, Hierarchical key control, session key lifetime, a transparent key control scheme, Decentralized key control, controlling key usage, Symmetric key distribution using asymmetric encryption, simple secret key distribution, secret key distribution with confidentiality and authentication, A hybrid scheme, distribution of public keys, public announcement of public keys, publicly available directory, public key authority, public keys certificates, X-509 certificates. Certificates, X-509 version 3, public key infrastructure .**User Authentication:** Remote user Authentication principles, Mutual Authentication, one way Authentication, remote user Authentication using Symmetric encryption, Mutual Authentication, one way Authentication, Kerberos, Motivation , Kerberos version 4, Kerberos version 5, Remote user Authentication using Asymmetric encryption, Mutual Authentication, one way Authentication, federated identity management, identity management, identity federation, personal identity verification.

10 Hours

MODULE IV

Wireless network security: Wireless security, Wireless network threats, Wireless network measures, mobile device security, security threats, mobile device security strategy, IEEE 802.11 Wireless LAN overview, the Wi-Fi alliance, IEEE 802 protocol architecture. Security, IEEE 802.11i services, IEEE 802.11i phases of operation, discovery phase, Authentication phase, key management phase, protected data transfer phase, the IEEE 802.11i pseudorandom function, .
Web Security Considerations: Web Security Threats, Web Traffic Security Approaches. **Secure Sockets Layer:** SSL Architecture, SSL Record Protocol, Change Cipher Spec Protocol, Alert Protocol, and shake Protocol, Cryptographic

Computations. **Transport Layer Security:** Version Number, Message Authentication Code, Pseudorandom Functions, Alert Codes, Cipher Suites, Client Certificate Types, Certificate Verify And Finished Messages, Cryptographic Computations, Padding. **HTTPS** Connection Initiation, Connection Closure. **Secure Shell (SSH)** Transport Layer Protocol, User Authentication Protocol, Connection Protocol.

10 Hours

MODULE V

Electronic Mail Security: Pretty good privacy, notation, operational; description, S/MIME, RFC5322, Multipurpose internet mail extensions, S/MIME functionality, S/MIME messages, S/MIME certificate processing, enhanced security services, Domain keys identified mail, internet mail architecture, E-Mail threats, DKIM strategy, DKIM functional flow. **IP Security:** IP Security overview, applications of IPsec, benefits of IPsec, Routing applications, IPsec documents, IPsec services, transport and tunnel modes, IP Security policy, Security associations, Security associations database, Security policy database, IP traffic processing, Encapsulating Security payload, ESP format, encryption and authentication algorithms, Padding, Anti replay service, transport and tunnel modes, combining security associations, authentication plus confidentiality, basic combinations of security associations, internet key exchange, key determinations protocol, header and payload formats, cryptographic suits. **10 Hours**

Course Outcomes:

The students be able to

- Analyze the vulnerabilities in any computing system and hence be able to design a
- security solution.
- Identify the security issues in the network and resolve it.
- Evaluate security mechanisms using rigorous approaches, including theoretical.

Text Books:

1. William Stallings: Cryptography and Network Security, Pearson 6th edition. 2013

References

1. V k Pachghare: Cryptography and Information Security, PHE ,2013.

Semester: II **Year: 2014-2015**

Course Title : Pattern Recognition	Course Code: 14SCS253
Credits(L:T:P):4:0:0	Core/Elective: Elective
Type of Course: Lecture	Total Contact Hours: 50 Hrs

Course Objectives:

- To study the mathematical morphology necessary for Pattern recognition.
- To introduce the student to various Pattern recognition techniques.
- To study the Representation and description and feature extraction.
- To study the principles of decision trees and clustering in pattern recognition.

TOPICS:

MODULE I

Introduction: Definition of PR, Applications, Datasets for PR, Different paradigms for PR, Introduction to probability, events, random variables, Joint distributions and densities, moments. Estimation minimum risk estimators, problems.

10 Hours

MODULE II

Representation: Data structures for PR, Representation of clusters, proximity measures, size of patterns, Abstraction of Data set, Feature extraction, Feature selection, Evaluation. **10 Hours**

MODULE III

Nearest Neighbor based classifiers & Bayes classifier: Nearest neighbor algorithm, variants of NN algorithms, use of NN for transaction databases, efficient algorithms, Data reduction, prototype selection, Bayes theorem, minimum error rate classifier, estimation of probabilities, estimation of probabilities, comparison with NNC, Naive Bayes classifier, Basyessian belief network. **10 Hours**

MODULE IV

Decision Trees: Introduction, DT for PR, Construction of DT, Splitting at the nodes, Over-fitting & Pruning, Examples.

10 Hours

MODULE V

Clustering: Hierarchical (Agglomerative, single/complete/average linkage, wards, Partitional (Forgy's, k-means, Iso-data), clustering large data sets, examples. **10 Hours**

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

- Develop and analyze decision tress.
- Design the nearest neighbor classifier.
- Develop algorithms for Pattern Recognition.

Text Books:

1. Pattern Recognition (An Introduction) , V Susheela Devi, M Narsimha Murthy, Universities Press, ISBN 978-81-7371-725-3,2011.
2. Pattern Recognition & Image Analysis, Earl Gose, Richard Johnsonbaugh, Steve Jost. PHI ISBN-81-203-1484-0, 1996.

References

1. Duda R. O., P.E. Hart, D.G. Stork., Pattern Classification, John Wiley and sons, 2000.

Semester: IV **Year: 2014-2015**

Course Title: Machine Learning Techniques	**Course Code: 14SCS41**
Credits(L:T:P):3:0:1	**Core/Elective: Core**
Type of Course: Lecture & Practical	**Total Contact Hours: 50 Hrs**

COURSE OBJECTIVES:

- To understand the basic concepts of learning and decision trees.
- To understand the neural networks and genetic algorithms
- To understand the Bayesian techniques
- To understand the instant based learning
- To understand the analytical learning and reinforced learning

TOPICS:

MODULE I

INTRODUCTION, CONCEPT LEARNING AND DECISION TREES

Learning Problems – Designing Learning systems, Perspectives and Issues – Concept Learning – Version Spaces and Candidate Elimination Algorithm – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search. **10 Hrs**

MODULE II

NEURAL NETWORKS AND GENETIC ALGORITHMS

Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evolution and Learning. **10 Hrs**

MODULE III

BAYESIAN AND COMPUTATIONAL LEARNING

Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network – EM Algorithm – Probably Learning – Sample Complexity for Finite and Infinite Hypothesis Spaces – Mistake Bound Model. **10 Hrs**

MODULE IV

INSTANT BASED LEARNING AND LEARNING SET OF RULES

K- Nearest Neighbor Learning – Locally Weighted Regression – Radial Basis Functions – Case-Based Reasoning – Sequential Covering Algorithms – Learning Rule Sets – Learning First Order Rules – Learning Sets of First Order Rules – Induction as Inverted Deduction – Inverting Resolution

10 Hrs

MODULE V

ANALYTICAL LEARNING AND REINFORCED LEARNING

Perfect Domain Theories – Explanation Based Learning – Inductive-Analytical Approaches - FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning

10 Hrs

LABORATORY WORK

(The following tasks can be implemented in a language of your choice or any tools available)

1) Implement the CANDIDATE – ELIMINATION algorithm. Show how it is used to learn from training examples and hypothesize new instances in Version Space.
2) Implement the FIND–S algorithm. Show how it can be used to classify new instances of target concepts. Run the experiments to deduce instances and hypothesis consistently.

3) Implement the ID3 algorithm for learning Boolean–valued functions for classifying the training examples by searching through the space of a Decision Tree.
4) Design and implement the Back-propagation algorithm by applying it to a learning task involving an application like FACE RECOGNITION.
5) Design and implement Naïve Bayes Algorithm for learning and classifying TEXT DOCUMENTS.

COURSE OUTCOMES:

On Completion of the course, the students will be able to

- Choose the learning techniques with this basic knowledge.
- Apply effectively neural networks and genetic algorithms for appropriate applications.
- Apply bayesian techniques and derive effectively learning rules.
- Choose and differentiate reinforcement and analytical learning techniques

TEXT BOOK:

1. Tom M. Mitchell, "Machine Learning", McGraw-Hill Education (INDIAN EDITION), 2013.

REFERENCES:

2. Ethem Alpaydin, "Introduction to Machine Learning", 2nd Ed., PHI Learning Pvt. Ltd., 2013.
3. T. Hastie, R. Tibshirani, J. H. Friedman, "The Elements of Statistical Learning", Springer; 1st edition, 2001.

ANALOG ELECTRONIC CIRCUITS
(Common to EC/TC/EE/IT/BM/ML)

Sub Code	:	**10ES32**	**IA Marks**	:	**25**
Hrs/ Week	:	**04**	**Exam Hours**	:	**03**
Total Hrs.	:	**52**	**Exam Marks**	:	**100**

PART – A

UNIT 1:
Diode Circuits: Diode Resistance, Diode equivalent circuits, Transition and diffusion capacitance, Reverse recovery time, Load line analysis, Rectifiers, Clippers and clampers. **6 Hours**

UNIT 2:
Transistor Biasing: Operating point, Fixed bias circuits, Emitter stabilized biased circuits, Voltage divider biased, DC bias with voltage feedback, Miscellaneous bias configurations, Design operations, Transistor switching networks, PNP transistors, Bias stabilization. **6 Hours**

UNIT 3:
Transistor at Low Frequencies: BJT transistor modeling, CE Fixed bias configuration, Voltage divider bias, Emitter follower, CB configuration, Collector feedback configuration, Analysis of circuits r_e model; analysis of CE configuration using h- parameter model; Relationship between h-parameter model of CE,CC and CE configuration. **7 Hours**

UNIT 4:
Transistor Frequency Response: General frequency considerations, low frequency response, Miller effect capacitance, High frequency response, multistage frequency effects. **7 Hours**

PART – B

UNIT 5:
(a) General Amplifiers: Cascade connections, Cascode connections, Darlington connections. **3 Hours**
(b) Feedback Amplifier: Feedback concept, Feedback connections type, Practical feedback circuits. Design procedures for the feedback amplifiers. **4 Hours**

UNIT 6:

Power Amplifiers: Definitions and amplifier types, series fed class A amplifier, Transformer coupled Class A amplifiers, Class B amplifier operations, Class B amplifier circuits, Amplifier distortions. Designing of Power amplifiers. **7 Hours**

UNIT 7:

Oscillators: Oscillator operation, Phase shift Oscillator, Wienbridge Oscillator, Tuned Oscillator circuits, Crystal Oscillator. (BJT Version Only) Simple design methods of Oscillators. **6 Hours**

UNIT 8:

FET Amplifiers: FET small signal model, Biasing of FET, Common drain common gate configurations, MOSFETs, FET amplifier networks.

6 Hours

TEXT BOOK:

1. **"Electronic Devices and Circuit Theory",** Robert L. Boylestad and Louis Nashelsky, PHI/Pearson Eduication. 9TH Edition.

REFERENCE BOOKS:

1. **'Integrated Electronics',** Jacob Millman & Christos C. Halkias, Tata - McGraw Hill, 2nd Edition, 2010
2. **"Electronic Devices and Circuits",** David A. Bell, PHI, 4th Edition, 2004
3. "**Analog Electronics Circuits: A Simplified Approach"**, U.B. Mahadevaswamy, Pearson/Saguine, 2007.

LOGIC DESIGN
(Common to EC/TC/EE/IT/BM/ML)

Sub Code	**:**	**10ES33**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:

Principles of combinational logic-1: Definition of combinational logic, Canonical forms, Generation of switching equations from truth tables,

UNIT 6:

Power Amplifiers: Definitions and amplifier types, series fed class A amplifier, Transformer coupled Class A amplifiers, Class B amplifier operations, Class B amplifier circuits, Amplifier distortions. Designing of Power amplifiers. **7 Hours**

UNIT 7:

Oscillators: Oscillator operation, Phase shift Oscillator, Wienbridge Oscillator, Tuned Oscillator circuits, Crystal Oscillator. (BJT Version Only) Simple design methods of Oscillators. **6 Hours**

UNIT 8:

FET Amplifiers: FET small signal model, Biasing of FET, Common drain common gate configurations, MOSFETs, FET amplifier networks.

6 Hours

TEXT BOOK:

1. **"Electronic Devices and Circuit Theory",** Robert L. Boylestad and Louis Nashelsky, PHI/Pearson Eduication. 9TH Edition.

REFERENCE BOOKS:

1. **'Integrated Electronics',** Jacob Millman & Christos C. Halkias, Tata - McGraw Hill, 2nd Edition, 2010
2. **"Electronic Devices and Circuits",** David A. Bell, PHI, 4th Edition, 2004
3. "**Analog Electronics Circuits: A Simplified Approach"**, U.B. Mahadevaswamy, Pearson/Saguine, 2007.

LOGIC DESIGN
(Common to EC/TC/EE/IT/BM/ML)

Sub Code	**:**	**10ES33**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:

Principles of combinational logic-1: Definition of combinational logic, Canonical forms, Generation of switching equations from truth tables,

Karnaugh maps-3, 4 and 5 variables, Incompletely specified functions (Don't Care terms), Simplifying Max term equations. **6 Hours**

UNIT 2:

Principles of combinational Logic-2: Quine-McCluskey minimization technique- Quine-McCluskey using don't care terms, Reduced Prime Implicant Tables, Map entered variables. **7 Hours**

UNIT 3:

Analysis and design of combinational logic - I: General approach, Decoders-BCD decoders, Encoders. **6 Hours**

UNIT 4:

Analysis and design of combinational logic - II: Digital multiplexers- Using multiplexers as Boolean function generators. Adders and subtractors-Cascading full adders, Look ahead carry, Binary comparators. Design methods of building blocks of combinational logics.

7 Hours

PART – B

UNIT 5:

Sequential Circuits – 1: Basic Bistable Element, Latches, SR Latch, Application of SR Latch, A Switch Debouncer, The $\bar{S}\bar{R}$ Latch, The gated SR Latch, The gated D Latch, The Master-Slave Flip-Flops (Pulse-Triggered Flip-Flops): The Master-Slave SR Flip-Flops, The Master-Slave JK Flip-Flop, Edge Triggered Flip-Flop: The Positive Edge-Triggered D Flip-Flop, Negative-Edge Triggered D Flip-Flop. **7 Hours**

UNIT 6:

Sequential Circuits – 2: Characteristic Equations, Registers, Counters - Binary Ripple Counters, Synchronous Binary counters, Counters based on Shift Registers, Design of a Synchronous counters, Design of a Synchronous Mod-6 Counter using clocked JK Flip-Flops Design of a Synchronous Mod-6 Counter using clocked D, T, or SR Flip-Flops **7 Hours**

UNIT 7:

Sequential Design - I: Introduction, Mealy and Moore Models, State Machine Notation, Synchronous Sequential Circuit Analysis and Design.

6 Hours

UNIT 8:
Sequential Design - II: Construction of state Diagrams, Counter Design.
6 Hours

TEXT BOOKS:
1. **"Digital Logic Applications and Design"**, John M Yarbrough, Thomson Learning, 2001.
2. **"Digital Principles and Design ",** Donald D Givone, Tata McGraw Hill Edition, 2002.

REFERENCE BOOKS:
1. **"Fundamentals of logic design",** Charles H Roth, Jr; Thomson Learning, 2004.
2. **"Logic and computer design Fundamentals",** Mono and Kim, Pearson, Second edition, 2001.
3. **"Logic Design",** Sudhakar Samuel, Pearson/Saguine, 2007

NETWORK ANALYSIS
(Common to EC/TC/EE/IT/BM/ML)

Sub Code	**:**	**10ES34**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:
Basic Concepts: Practical sources, Source transformations, Network reduction using Star – Delta transformation, Loop and node analysis With linearly dependent and independent sources for DC and AC networks, Concepts of super node and super mesh. **7 Hours**
UNIT 2:
Network Topology: Graph of a network, Concept of tree and co-tree, incidence matrix, tie-set, tie-set and cut-set schedules, Formulation of equilibrium equations in matrix form, Solution of resistive networks, Principle of duality**.** **7 Hours**
UNIT 3:
Network Theorems – 1: Superposition, Reciprocity and Millman's theorems. **6 Hours**

transform representation of discrete time signals. Sampling theorm and Nyquist rate. **7 Hours**

UNIT 7:
Z-Transforms – 1: Introduction, Z – transform, properties of ROC, properties of Z – transforms, inversion of Z – transforms.
6 Hours

UNIT 8:
Z-transforms – 2: Transform analysis of LTI Systems, unilateral Z-Transform and its application to solve difference equations. **6 Hours**

TEXT BOOK

1. **Simon Haykin,** "Signals and Systems", John Wiley India Pvt. Ltd., 2nd Edn, 2008.
2. **Michael Roberts,** "Fundamentals of Signals & Systems", 2nd ed, Tata McGraw-Hill, 2010.

REFERENCE BOOKS:

1. **Alan V Oppenheim, Alan S, Willsky and A Hamid Nawab,** "Signals and Systems" Pearson Education Asia / PHI, 2nd edition, 1997. Indian Reprint 2002.
2. **H. P Hsu, R. Ranjan**, "Signals and Systems", Scham's outlines, TMH, 2006.
3. **B. P. Lathi**, "Linear Systems and Signals", Oxford University Press, 2005.
4. **Ganesh Rao and Satish Tunga**, "Signals and Systems", Pearson/Sanguine Technical Publishers, 2004.

FUNDAMENTALS OF HDL
(Common to EC/TC/IT/BM/ML)

Sub Code	**:**	**10EC45**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:
Introduction: Why HDL? , A Brief History of HDL, Structure of HDL Module, Operators, Data types, Types of Descriptions, simulation and synthesis, Brief comparison of VHDL and Verilog
7 Hours

UNIT 2:
Data –Flow Descriptions: Highlights of Data-Flow Descriptions, Structure of Data-Flow Description, Data Type – Vectors. **6 Hours**

UNIT 3:
Behavioral Descriptions: Behavioral Description highlights, structure of HDL behavioral Description, The VHDL variable –Assignment Statement, sequential statements. **6 Hours**

UNIT 4:
Structural Descriptions: Highlights of structural Description, Organization of the structural Descriptions, Binding, state Machines, Generate, Generic, and Parameter statements.

7 Hours

PART – B

UNIT 5:
Procedures, Tasks, and Functions: Highlights of Procedures, tasks, and Functions, Procedures and tasks, Functions.
Advanced HDL Descriptions: File Processing, Examples of File Processing
7 Hours

UNIT 6:
Mixed –Type Descriptions: Why Mixed-Type Description? VHDL User-Defined Types, VHDL Packages, Mixed-Type Description examples
6 Hours

UNIT 7:
Mixed –Language Descriptions: Highlights of Mixed-Language Description, How to invoke One language from the Other, Mixed-language Description Examples, Limitations of Mixed-Language Description.
7 Hours

UNIT 8:
Synthesis Basics: Highlights of Synthesis, Synthesis information from Entity and Module, Mapping Process and Always in the Hardware Domain.
6 Hours

TEXT BOOKS:
1. **HDL Programming (VHDL and Verilog**)- Nazeih M.Botros- John Weily India Pvt. Ltd. 2008.

REFERENCE BOOKS:
1. **Fundamentals of HDL** – Cyril P.R. Pearson/Sanguin 2010.
2. **VHDL** -Douglas perry-Tata McGraw-Hill.
3. **A Verilog HDL Primer**- J.Bhaskar – BS Publications
4. **Circuit Design with VHDL**-Volnei A.Pedroni-PHI.

MICROCONTROLLERS LAB
(Common to EC/TC/EE/IT/BM/ML)

Sub Code	**:**	**10ESL47**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**03**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**42**	**Exam Marks**	**:**	**50**

I. PROGRAMMING

1. Data Transfer - Block move, Exchange, Sorting, Finding largest element in an array.
2. Arithmetic Instructions - Addition/subtraction, multiplication and division, square, Cube – (16 bits Arithmetic operations – bit addressable).
3. Counters.
4. Boolean & Logical Instructions (Bit manipulations).
5. Conditional CALL & RETURN.
6. Code conversion: BCD – ASCII; ASCII – Decimal; Decimal - ASCII; HEX - Decimal and Decimal - HEX .
7. Programs to generate delay, Programs using serial port and on-Chip timer / counter.

Note: Programming exercise is to be done on both 8051 & MSP430.

II. INTERFACING:

Write C programs to interface 8051 chip to Interfacing modules to develop single chip solutions.

8. Simple Calculator using 6 digit seven segment displays and Hex Keyboard interface to 8051.
9. Alphanumeric LCD panel and Hex keypad input interface to 8051.
10. External ADC and Temperature control interface to 8051.
11. Generate different waveforms Sine, Square, Triangular, Ramp etc. using DAC interface to 8051; change the frequency and amplitude.
12. Stepper and DC motor control interface to 8051.
13. Elevator interface to 8051.

HDL LAB
(Common to EC/TC/IT/BM/ML)

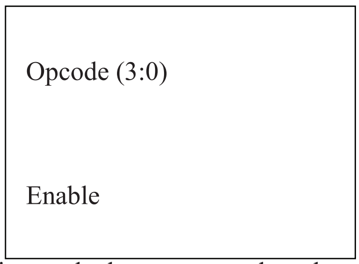
Sub Code	**:**	**10ECL48**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**03**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**42**	**Exam Marks**	**:**	**50**

Note: Programming can be done using any compiler. Download the programs on a FPGA/CPLD boards such as Apex/Acex/Max/Spartan/Sinfi/TK Base or equivalent and performance testing may be done using 32 channel pattern generator and logic analyzer apart from verification by simulation with tools such as Altera/Modelsim or equivalent.

PROGRAMMING (using VHDL /Verilog)

1. Write HDL code to realize all the logic gates
2. Write a HDL program for the following combinational designs
   a. 2 to 4 decoder
   b. 8 to 3 (encoder without priority & with priority)
   c. 8 to 1 multiplexer
   d. 4 bit binary to gray converter
   e. Multiplexer, de-multiplexer, comparator.
2. Write a HDL code to describe the functions of a Full Adder Using three modeling styles.

3. Write a model for 32 bit ALU using the schematic diagram shown below
A (31:0) B (31:0)



- ALU should use combinational logic to calculate an output based on the four bit op-code input.
- ALU should pass the result to the out bus when enable line in high, and tri-state the out bus when the enable line is low.
- ALU should decode the 4 bit op-code according to the given in example below.

OPCODE	ALU OPERATION
1.	A + B
2.	A – B
3.	A Complement
4.	A * B
5.	A AND B
6.	A OR B
7.	A NAND B
8.	A XOR B

4. Develop the HDL code for the following flip-flops, SR, D, JK, T.
5. Design 4 bit binary, BCD counters (Synchronous reset and Asynchronous reset) and "any sequence" counters

INTERFACING (at least four of the following must be covered using VHDL/Verilog)

1. Write HDL code to display messages on the given seven segment display and LCD and accepting Hex key pad input data.

2. Write HDL code to control speed, direction of DC and Stepper motor.

3. Write HDL code to accept 8 channel Analog signal, Temperature sensors and display the data on LCD panel or Seven segment display.

4. Write HDL code to generate different waveforms (Sine, Square, Triangle, Ramp etc.,) using DAC change the frequency and amplitude.

5. Write HDL code to simulate Elevator operations
6. Write HDL code to control external lights using relays.

DIGITAL SIGNAL PROCESSING

Subject Code	: **10EC52**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1
Discrete Fourier Transforms (DFT): Frequency domain sampling and reconstruction of discrete time signals. DFT as a linear transformation, its relationship with other transforms. **6 Hours**

UNIT - 2
Properties of DFT, multiplication of two DFTs- the circular convolution, additional DFT properties. **6 Hours**

UNIT - 3
Use of DFT in linear filtering, overlap-save and overlap-add method. Direct computation of DFT, need for efficient computation of the DFT (FFT algorithms). **7 Hours**

UNIT - 4
Radix-2 FFT algorithm for the computation of DFT and IDFT–decimation-in-time and decimation-in-frequency algorithms. Goertzel algorithm, and chirp-z transform. **7 Hours**

PART – B

UNIT - 5
IIR filter design: Characteristics of commonly used analog filters – Butterworth and Chebysheve filters, analog to analog frequency transformations. **6 Hours**

UNIT - 6
Implementation of discrete-time systems: Structures for IIR and FIR systems-direct form I and direct form II systems, cascade, lattice and parallel realization. **7 Hours**

UNIT - 7
FIR filter design: Introduction to FIR filters, design of FIR filters using - Rectangular, Hamming, Bartlet and Kaiser windows, FIR filter design using frequency sampling technique. **6 Hours**

UNIT - 8

Design of IIR filters from analog filters (Butterworth and Chebyshev) - impulse invariance method. Mapping of transfer functions: Approximation of derivative (backward difference and bilinear transformation) method, Matched z transforms, Verification for stability and linearity during mapping

7 Hours

TEXT BOOK:

1. **Digital signal processing – Principles Algorithms & Applications**, Proakis & Monalakis, Pearson education, 4th Edition, New Delhi, 2007.

REFERENCE BOOKS:

1. **Discrete Time Signal Processing**, Oppenheim & Schaffer, PHI, 2003.
2. **Digital Signal Processing**, S. K. Mitra, Tata Mc-Graw Hill, 3rd Edition, 2010.
3. **Digital Signal Processing**, Lee Tan: Elsivier publications, 2007

ANALOG COMMUNICATION

Subject Code	: **10EC53**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

RANDOM PROCESS: Random variables: Several random variables. Statistical averages: Function of Random variables, moments, Mean, Correlation and Covariance function: Principles of autocorrelation function, cross – correlation functions. Central limit theorem, Properties of Gaussian process. **7 Hours**

UNIT - 2

AMPLITUDE MODULATION: Introduction, AM: Time-Domain description, Frequency – Domain description. Generation of AM wave: square law modulator, switching modulator. Detection of AM waves: square law detector, envelop detector. Double side band suppressed carrier modulation (DSBSC): Time-Domain description, Frequency-Domain representation, Generation of DSBSC waves: balanced modulator, ring modulator. Coherent detection of DSBSC modulated waves. Costas loop.

7 Hours

TEXT BOOKS:

1. **Communication Systems**, Simon Haykins, 5^{th} Edition, John Willey, India Pvt. Ltd, 2009.
2. **An Introduction to Analog and Digital Communication**, Simon Haykins, John Wiley India Pvt. Ltd., 2008

REFERENCE BOOKS:

1. **Modern digital and analog Communication systems** B. P. Lathi, Oxford University Press., 4^{th} ed, 2010,
2. **Communication Systems**, Harold P.E, Stern Samy and A Mahmond, Pearson Edn, 2004.
3. **Communication Systems**: Singh and Sapre**:** Analog and digital TMH 2^{nd} , Ed 2007.

MICROWAVES AND RADAR

Subject Code	: **10EC54**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

MICROWAVE TRANSMISSION LINES: Introduction, transmission lines equations and solutions, reflection and transmission coefficients, standing waves and SWR, line impedance and line admittance. Smith chart, impedance matching using single stubs, Microwave coaxial connectors.

7 Hours

UNIT - 2

MICROWAVE WAVEGUIDES AND COMPONENTS: Introduction, rectangular waveguides, circular waveguides, microwave cavities, microwave hybrid circuits, directional couplers, circulators and isolators.

6 Hours

UNIT - 3

MICROWAVE DIODES,

Transfer electron devices: Introduction, GUNN effect diodes – GaAs diode, RWH theory, Modes of operation, Avalanche transit time devices: READ diode, IMPATT diode, BARITT diode, Parametric amplifiers

Other diodes: PIN diodes, Schottky barrier diodes. **7 Hours**

UNIT - 4

Microwave network theory and passive devices. Symmetrical Z and Y parameters, for reciprocal Networks, S matrix representation of multi port networks. **6 Hours**

PART – B

UNIT - 5

Microwave passive devices, Coaxial connectors and adapters, Phase shifters, Attenuators, Waveguide Tees, Magic tees. **6 Hours**

UNIT - 6

STRIP LINES: Introduction, Microstrip lines, Parallèle strip lines, Coplanar strip lines, Shielded strip Lines. **6 Hours**

UNIT - 7

AN INTRODUCTION TO RADAR: Basic Radar, The simple form of the Radar equation, Radar block diagram, Radar frequencies, application of Radar, the origins of Radar. **7 Hours**

UNIT - 8

MTI AND PULSE DOPPLER RADAR: Introduction to Doppler and MTI Radar, delay line Cancellers, digital MTI processing, Moving target detector, pulse Doppler Radar. **7 Hours**

TEXT BOOKS:

1. **Microwave Devices and circuits**- Liao / Pearson Education.
2. **Introduction to Radar systems**-Merrill I Skolnik, 3rd Ed, TMH, 2001.
3. **Microwave Engineering** – Annapurna Das, Sisir K Das TMH Publication, 2nd , 2010.

REFERENCE BOOK:

1. **Microwave Engineering** – David M Pozar, John Wiley India Pvt. Ltd., 3rd Edn, 2008.

INFORMATION THEORY AND CODING

Subject Code	: **10EC55**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1
INFORMATION THEORY: Introduction, Measure of information, Average information content of symbols in long independent sequences, Average information content of symbols in long dependent sequences. Mark-off statistical model for information source, Entropy and information rate of mark-off source. **7 Hours**

UNIT - 2
SOURCE CODING: Encoding of the source output, Shannon's encoding algorithm. Communication Channels, Discrete communication channels, Continuous channels. **6 Hours**

UNIT - 3
FUNDAMENTAL LIMITS ON PERFORMANCE: Source coding theorem, Huffman coding, Discrete memory less Channels, Mutual information, Channel Capacity. **7 Hours**

UNIT - 4
Channel coding theorem, Differential entropy and mutual information for continuous ensembles, Channel capacity Theorem. **6 Hours**

PART – B

UNIT - 5
INTRODUCTION TO ERROR CONTROL CODING: Introduction, Types of errors, examples, Types of codes Linear Block Codes: Matrix description, Error detection and correction, Standard arrays and table look up for decoding. **7 Hours**

UNIT - 6
Binary Cycle Codes, Algebraic structures of cyclic codes, Encoding using an (n-k) bit shift register, Syndrome calculation. BCH codes. **6 Hours**

UNIT - 7
RS codes, Golay codes, Shortened cyclic codes, Burst error correcting codes. Burst and Random Error correcting codes. **7 Hours**

UNIT - 8
Convolution Codes, Time domain approach. Transform domain approach. **6 Hours**

TEXT BOOKS:

1. **Digital and analog communication systems**, K. Sam Shanmugam, John Wiley India Pvt. Ltd, 1996.
2. **Digital communication**, Simon Haykin, John Wiley India Pvt. Ltd, 2008.

REFERENCE BOOKS:

1. **ITC and Cryptography**, Ranjan Bose, TMH, II edition, 2007
2. **Digital Communications** - Glover and Grant**;** Pearson Ed. 2nd Ed 2008.

FUNDAMENTALS OF CMOS VLSI

Subject Code	: **10EC56**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1
BASIC MOS TECHNOLOGY: Integrated circuit's era. Enhancement and depletion mode MOS transistors. nMOS fabrication. CMOS fabrication. Thermal aspects of processing. BiCMOS technology. Production of E-beam masks. **3 Hours**

MOS TRANSISTOR THEORY: Introduction, MOS Device Design Equations, The Complementary CMOS Inverter – DC Characteristics, Static Load MOS Inverters, The Differential Inverter, The Transmission Gate, Tristate Inverter**.** **4 Hours**

UNIT - 8

TESTABILITY: Performance parameters. Layout issues. I/O pads. Real estate. System delays. Ground rules for design. Test and testability.

7 Hours

TEXT BOOKS:

1. **CMOS VLSI Design – A Circuits and Systems Perspective. 3rd Edition. N.H. Weste and David Harris. Addison-Wesley, 2005. (Refer to** http://www.cmosvlsi.com**).**
2. **Principles of CMOS VLSI Design: A Systems Perspective**, Neil H. E. Weste, K. Eshragian, and ??? 3rd edition, Pearson Education (Asia) Pvt. Ltd., 200?. (Shift to the latest edition.).
3. **Basic VLSI Design** - Douglas A. Pucknell & Kamran Eshraghian, PHI 3rd Edition (original Edition – 1994), 2005.

REFERENCE BOOKS:

1. R. Jacob Baker. CMOS Circuit Design, Layout and Simulation. John Wiley India Pvt. Ltd, 2008.
2. **Fundamentals of Semiconductor Devices**, M. K. Achuthan and K. N. Bhat, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2007.
3. **CMOS Digital Integrated Circuits: Analysis and Design**, Sung-Mo Kang & Yusuf Leblebici, 3rd Edition, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2007.
4. **Analysis and Design of Digital Integrated Circuits** - D.A Hodges, H.G Jackson and R.A Saleh. 3rd Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2007.

DIGITAL SIGNAL PROCESSING LABORATORY

Subject Code	: **10ECL57**	IA Marks	: 25
No. of Practical Hrs/Week	: 03	Exam Hours	: 03
Total no. of Practical Hrs.	: 42	Exam Marks	: 50

A LIST OF EXPERIMENTS USING MATLAB / SCILAB / OCTAVE / WAB

3. Verification of Sampling theorem.
4. Impulse response of a given system
5. Linear convolution of two given sequences.
6. Circular convolution of two given sequences

7. Autocorrelation of a given sequence and verification of its properties.
8. Cross correlation of given sequences and verification of its properties.
9. Solving a given difference equation.
10. Computation of N point DFT of a given sequence and to plot magnitude and phase spectrum.
11. Linear convolution of two sequences using DFT and IDFT.
12. Circular convolution of two given sequences using DFT and IDFT
13. Design and implementation of FIR filter to meet given specifications.
14. Design and implementation of IIR filter to meet given specifications.

B. LIST OF EXPERIMENTS USING DSP PROCESSOR

1.Linear convolution of two given sequences.

2.Circular convolution of two given sequences.

3.Computation of N- Point DFT of a given sequence

4.Realization of an FIR filter (any type) to meet given specifications .The input can be a signal from function generator / speech signal.

5.Audio applications such as to plot time and frequency (Spectrum) display of Microphone output plus a cosine using DSP. Read a wav file and match with their respective spectrograms

6.Noise: Add noise above 3kHz and then remove; Interference suppression using 400 Hz tone.

7.Impulse response of first order and second order system

REFERENCE BOOKS:

1. **Digital signal processing using MATLAB -** Sanjeet Mitra, TMH, 2001
2. **Digital signal processing using MATLAB** - J. G. Proakis & Ingale, MGH, 2000
3. **Digital Signal Processors**, B. Venkataramani and Bhaskar, TMH,2002

ANALOG COMMUNICATION LAB + LIC LAB

Subject Code	: **10ECL58**	IA Marks	: 25
No. of Practical Hrs/Week	: 03	Exam Hours	: 03
Total no. of Practical Hrs.	: 42	Exam Marks	: 50

EXPERIMENTS USING DESCERTE COMPONENTS and LABVIEW - 2009 CAN BE USED FOR VERIFICATION AND TESTING.

1. Second order active LPF and HPF
2. Second order active BPF and BE
3. Schmitt Trigger Design and test a Schmitt trigger circuit for the given values of UTP and LTP

VI SEMESTER

DIGITAL COMMUNICATION

Subject Code	: **10EC61**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

Basic signal processing operations in digital communication. Sampling Principles: Sampling Theorem, Quadrature sampling of Band pass signal, Practical aspects of sampling and signal recovery. **7 Hours**

UNIT - 2

PAM, TDM. Waveform Coding Techniques, PCM, Quantization noise and SNR, robust quantization. **6 Hours**

UNIT - 3

DPCM, DM, applications. Base-Band Shaping for Data Transmission, Discrete PAM signals, power spectra of discrete PAM signals. **7 Hours**

UNIT - 4

ISI, Nyquist's criterion for distortion less base-band binary transmission, correlative coding, eye pattern, base-band M-ary PAM systems, adaptive equalization for data transmission. **6 Hours**

PART – B

UNIT - 5

DIGITAL MODULATION TECHNIQUES: Digital Modulation formats, Coherent binary modulation techniques, Coherent quadrature modulation techniques. Non-coherent binary modulation techniques. **6 Hours**

UNIT - 6

Detection and estimation, Model of DCS, Gram-Schmidt Orthogonalization procedure, geometric interpretation of signals, response of bank of correlators to noisy input. **6 Hours**

UNIT - 7

Detection of known signals in noise, correlation receiver, matched filter receiver, detection of signals with unknown phase in noise. **7 Hours**

UNIT - 8

Spread Spectrum Modulation: Pseudo noise sequences, notion of spread spectrum, direct sequence spread spectrum, coherent binary PSK, frequency hop spread spectrum, applications. **7 Hours**

TEXT BOOK:

1. **Digital communications**, Simon Haykin, John Wiley India Pvt. Ltd, 2008.

REFERENCE BOOKS:

1. **Digital and Analog communication systems,** Simon Haykin, John Wildy India Lts, 2008
2. **An introduction to Analog and Digital Communication**, K. Sam Shanmugam, John Wiley India Pvt. Ltd, 2008.
3. **Digital communications** - Bernard Sklar: Pearson education 2007

MICROPROCESSOR

Subject Code	: **10EC62**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

8086 PROCESSORS: Historical background, The microprocessor-based personal computer system, 8086 CPU Architecture, Machine language instructions, Instruction execution timing. **6 Hours**

UNIT - 2

INSTRUCTION SET OF 8086: Assembler instruction format, data transfer and arithmetic, branch type, loop, NOP & HALT, flag manipulation, logical and shift and rotate instructions. Illustration of these instructions with example programs, Directives and operators. **6 Hours**

UNIT - 3

BYTE AND STRING MANIPULATION: String instructions, REP Prefix, Table translation, Number format conversions, Procedures, Macros, Programming using keyboard and video display. **7 Hours**

UNIT - 4

8086 INTERRUPTS: 8086 Interrupts and interrupt responses, Hardware interrupt applications, Software interrupt applications, Interrupt examples.
7 Hours

Stability problem. Effect of feedback an amplifier poles. Stability study using Bode plots. Frequency compensation. SPICE examples. **7 Hours**

UNIT - 6

Operational Amplifiers: The two stage CMOS Op-amp, folded cascade CMOS op-amp, 741 op-amp circuit, DC analysis of the 741, small signal analysis of 741, gain, frequency response and slew rate of 741. Data Converters. A-D and D-A converters. **6 Hours**

UNIT – 7 & 8

Digital CMOS circuits. Overview. Design and performance analysis of CMOS inverter. Logic Gate Circuits. Pass-transistor logic. Dynamic Logic Circuits. SPICE examples. **12 Hours**

TEXT BOOK:

1. **"Microelectronic Circuits",** Adel Sedra and K.C. Smith, 5^{th} Edition, Oxford University Press, Interantional Version, 2009.

REFERENCE BOOK:

1. "**Fundamentals of Microelectronics**" , Behzad Razavi, John Wiley India Pvt. Ltd, 2008.
2. **"Microelectronics – Analysis and Design"**, Sundaram Natarajan,
3. Tata McGraw-Hill, 2007

ANTENNAS AND PROPAGATION

Subject Code	: **10EC64**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

ANTENNA BASICS: Introduction, basic Antenna parameters, patterns, beam area, radiation intensity, beam efficiency, diversity and gain, antenna apertures, effective height, bandwidth, radiation, efficiency, antenna temperature and antenna filed zones.

7 Hours

UNIT - 2

POINT SOURCES AND ARRAYS: Introduction, point sources, power patterns, power theorem, radiation intensity, filed patterns, phase patterns. Array of two isotropic point sources. Endfire array and Broadside array.

6 Hours

UNIT - 3

ELECTRIC DIPOLES AND THIN LINEAR ANTENNAS: Introduction, short electric dipole, fields of a short dipole(no derivation of field components), radiation resistance of short dipole, radiation resistances of lambda/2 Antenna, thin linear antenna, micro strip arrays, low side lobe arrays, long wire antenna, folded dipole antennas. **7 Hours**

UNIT - 4

LOOP, SLOT, PATCH AND HORN ANTENNA: Introduction, small loop, comparison of far fields of small loop and short dipole, loop antenna general case, far field patterns of circular loop, radiation resistance, directivity, slot antenna, Babinet's principle and complementary antennas, impedance of complementary and slot antennas, patch antennas.

8 Hours

PART – B

UNIT – 5 & 6

ANTENNA TYPES: Horn antennas, rectangular horn antennas, Helical Antenna, Yagi-Uda array, corner reflectors, parabolic reflectors, log periodic antenna, lens antenna, antenna for special applications – sleeve antenna, turnstile antenna, omni directional antennas, antennas for satellite antennas for ground penetrating radars, embedded antennas, ultra wide band antennas, plasma antenna, high-resolution data, intelligent antennas, antenna for remote sensing.

12 Hours

UNIT - 7 & 8

RADIO WAVE PROPAGATION: Introduction, Ground wave propagation, free space propagation, ground reflection, surface wave, diffraction.

TROPOSPHERE WAVE PROPAGATION: Troposcopic scatter, Ionosphere propagation, electrical properties of the ionosphere, effects of earth's magnetic field. **10 Hours**

TEXT BOOKS:

1. **Antennas and Wave Propagation**, John D. Krauss, 4th Edn,McGraw-Hill International edition, 2010.
2. **Antennas and Wave Propagation** - Harish and Sachidananda: Oxford Press 2007.

REFERENCE BOOKS:

1. **Antenna Theory Analysis and Design** - C A Balanis, 3rd Edn, John Wiley India Pvt. Ltd, 2008.
2. **Antennas and Propagation for Wireless Communication Systems** - Sineon R Saunders, John Wiley, 2003.
3. **Antennas and wave propagation -** G S N Raju: Pearson Education 2005.

OPERATING SYSTEMS

Subject Code	: **10EC65**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

INTRODUCTION AND OVERVIEW OF OPERATING SYSTEMS: Operating system, Goals of an O.S, Operation of an O.S, Resource allocation and related functions, User interface related functions, Classes of operating systems, O.S and the computer system, Batch processing system, Multi programming systems, Time sharing systems, Real time operating systems, distributed operating systems. **6 Hours**

UNIT - 2

STRUCTURE OF THE OPERATING SYSTEMS: Operation of an O.S, Structure of the supervisor, Configuring and installing of the supervisor, Operating system with monolithic structure, layered design, Virtual machine operating systems, Kernel based operating systems, and Microkernel based operating systems. **7 Hours**

TEXT BOOKS:

1. **Antennas and Wave Propagation**, John D. Krauss, 4th Edn,McGraw-Hill International edition, 2010.
2. **Antennas and Wave Propagation** - Harish and Sachidananda: Oxford Press 2007.

REFERENCE BOOKS:

1. **Antenna Theory Analysis and Design** - C A Balanis, 3rd Edn, John Wiley India Pvt. Ltd, 2008.
2. **Antennas and Propagation for Wireless Communication Systems** - Sineon R Saunders, John Wiley, 2003.
3. **Antennas and wave propagation -** G S N Raju: Pearson Education 2005.

OPERATING SYSTEMS

Subject Code	: **10EC65**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

INTRODUCTION AND OVERVIEW OF OPERATING SYSTEMS: Operating system, Goals of an O.S, Operation of an O.S, Resource allocation and related functions, User interface related functions, Classes of operating systems, O.S and the computer system, Batch processing system, Multi programming systems, Time sharing systems, Real time operating systems, distributed operating systems. **6 Hours**

UNIT - 2

STRUCTURE OF THE OPERATING SYSTEMS: Operation of an O.S, Structure of the supervisor, Configuring and installing of the supervisor, Operating system with monolithic structure, layered design, Virtual machine operating systems, Kernel based operating systems, and Microkernel based operating systems. **7 Hours**

UNIT - 3
PROCESS MANAGEMENT: Process concept, Programmer view of processes, OS view of processes, Interacting processes, Threads, Processes in UNIX, Threads in Solaris**.** **6 Hours**

UNIT - 4
MEMORY MANAGEMENT: Memory allocation to programs, Memory allocation preliminaries, Contiguous and noncontiguous allocation to programs, Memory allocation for program controlled data, kernel memory allocation. **7 Hours**

PART – B

UNIT - 5
VIRTUAL MEMORY: Virtual memory basics, Virtual memory using paging, Demand paging, Page replacement, Page replacement policies, Memory allocation to programs, Page sharing, UNIX virtual memory.
6 Hours

UNIT - 6
FILE SYSTEMS: File system and IOCS, Files and directories, Overview of I/O organization, Fundamental file organizations, Interface between file system and IOCS, Allocation of disk space, Implementing file access, UNIX file system. **7 Hours**

UNIT - 7
SCHEDULING: Fundamentals of scheduling, Long-term scheduling, Medium and short term scheduling, Real time scheduling, Process scheduling in UNIX. **6 Hours**

UNIT - 8
MESSAGE PASSING: Implementing message passing, Mailboxes, Inter process communication in UNIX. 7 Hours

TEXT BOOK:

1. **"Operating Systems - A Concept based Approach"**, D. M. Dhamdhare, TMH, 3rd Ed, 2010.

REFERENCE BOOK:

1. **Operating Systems Concepts**, Silberschatz and Galvin, John Wiley India Pvt. Ltd, 5th Edition, 2001.
2. **Operating System – Internals and Design Systems**, Willaim Stalling, Pearson Education, 4th Ed, 2006.
3. **Design of Operating Systems,** Tennambhaum, TMH, 2001.

POWER ELECTRONICS

Subject Code	: **10EC73**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1
Introduction, Applications of power electronics, Power semiconductor devices, Control characteristics, Types of power electronics circuits, Peripheral effects. **6 Hours**

UNIT - 2
POWER TRANSISTOR: Power BJT's, Switching characteristics, Switching limits, Base derive control, Power MOSFET's, Switching characteristics, Gate drive, IGBT's, Isolation of gate and base drives.
6 Hours

UNIT - 3
INTRODUCTION TO THYRISTORS: Principle of operation states anode-cathode characteristics, Two transistor model. Turn-on Methods, Dynamic Turn-on and turn-off characteristics, Gate characteristics, Gate trigger circuits, di / dt and dv / dt protection, Thyristor firing circuits.
7 Hours

UNIT - 4
CONTROLLED RECTIFIERS: Introduction, Principles of phase controlled converter operation, 1φ fully controlled converters, Duel converters, 1 φ semi converters (all converters with R & RL load).
7 Hours

PART – B

UNIT - 5
Thyristor turn off methods, natural and forced commutation, self commutation, class A and class B types, Complementary commutation, auxiliary commutation, external pulse commutation, AC line commutation, numerical problems. **7 Hours**

UNIT - 6
AC VOLTAGE CONTROLLERS: Introduction, Principles of on and off control, Principles of phase control, Single phase controllers with restive loads and Inductive loads, numerical problems.
6 Hours

UNIT - 7

DC CHOPPERS: Introduction, Principles of step down and step up choppers, Step down chopper with RL loads, Chopper classification, Switch mode regulators – buck, boost and buck – boost regulators. **6 Hours**

UNIT - 8

INVERTORS: Introduction, Principles of operation, Performance parameters, 1φ bridge inverter, voltage control of 1φ invertors, current source invertors, Variable DC link inverter.

7 Hours

TEXT BOOKS:

1. **"Power Electronics" -** M. H. Rashid 3rd edition, PHI / Pearson publisher 2004.
2. **"Power Electronics" -** M. D. Singh and Kanchandani K.B. TMH publisher, 2nd Ed. 2007.

REFERENCE BOOKS:

1. **"Power Electronics, Essentials and Applications", L Umanand,** John Wiley India Pvt. Ltd, 2009.
2. **"Power Electronics"** , Daniel W. Hart, McGraw Hill, 2010.
3. **"Power Electronics**", V Nattarasu and R.S. Anandamurhty, **Pearson/Sanguine Pub. 2006.**

EMBEDED SYSTEM DESIGN

Subject Code	: **10EC74**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT 1:

Introduction to Embedded System: Introducing Embedded Systems, Philosophy, Embedded Systems, Embedded Design and Development Process. **5 Hours**

UNIT 2:

The Hardware Side: An Introduction, The Core Level, Representing Information, Understanding Numbers, Addresses, Instructions, Registers-A

UNIT - 7

DC CHOPPERS: Introduction, Principles of step down and step up choppers, Step down chopper with RL loads, Chopper classification, Switch mode regulators – buck, boost and buck – boost regulators. **6 Hours**

UNIT - 8

INVERTORS: Introduction, Principles of operation, Performance parameters, 1φ bridge inverter, voltage control of 1φ invertors, current source invertors, Variable DC link inverter.

7 Hours

TEXT BOOKS:

1. **"Power Electronics" -** M. H. Rashid 3rd edition, PHI / Pearson publisher 2004.
2. **"Power Electronics" -** M. D. Singh and Kanchandani K.B. TMH publisher, 2nd Ed. 2007.

REFERENCE BOOKS:

1. **"Power Electronics, Essentials and Applications", L Umanand,** John Wiley India Pvt. Ltd, 2009.
2. **"Power Electronics"** , Daniel W. Hart, McGraw Hill, 2010.
3. **"Power Electronics**", V Nattarasu and R.S. Anandamurhty, **Pearson/Sanguine Pub. 2006.**

EMBEDED SYSTEM DESIGN

Subject Code	: **10EC74**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT 1:

Introduction to Embedded System: Introducing Embedded Systems, Philosophy, Embedded Systems, Embedded Design and Development Process. **5 Hours**

UNIT 2:

The Hardware Side: An Introduction, The Core Level, Representing Information, Understanding Numbers, Addresses, Instructions, Registers-A

First Look, Embedded Systems-An Instruction Set View, Embedded Systems-A Register View, Register View of a Microprocessor
The Hardware Side: Storage Elements and Finite-State Machines (2 hour)
The concepts of State and Time, The State Diagram, Finite State Machines-A Theoretical Model.

8 Hours

UNIT 3:

Memories and the Memory Subsystem: Classifying Memory, A General Memory Interface, ROM Overview, Static RAM Overview, Dynamic RAM Overview, Chip Organization, Terminology, A Memory Interface in Detail, SRAM Design, DRAM Design, DRAM Memory Interface, The Memory Map, Memory Subsystem Architecture, Basic Concepts of Caching, Designing a Cache System, Dynamic Memory Allocation.

7 Hours

UNIT 4:

Embedded Systems Design and Development : System Design and Development, Life-cycle Models, Problem Solving-Five Steps to Design, The Design Process, Identifying the Requirements, Formulating the Requirements Specification, The System Design Specification, System Specifications versus System Requirements, Partitioning and Decomposing a System, Functional Design, Architectural Design, Functional Model versus Architectural Model, Prototyping, Other Considerations, Archiving the Project. **6 Hours**

PART – B

UNIT 5 & 6:

Real-Time Kernels and Operating Systems: Tasks and Things, Programs and Processes, The CPU is a resource, Threads – Lightweight and heavyweight, Sharing Resources, Foreground/Background Systems, The operating System, The real time operating system (RTOS), OS architecture, Tasks and Task control blocks, memory management revisited.

12 Hours

UNIT 7 & 8:

Performance Analysis and Optimization: Performance or Efficiency Measures, Complexity Analysis, The methodology, Analyzing code, Instructions in Detail, Time, etc. – A more detailed look, Response Time, Time Loading, Memory Loading, Evaluating Performance, Thoughts on Performance Optimization, Performance Optimization, Tricks of the Trade, Hardware Accelerators, Caches and Performance.

12 Hours

TEXT BOOK:

1. **Embedded Systems – A contemporary Design Tool,** James K. Peckol**,** John Weily India Pvt. Ltd, 2008.

REFERENCE BOOKS:

1. **Embedded Systems: Architecture and Programming,** Raj Kamal, TMH. 2008.
2. **Embedded Systems Architecture – A Comprehensive Guide for Engineers and Programmers**, Tammy Noergaard, Elsevier Publication, 2005.
3. **Programming for Embedded Systems**, Dreamtech Software Team, John Wiley India Pvt. Ltd, 2008.

VLSI LAB

Subject Code	: **10ECL77**	IA Marks	: 25
No. of Practical Hrs/Week	: 03	Exam Hours	: 03
Total no. of Practical Hrs.	: 42	Exam Marks	: 50

(Wherever necessary Cadence/Synopsis/Menta Graphics tools <u>must be</u> used)

PART - A
DIGITAL DESIGN

ASIC-DIGITAL DESIGN FLOW

1. Write Verilog Code for the following circuits and their Test Bench for **verification**, observe the waveform and **synthesize** the code with technological library with given Constraints*. Do the initial timing verification with gate level simulation.

1. An inverter
2. A Buffer
3. Transmission Gate
4. Basic/universal gates
5. Flip flop -RS, D, JK, MS, T
6. Serial & Parallel adder
7. 4-bit counter [Synchronous and Asynchronous counter]
8. Successive approximation register [SAR]

** An appropriate constraint should be given*

VIII SEMESTER
WIRELESS COMMUNICATION

Subject Code	: **10EC81**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1
Introduction to wireless telecommunication systems and Networks, History and Evolution Different generations of wireless cellular networks 1G, 2g,3G and 4G networks. **6 Hours**

UNIT - 2
Common Cellular System components, Common cellular network components, Hardware and software, views of cellular networks, 3G cellular systems components, Cellular component identification Call establishment. **7 Hours**

UNIT - 3
Wireless network architecture and operation, Cellular concept Cell fundamentals, Capacity expansion techniques, Cellular backbone networks, Mobility management, Radio resources and power management Wireless network security. **7 Hours**

UNIT - 4
GSM and TDMA techniques, GSM system overview, GSM Network and system Architecture, GSM channel concepts, GSM identifiers **6 Hours**

PART – B

UNIT - 5
GSM system operation, Traffic cases, Cal handoff, Roaming, GSM protocol architecture. TDMA systems. **6 Hours**

UNIT - 6
CDMA technology, CDMA overview, CDMA channel concept CDMA operations. **6 Hours**

UNIT - 7
Wireless Modulation techniques and Hardware, Characteristics of air interface, Path loss models, wireless coding techniques, Digital modulation

techniques, OFDM, UWB radio techniques, Diversity techniques, Typical GSM Hardware. **7 Hours**

UNIT - 8

Introduction to wireless LAN 802.11X technologies, Evolution of Wireless LAN Introduction to 802.15X technologies in PAN Application and architecture Bluetooth Introduction to Broadband wireless MAN, 802.16X technologies. **7 Hours**

TEXT BOOK:

1. **Wireless Telecom Systems and networks**, Mullet: Thomson Learning 2006.

REFERENCE BOOKS:

1. **Mobile Cellular Telecommunication**, Lee W.C.Y, MGH, 2^{nd}, 2009.
2. **Wireless communication** - D P Agrawal: 2^{nd} Edition Thomson learning 2007.
3. **Fundamentals of Wireless Communication**, David Tse, Pramod Viswanath, Cambridge 2005.
4. S. S. Manvi, M. S. Kakkasageri, "**Wireles and Mobile Network concepts and protocols**", John Wiley India Pvt. Ltd, 1^{st} edition, 2010.
5. "**Wireless Communication – Principles & Practice**" , T.S. Rappaport, PHI 2001.

DIGITAL SWITCHING SYSTEMS

Subject Code	: **10EC82**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

Developments of telecommunications, Network structure, Network services, terminology, Regulation, Standards. Introduction to telecommunications transmission, Power levels, Four wire circuits, Digital transmission, FDM, TDM, PDH and SDH, Transmission performance.

7 Hours

UNIT - 7

DESIGN OF RTSS – GENERAL INTRODUCTION: Introduction, Specification documentation, Preliminary design, Single-program approach, Foreground/background, Multi-tasking approach, Mutual exclusion, Monitors. **6 Hours**

UNIT - 8

RTS DEVELOPMENT METHODOLOGIES: Introduction, Yourdon Methodology, Requirement definition for Drying Oven, Ward and Mellor Method, Hately and Pirbhai Method. **6 Hours**

TEXT BOOKS:

1. **Real - Time Computer Control- An Introduction**, Stuart Bennet, 2nd Edn. Pearson Education. 2005.

REFERENCE BOOKS:

1. **Real-Time Systems Design and Analysis**, Phillip. A. Laplante, second edition, PHI, 2005.
2. **Real-Time Systems Development**, Rob Williams, Elsevier. 2006.
3. **Embedded Systems**, Raj Kamal, Tata Mc Graw Hill, India, 2005.

IMAGE PROCESSING

Subject Code	: **10EC763**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

DIGITAL IMAGE FUNDAMENTALS: What is Digital Image Processing. fundamental Steps in Digital Image Processing, Components of an Image processing system, elements of Visual Perception. **6 Hours**

UNIT - 2

Image Sensing and Acquisition, Image Sampling and Quantization, Some Basic Relationships between Pixels, Linear and Nonlinear Operations. **6 Hours**

UNIT - 3
IMAGE TRANSFORMS: Two-dimensional orthogonal & unitary transforms, properties of unitary transforms, two dimensional discrete Fourier transform. **7 Hours**

UNIT - 4
Discrete cosine transform, sine transform, Hadamard transform, Haar transform, Slant transform, KL transform. **7 Hours**

PART – B

UNIT - 5
IMAGE ENHANCEMENT: Image Enhancement in Spatial domain, Some Basic Gray Level Trans -formations, Histogram Processing, Enhancement Using Arithmetic/Logic Operations. **7 Hours**

UNIT - 6
Basics of Spatial Filtering Image enhancement in the Frequency Domain filters, Smoothing Frequency Domain filters, Sharpening Frequency Domain filters, homomorphic filtering. **6 Hours**

UNIT - 7
Model of image degradation/restoration process, noise models, Restoration in the Presence of Noise, Only-Spatial Filtering Periodic Noise Reduction by Frequency Domain Filtering, Linear Position-Invariant Degradations, inverse filtering, minimum mean square error (Weiner) Filtering,

7 Hours

UNIT - 8
Color Fundamentals. Color Models, Pseudo color Image Processing., processing basics of full color image processing

6 Hours

TEXT BOOK:

1. **"Digital Image Processing"**, Rafael C.Gonzalez, Richard E. Woods, etl , TMH , 2nd Edition 2010.

REFERENCE BOOKS:

1. **"Fundamentals of Digital Image Processing"**, Anil K. Jain, Pearson Education, 2001.
2. **"Digital Image Processing and Analysis"**, B. Chanda and D. Dutta Majumdar, PHI, 2003.

UNIT - 7

PROTOCOL PERFORMANCE TESTING: SDL based performance testing of TCP, OSPF, Interoperability testing, SDL based interoperability testing of CSMA/CD and CSMA/CA protocol using bridge, Scalability testing.

7 Hours

UNIT - 8

PROTOCOL SYNTHESIS: Synthesis methods, interactive synthesis algorithms, automatic synthesis algorithm, automatic synthesis of SDL from MSC protocol re synthesis. **6 Hours**

TEXT BOOK:

1. **Communication Protocol Engineering**, P. Venkatarm and S. S. Manvi, PHI, 2004.

REFERENCES BOOKS:

1. **The Internet and its Protocols**, Adrian Farrel, Elsevier, 2006.
2. **TCP/IP Protocol Stack**, B A Forouzan, TMH, 2006.

ELECTIVE –V (GROUP E)
MULTIMEDIA COMMUNICATIONS

Subject Code	: **10EC841**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

MULTIMEDIA COMMUNICATIONS: Introduction, multimedia information representation, multimedia networks, multimedia applications, media types, communication modes, network types, multipoint conferencing, network QoS application QoS. **6 Hours**

UNIT - 2

MULTIMEDIA INFORMATION REPRESENTATION: Introduction, digital principles, text, images, audio, video. **7 Hours**

UNIT - 3

TEXT AND IMAGE COMPRESSION: Introduction, compression principles, text compression, image compression.

6 Hours

UNIT - 4

AUDIO AND VIDEO COMPRESSION: Introduction, audio compression, DPCM, ADPCM, APC, LPC, video compression, video compression principles, H.261, H.263, MPEG, MPEG-1, MPEG-2, and MPEG-4.

7 Hours

PART – B

UNIT - 5

MULTIMEDIA INFORMATION NETWORKS: Introduction, LANs, Ethernet, Token ring, Bridges, FDDI High-speed LANs, LAN protocol.

6 Hours

UNIT - 6

THE INTERNET: Introduction, IP Datagrams, Fragmentation, IP Address, ARP and RARP, QoS Support, IPv8. **7 Hours**

UNIT - 7

BROADBAND ATM NETWORKS: Introduction, Cell format, Switfh and Protocol Architecture ATM LANs. **6 Hours**

UNIT - 8

TRANSPORT PROTOCOL: Introduction, TCP/IP, TCP, UDP, RTP and RTCP. **7 Hours**

TEXT BOOK:

1. **Multimedia Communications: Applications, Networks, Protocols and Standards**, Fred Halsall, Pearson Education, Asia, Second Indian reprint 2002.

REFERENCE BOOKS:

1. **Multimedia Information Networking**, Nalin K. Sharda, PHI, 2003.
2. **"Multimedia Fundamentals: Vol 1 - Media Coding and Content Processing"**, Ralf Steinmetz, Klara Narstedt, Pearson Education, 2004.
3. **"Multimedia Systems Design"**, Prabhat K. Andleigh, Kiran Thakrar, PHI, 2004.

UNIT 6

Embedded System Components:

Firmware components, RTOS system software mechanisms, Software application components.

Debugging Components:

Execptions assert, Checking return codes, Single-step debugging, kernel scheduler traces, Test access ports, Trace ports, Power-On self test and diagnostics, External test equipment, Application-level debugging.

7 Hours

UNIT 7

Performance Tuning:

Basic concepts of drill-down tuning, hardware – supported profiling and tracing, Building performance monitoring into software, Path length, Efficiency, and Call frequency, Fundamental optimizations. **6 Hours**

UNIT 8

High availability and Reliability Design:

Reliability and Availability, Similarities and differences, Reliability, Reliable software, Available software, Design trade offs, Hierarchical applications for Fail-safe design.

Design of RTOS – PIC microcontroller. **(Chap 13 of book Myke Predko)**

7 Hours

REFERENCE BOOKS:

1. "**Real-Time Embedded Systems and Components"** Sam Siewert, Cengage Learning India Edition, 2007.
2. " **Programming and Customizing the PIC microcontroller"** , Myke Predko, 3rd Ed, TMH, 2008

GSM

Subject Code	: **10EC843**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

GSM ARCHITECTURE AND INTERFACES: Introduction, GSM frequency bands, GSM PLMN, Objectives of a GSM PLMN, GSM PLMN Services, GSM Subsystems, GSM Subsystems entities, GSM interfaces, The radio interface (MS to BSC), A_{bits} interface (BTS to BSC), A interface (BSC

to MSC), Interfaces between other GSM entities, Mapping of GSM layers onto OSI layers. **6 Hours**

UNIT - 2

RADIO LINK FEATURES IN GSM SYSTEMS: Introduction, Radio link measurements, Radio link features of GSM, Dynamic power control, Discontinuous transmission (DTX), SFH, Future techniques to reduce interface in GSM, Channel borrowing, Smart antenna. **7 Hours**

UNIT - 3

GSM LOGICAL CHANNELS AND FRAME STRUCTURE: Introduction, GSM logical channels, Allowed logical channel combinations, TCH multi frame for TCH/H, CCH multi frame, GSM frame structure, GSM bursts, Normal burst, Synchronization burst, Frequency correction channel burst, Access burst, Data encryption in GSM, Mobility management, Location registration, Mobile identification. **7 Hours**

UNIT - 4

SPEECH CODING IN GSM: Introduction, Speech coding methods, Speech code attributes, Transmission bit rate, Delay, Complexity, Quality, LPAS, ITU-T standards, Bit rate, Waveform coding, Time domain waveform coding, Frequency domain waveform coding, Vocoders, Full-rate vocoder, Half-rate vocoder. MESSAGES, SERVICES, AND CALL FLOWS IN GSM: Introduction, GSM PLMN services.

7 Hours

PART – B

UNIT - 5

GSM messages, MS-BS interface, BS to MSC messages on the A interface, MSC to VLR and HLR, GSM call setup by an MS, Mobile-Terminated call, Call release, Handover. Data services, Introduction, Data interworking, GSM data services, Interconnection for switched data, Group 3 fax, Packet data on the signaling channel, User-to-user signaling, SMS, GSM GPRS.

6 Hours

UNIT - 6

PRIVACY AND SECURITY IN GSM: Introduction, Wireless security requirements, Privacy of communications, Authentication requirements, System lifetime requirements, Physical requirements, SIM cards, Security algorithms for GSM, Token-based authentication, Token-based registration, Token-based challenge.

6 Hours

UNIT - 7

PLANNING AND DESIGN OF A GSM WIRELESS NETWORK: Introduction, Tele traffic models, Call model, Topology model, Mobility in

cellular / PCS networks, Application of a fluid flow model, Planning of a wireless network, Radio design for a cellular / PCS network, Radio link design, Coverage planning, Design of a wireless system, Service requirements, Constraints for hardware implementation, Propagation path loss, System requirements, Spectral efficiency of a wireless system, Receiver sensitivity and link budget, Selection of modulation scheme, Design of TDMA frame, Relationship between delay spread and symbol rate, Design example for a GSM system.

7 Hours

UNIT - 8

MANAGEMENT OF GSM NETWORKS: Introduction, Traditional approaches to NM, TMN, TMN layers, TMN nodes, TMN interface, TMN management services, Management requirements for wireless networks, Management of radio resources, Personal mobility management, Terminal mobility, Service mobility management, Platform-centered management, SNMP, OSI systems management, NM interface and functionality, NMS functionality, OMC functionality, Management of GSM network, TMN applications, GSM information model, GSM containment tree, Future work items.

7 Hours

TEXT BOOK:

1. **"Principles of Applications of GSM"**, Vijay K. Garg & Joseph E. Wilkes, Pearson education/ PHI, 1999.

REFERENCE BOOKS:

1. **GSM: Evolution towards 3rd Generation Systems**, (Editor), Z. Zvonar Peter Jung, Karl Kammerlander Springer; 1st edition 1998
2. **GSM & UMTS: The Creation of Global Mobile Communication,** Friedhelm Hillebrand, John Wiley & Sons; 2001.

ADHOC WIRELESS NETWORKS

Subject Code	: **10EC844**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

AD HOC NETWORKS: Introduction, Issues in Ad hoc wireless networks, Ad hoc wireless internet. **6 Hours**

10EE35 ELECTRICAL and ELECTRONIC MEASUREMENTS and INSTRUMENTATION

Subject Code	:	**10EE35**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART – A

UNIT 1:

1-(a) Units and Dimensions: Review of fundamental and derived units. S.I. units. Dimensional equations, problems. **3 Hours**

1-(b) Measurement of Resistance: Wheatstone's bridge, sensitivity, limitations. Kelvin's double bridge. Earth resistance, measurement by fall of potential method and by using Megger. **3 Hours**

UNIT 2:

Measurement of Inductance and Capacitance: Sources and detectors, Maxwell's inductance bridge, Maxwell's inductance &capacitance bridge,Hay's bridge, Anderson's bridge, Desauty's bridge, Schering bridge. Shielding of bridges. Problems. **07 Hours**

UNIT 3:

Extension of Instrument Ranges: Shunts and multipliers. Construction and theory of instrument transformers, Equations for ratio and phase angle errors of C.T. and P.T (derivations excluded). Turns compensation, illustrative examples (excluding problems on turns compensation),Silsbees's method of testing CT. **07 Hours**

UNIT 4:

Measurement of Power and Energy: Dynamometer wattmeter. UPF and LPF wattmeters, Measurement of real and reactive power in three-phase circuits. Induction type energy meter — construction, theory, errors, adjustments and calibration. Principle of working of electronic energy meter. 0**6 Hours**

PART – B

UNIT 5:

(a) Construction and operation of electro-dynamometer single-phase power factor meter. Weston frequency meter and phase sequence indicator. 0**4 Hours**

(b) Electronic Instruments: Introduction. True RMS responding voltmeter. Electronic multimeters. Digital voltmeters. Q meter. 0**4 Hours**

UNIT 6:

Dual trace oscilloscope — front panel details of a typical dual trace oscilloscope. Method of measuring voltage, current, phase, frequency and period. Use of Lissajous patterns. Working of a digital storage oscilloscope. Brief note on current probes. 0**6 Hours**

UNIT 7:

Transducers: Classification and selection of transducers. Strain gauges. LVDT. Measurement of temperature and pressure. Photo-conductive and photo-voltaic cells.

0**6 Hours**

UNIT 8:

(a) Interfacing resistive transducers to electronic circuits. Introduction to data acquisition systems.
2 Hours

(b) Display Devices and Signal Generators: X-Y recorders. Nixie tubes. LCD and LED display. Signal generators and function generators. 0**4 Hours**

Text Books

1. **Electrical and Electronic Measurements and Instrumentation,** A. K. Sawhney, Dhanpatrai and Sons, New Delhi.
2. **Modern Electronic Instrumentation and Measuring Techniques,** Cooper D. and A.D. Heifrick, PHI, 2009 Edition.

References

1. **Electronic Instrumentation and Measurement,** David A. Bell, oxford Publication ,2nd Edition, 2009.
2. **Electrical Measurements and Measuring Instruments,** Golding and Widdies, Pitman

10EE36 ELECTRIC POWER GENERATION

Subject Code	:	**10EE36**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART – A

UNIT 1:
Sources of Electrical Power: Wind, solar, fuel cell, tidal, geo-thermal, hydro-electric, thermal-steam, diesel, gas, nuclear power plants (block diagram approach only). Concept of co-generation. Combined heat and power distributed generation. 06 **Hours**

UNIT 2:
Diesel electric plants. Gas turbine plants. Mini, micro, and bio generation. Concept of distributed generation. 06 **Hours**

UNIT 3:
(a) Hydro Power Generation: Selection of site. Classification of hydro-electric plants. General arrangement and operation. Hydroelectric plant power station structure and control. 5 **Hours**
(b) Thermal Power Generation: Introduction. Main parts of a thermal power plant. Working. Plant layout. **3 Hours**

UNIT 4:
Nuclear Power Station: Introduction. Pros and cons of nuclear power generation. Selection of site, cost, components of reactors. Description of fuel sources. Safety of nuclear power reactor. **6 Hours**

PART – B

UNIT 5 and 6:
(a) Economics Aspects: Introduction. Terms commonly used in system operation. Diversity factor, load factor, plant capacity factor, plant use factor, plant utilization factor and loss factor, load duration curve. Cost of generating station, factors influencing the rate of tariff designing, tariff, types of tariff**.** Power factor improvement.
(b) Substations: Introduction, types, Bus bar arrangement schemes, Location of substation equipment. Reactors and capacitors. Interconnection of power stations. 1**4 Hours**

UNIT 7 and 8 :
Grounding Systems: Introduction, grounding systems. Neutral grounding. Ungrounded system.
Resonant grounding. Solid grounding, reactance grounding, resistance grounding. Earthing transformer. Neutral grounding transformer. **12 Hours**

Text Books

1. **Power System Engineering,** A. Chakrabarti, M. L. Soni, and P.V. Gupta, Dhanpat Rai and Co.,NewDelhi.
2. **Electric Power Generation, Transmission and Distribution,** S. N. Singh, PHI, 2nd Edition,2009.

References

1. **Elements of Electrical Power System Design,** M. V. Deshpande, PHI,2010

10ES42 MICROCONTROLLERS
(Common to EC/TC/EE/IT/BM/ML)

Sub Code	**:**	**10ES42**	***IA Marks***	**:**	**25**
Hrs/ Week	**:**	**04**	Exam Hours	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

UNIT 1:
Microprocessors and microcontroller. Introduction, Microprocessors and Microcontrollers, RISC & CISC CPU Architectures, Harvard & Von-Neumann CPU architecture, Computer software.
The 8051 Architecture: Introduction, Architecture of 8051, Pin diagram of 8051, Memory organization, External Memory interfacing, Stacks.

6 Hours

UNIT 2:
Addressing Modes: Introduction, Instruction syntax, Data types, Subroutines, Addressing modes: Immediate addressing , Register addressing, Direct addressing, Indirect addressing, relative addressing, Absolute addressing, Long addressing, Indexed addressing, Bit inherent addressing, bit direct addressing.

Instruction set: Instruction timings, 8051 instructions: Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Subroutine instructions, Bit manipulation instruction.

6H**ours**

UNIT 3:
8051 programming: Assembler directives, Assembly language programs and Time delay calculations.

6 Hours

UNIT 4:
8051 Interfacing and Applications: Basics of I/O concepts, I/O Port Operation, Interfacing 8051 to LCD, Keyboard, parallel and serial ADC, DAC, Stepper motor interfacing and DC motor interfacing and programming

6 Hours

UNIT 5:

8051 Interrupts and Timers/counters: Basics of interrupts, 8051 interrupt structure, Timers and Counters, 8051 timers/counters, programming 8051 timers in assembly and C .

6 Hours

UNIT 6:

8051 Serial Communication: Data communication, Basics of Serial Data Communication, 8051 Serial Communication, connections to RS-232, Serial communication Programming in assembly and C.8255A Programmable Peripheral Interface:, Architecture of 8255A, I/O addressing,, I/O devices interfacing with 8051 using 8255A. **6 Hours**

Course Aim – The MSP430 microcontroller is ideally suited for development of low-power embedded systems that must run on batteries for many years. There are also applications where MSP430 microcontroller must operate on energy harvested from the environment. This is possible due to the ultra- low power operation of MSP430 and the fact that it provides a complete system solution including a RISC CPU, flash memory, on-chip data converters and on-chip peripherals.

UNIT 7:
Motivation for MSP430microcontrollers – Low Power embedded systems, On-chip peripherals (analog and digital), low-power RF capabilities. Target applications (Single-chip, low cost, low power, high performance system design).

2 Hours

MSP430 RISC CPU architecture, Compiler-friendly features, Instruction set, Clock system, Memory subsystem. Key differentiating factors between different MSP430 families.

2 Hours

Introduction to Code Composer Studio (CCS v4). Understanding how to use CCS for Assembly, C, Assembly+C projects for MSP430 microcontrollers. Interrupt programming.

2 **Digital I/O – I/O ports** programming using C and assembly, Understanding the muxing scheme of the MSP430 pins. **2 Hours**

UNIT 8:

On-chip peripherals. Watchdog Timer, Comparator, Op-Amp, Basic Timer, Real Time Clock (RTC), ADC, DAC, SD16, LCD, DMA.

2 Hours

Using the Low-power features of MSP430. Clock system, low-power modes, Clock request feature, Low-power programming and Interrupt.

2 Hours

Interfacing LED, LCD, External memory. Seven segment LED modules interfacing. Example – Real-time clock.

2 Hours

Case Studies of applications of MSP430 - Data acquisition system, Wired Sensor network, Wireless sensor network with Chipcon RF interfaces.

3 Hours

TEXT BOOKS:

1. "The 8051 Microcontroller and Embedded Systems – using assembly and C "-, **Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; PHI, 2006 / Pearson, 2006**
2. "MSP430 Microcontroller Basics", **John Davies, Elsevier, 2010**

REFERENCE BOOKS:

1. "The 8051 Microcontroller Architecture, Programming & Applications", **2e Kenneth J. Ayala ;, Penram International, 1996 / Thomson Learning 2005.**
2. **"**The 8051 Microcontroller", **V.Udayashankar and MalikarjunaSwamy, TMH, 2009**
3. MSP430 Teaching CD-ROM, **Texas Instruments, 2008 (can be requested** http://www.uniti.in **)**
4. Microcontrollers: Architecture, Programming, Interfacing and System Design",**Raj Kamal, "Pearson Education, 2005**

10EE45 POWER ELECTRONICS

Subject Code	:	10EE45	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART – A

UNIT 1:

Power Semiconductor Devices:

Introduction to semiconductors, Power Electronics, Power semiconductor devices, Control Characteristics. Types of power electronic converters and industrial applications-Drives, Electrolysis, Heating, Welding, Static Compensators, SMPS, HVDC power transmission, Thyristorized tap changers and Circuit breakers.

7 hours

UNIT 2:

Power Transistors: Power BJT's – switching characteristics, switching limits, base drive control. Power MOSFET's and IGBT's –characteristics, gate drive , di/dt and dv/dt limitations. Isolation of gate and base drives. Simple design of gate and base drives. **6 Hours**

UNIT 3:

Thyristors

Introduction, Two Transistor Model, characteristics-static and dynamic. di/dt and dv/dt protection. Ratings of thyristors. Thyristor types. Series and parallel operation of Thyristors. Thyristor firing circuits. Design of firing circuits using UJT, R, R-C circuits. Analysis of firing circuits using operational amplifiers and digital IC's. **7 Hours**

UNIT 4:

Commutation Techniques: Introduction. Natural Commutation. Forced commutation- self-commutation, impulse commutation, resonant pulse commutation and complementary commutation. **6 Hours**

PART – B

UNIT 5:

Controlled Rectifiers: Introduction. Principle of phase controlled converter operation. Single- phase semi-converters. Full converters. Three-phase half-wave converters. Three-phase full-wave converters. **7 Hours**

UNIT 6:

Choppers: Introduction. Principle of step-down and step-up chopper with R-L load. Performance parameters. Chopper classification. Analysis of impulse commutated thyristor chopper (only qualitative analysis) **6 Hours**

UNIT 7:

Inverters: Introduction. Principle of operation. Performance parameters. Single-phase bridge inverters. Threephase inverters. Voltage control of single-phase inverters – single pulse width, multiple pulse width, and sinusoidal pulse width modulation. Current source inverters. **7 Hours**

1

UNIT 8:

(a) AC Voltage Controllers: Introduction. Principle of ON-OFF and phase control. Single-phase, bi-directional controllers with resistive and R-L loads.

(b) Electromagnetic Compatibility: Introduction, effect of power electronic converters and remedial measures.

6 Hours

Text Book:

1. **Power Electronics,** M.H.Rashid, , Pearson, 3rd Edition, 2006.
2. **Power Electronics,** M.D. Singh and Khanchandani K.B., T.M.H., 2nd Edition,2001

References

1. **Power Electronics Essentials and Applications**,L.Umanand, Wiley India Pvt Ltd,Reprint,2010
2. **Thyristorised Power Controllers,** G.K. Dubey, S.R. Doradla, A. Joshi and R.M.K. Sinha, New Age International Publishers.
3. **Power Electronics – Converters, Applications and Design,** Ned Mohan, Tore M. Undeland, and William P. Robins, Third Edition, John Wiley and Sons,2008.
4. **Power Electronics: A Simplified Approach,** R.S. Ananda Murthy and V. Nattarasu, pearson/Sanguine Technical Publishers.

MICROCONTROLLERS LAB

(Common to EC/TC/EE/IT/BM/ML)

Sub Code	**:**	**10ESL47**	***IA Marks***	**:**	**25**
Hrs/ Week	**:**	**03**	Exam Hours	**:**	**03**
Total Hrs.	**:**	**42**	**Exam Marks**	**:**	**50**

I. PROGRAMMING

1. Data Transfer - Block move, Exchange, Sorting, Finding largest element in an array.
2. Arithmetic Instructions - Addition/subtraction, multiplication and division, square, Cube – (16 bits Arithmetic operations – bit addressable).
3. Counters.
4. Boolean & Logical Instructions (Bit manipulations).
5. Conditional CALL & RETURN.
6. Code conversion: BCD – ASCII; ASCII – Decimal; Decimal - ASCII; HEX - Decimal and Decimal - HEX .
7. Programs to generate delay, Programs using serial port and on-Chip timer / counter.

Note: Programming exercise is to be done on both 8051 & MSP430.

II. INTERFACING:

Write C programs to interface 8051 chip to Interfacing modules to develop single chip solutions.

8. Simple Calculator using 6 digit seven segment displays and Hex Keyboard interface to 8051.
9. Alphanumeric LCD panel and Hex keypad input interface to 8051.
10. External ADC and Temperature control interface to 8051.
11. Generate different waveforms Sine, Square, Triangular, Ramp etc. using DAC interface to 8051; change the frequency and amplitude.
12. Stepper and DC motor control interface to 8051.
13. Elevator interface to 8051.

10EEL48 POWER ELECTRONICS LAB

Subject Code	:	**10EEL48**	**IA Marks**	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

1. Static characteristics of SCR.
2. Static characteristics of MOSFET and IGBT.
3. SCR turn-on circuit using synchronized UJT relaxation oscillator.
4. SCR Digital triggering circuit for a single-phase controlled rectifier and A.C. voltage controller.
5. Single-phase controlled full-wave rectifier with *R* and *R-L* loads.
6. A.C. voltage controller using TRIAC and DIAC combination connected to *R* and *R-L* loads.
7. Speed control of a separately excited D.C. motor using an IGBT or MOSFET chopper.
8. Speed control of D.C. motor using single semi converter
9. Speed control of a stepper motor.
10. Speed control of universal motor using A.C. voltage controller.
11. MOSFET OR IGBT based single-phase full-bridge inverter connected to R load.
12. Study of commutation using LC circuits and auxiliary circuits.

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10EEL57 MEASUREMENTS AND CIRCUIT SIMULATION LABORATORY

Subject Code	:	**10EEL57**	**IA Marks**	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

1. Measurement of low resistance using Kelvin's double bridge.
2. Measurement of cable insulation and earth resistance using Meggar
3. Measurement of inductance using Maxwell Inductance-Capacitance bridge & determination of Q-factor
4. Measurement of capacitance using De-Sauty's bridge & determination of dissipation factor.
5. M easurement of active and reactive power in balanced 3-phase circuit using two-watt meter method.
6. Adjustment & calibration of 1-phase energy meter
7. Determination of ratio & phase angle error in CT.
8. a) Inverting, non-inverting & scale changing of signals using op -amps
   b) RC phase shift oscillator using op amps (Both using simulation package)
9. RC coupled amplifier-frequency response for variation of bias & coupling using simulation package
10. Rectifier circuits-Bridge rectifier, diode clipping & clamping circuits using simulation package.
11. Schmitt –trigger- inverting and non-inverting.
    12 Signal generator- triangular, saw tooth and rectangular wave generation
    Note: All experiments, except 5,6 and 7, are to be carried out by using components and verify the result by using a simulation package.

10EE61 POWER SYSTEM ANALYSIS AND STABILITY

Subject Code	:	**10EE61**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

REPRESENTATION OF POWER SYSTEM COMPONENTS: Circuit models of Transmission line, Synchronous machines, Transformers and load. Single line diagram, impedance and reactance diagrams. Per unit system, per unit impedance diagram of power system. **8 Hours**

UNIT - 2

SYMMETRICAL 3 - PHASE FAULTS: Analysis of Synchronous machines and Power system. Transients on a transmission line, Short-Circuit currents and the reactance of synchronous machines with and without load . **6 Hours**

UNIT - 3 & 4

SYMMETRICAL COMPONENTS: Introduction, analysis of unbalanced load against balanced Three-phase supply, neutral shift. Resolution of unbalanced phasors into their symmetrical components, Phase shift of symmetrical components in star-delta transformer bank, Power in terms of symmetrical components**,** Analysis of balanced and unbalanced loads against unbalanced 3 phase supply, Sequence impedances and networks of power system elements (alternator, transformer and transmission line) Sequence networks of power systems. Measurement of sequence impedance of synchronous generator.

12 Hours

Part - B

UNIT - 5 & 6

UNSYMMETRICAL FAULTS: L-G, L-L, L-L-G faults on an unbalanced alternator with and without fault impedance. Unsymmetrical faults on a power system with and without fault impedance. Open conductor faults in power system. **14 Hours**

UNIT - 7

STABILITY STUDIES: Introduction**,** Steady state and transient stability. Rotor dynamics and the swing equation. Equal area criterion for transient stability evaluation and its applications. **8 Hours**

UNIT – 8

UNBALANCED OPERATION OF THREE PHASE INDUCTION MOTRORS: Analysis of three phase induction motor with one line open., Analysis of three phase induction motor with unbalanced voltage. **4 Hours**

TEXT BOOKS:

1. **Elements of Power System Analysis**, W.D.Stevenson, TMH,4th Edition
2. **Modern Power System Analysis**,.I. J. Nagrath and D.P.Kothari- TMH, 3rd Edition,2003.
3. **Symmetrical Components and Short Circuit Studies,** Dr.P.N.Reddy, Khanna Publishers

REFERENCE BOOKS:

1. **Power System Analysis**, Hadi Sadat, TMH,2nd Edition.
2. **Power system Analysis**, R.Bergen, and Vijay Vittal, Pearson publications, 2nd edition, 2006.
3. **Computer Aided Power system analysis**, G.L., Kusic, PHI.Indian Edition, 2010 .
4. **Power System Analysis**,W.D.Stevenson & Grainger,TMH, First Edition, 2003.

10EE62 SWITCHGEAR & PROTECTION

Subject Code	:	**10EE62**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

SWITCHES AND FUSES: Introduction, energy management of power system, definition of switchgear, switches - isolating, load breaking and earthing. Introduction to fuse**,** fuse law, cut -off characteristics,: Time current characteristics, fuse material, HRC fuse, liquid fuse, Application of fuse

4 Hours

UNIT - 2

PRINCIPLES OF CIRCUIT BREAKERS: Introduction, requirement of a circuit breakers, difference between an isolator and circuit breaker, basic principle of operation of a circuit breaker, phenomena of arc, properties of arc, initiation and maintenance of arc, arc interruption theories - slepian's theory and energy balance theory**,** Restriking voltage, recovery voltage, Rate of rise of Restriking voltage, DC circuit breaking, AC circuit breaking, current chopping, capacitance switching, resistance switching, Rating of Circuit breakers.

10 Hours

UNIT - 3 & 4

CIRCUITS BREAKERS: Air Circuit breakers – Air break and Air blast Circuit breakers, oil Circuit breakers - Single break, double break, minimum OCB, SF_6 breaker - Preparation of SF_6 gas, Puffer and non Puffer type of SF_6 breakers. Vacuum circuit breakers - principle of operation and constructional details. Advantages and disadvantages of different types of Circuit breakers, Testing of Circuit breakers, Unit testing, synthetic testing, substitution test, compensation test and capacitance test.

LIGHTNING ARRESTERS: Causes of over voltages – internal and external, lightning, working principle of different types of lightning arresters. Shield wires.

12 Hours

PART - B

UNIT - 5

PROTECTIVE RELAYING: Requirement of Protective Relaying, Zones of protection, primary and backup protection, Essential qualities of Protective Relaying, Classification of Protective Relays

4 Hours

UNIT - 6

INDUCTION TYPE RELAY: Non-directional and directional over current relays, IDMT and Directional characteristics. Differential relay – Principle of operation, percentage differential relay, bias characteristics, distance relay – Three stepped distance protection, Impedance relay, Reactance relay, Mho relay, Buchholz relay, Negative Sequence relay, Microprocessor based over current relay – block diagram approach.

10 Hours

UNIT - 7 & 8

PROTECTION SCHEMES: Generator Protection - Merz price protection, prime mover faults, stator and rotor faults, protection against abnormal conditions – unbalanced loading, loss of excitation, over speeding. Transformer Protection - Differential protection, differential relay with harmonic restraint, Inter turn faults Induction motor protection - protection against electrical faults such as phase fault, ground fault, and abnormal operating conditions such as single phasing, phase reversal, over load. **12 Hours**

TEXT BOOKS:

1. **Switchgear & Protection** Sunil S.Rao,,Khanna Publishers,13th Edition,2008.
2. **Power System Protection & Switchgear,** Badriram & Viswa Kharma ,TMH,1st edition, 2001.
3. **Fundamentals of Power System protection,** Y G. Painthankar and S R Bhide,PHI, 2009.

REFERENCE BOOKS:

1. **A Course in Electrical Power,** Soni, Gupta & Bhatnagar, Dhanapatirai.
2. **Power System Protection & Switchgear,** Ravindarnath & Chandra -New age Publications.
3 **Electrical Power,** Dr S. L. Uppal, Khanna Publishers.
4. **Handbook of Switchgears**, BHEL,TMH, 5th reprint,2008.

10EE664 OBJECT ORIENTED PROGRAMMING USING C ++

Subject Code	:	10EE664	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
PRINCIPLES OF OBJECT-ORIENTED PROGRAMMING: Review of Procedure Oriented Programming, Basic concepts of Object Oriented Programming – Object, Class, Encapsulation, Inheritance, Polymorphism; Benefits of OOPs, Applications of OOP's. **4 Hours**

UNIT - 2
THE BASIC LANGUAGE C++: A comparison of C and C++, Structure of C++ program with Class, Preprocessor directives, C++ Statements – Input/Output, Comments, Tokens, Keywords, Identifiers, Constants, Data types – string, pointer, reference, boole, enumeration, array, complex number; typedef names, type compatibility, type conversion, qualifier – const, volatile; Operators in C++, Operator Precedence and Operator Overloading; C++ expressions – New and Delete. **6 Hours**

UNIT - 3
FUNCTIONS IN C++: Introduction, The main() function, Function prototype, Call by reference, Return by reference, Inline functions, Default arguments, const Arguments, Function Overloading, Friend and Virtual functions, pointer to functions. **8 hours**

UNIT - 4
CLASSES AND OBJECTS: Introduction – declaration and definition of a Class, defining member functions, C++ program with a Class, Making an outside function Inline, Nesting of member functions, Arrays within a class, Static data members, static member functions, Objects – global & local objects, scope & lifetime, memory allocation for objects, dynamically allocated objects, pointers to objects, arrays of objects, function arguments with objects, returning objects; const member functions. **8 Hours**

PART - B

UNIT - 5
CONSTRUCTORS AND DESTRUCTORS: Introduction, Constructors, Parameterized Constructors, Multiple constructors in a class, Constructors with default arguments, Dynamic initialization of objects, Copy constructor, Constructing two-dimensional arrays, const Objects, Destructors. **4 Hours**

UNIT - 6
OPERATOR OVERLOADING AND TYPE CONVERSION: Introduction, Defining operator overloading, Overloading unary operators, Overloading binary operators, Overloading binary operators using Friends, Rules for overloading operators, overloading a comma operator, overloading the output operator , Type conversion. **7 Hours**

UNIT - 7
INHERITANCE: Introduction, Defining derived classes, Single inheritance, Making a private member Inheritable, Multilevel inheritance, Multiple inheritance, Hierarchical inheritance, Hybrid inheritance, Virtual base classes, Abstract classes, Constructors & Destructors in base & derived classes. **6 Hours**

UNIT - 8
POINTER, VIRTUAL FUNCTIONS AND POLYMORPHISM: Introduction, Pointers, Pointers to Objects, this pointer, Pointers to derived classes, type-checking pointers, pointers to members, Virtual functions, Pure virtual functions.

MANAGING CONSOLE I/O AND FILE I/O: C++ streams, C++ stream classes, examples of formatted and unformatted I/O operations, Classes for file stream operations, Methods of Opening and Closing a File, Examples of Opening file using constructor open(), file modes (simple programming exercises). **9 Hours**

TEXT BOOKS:

1. **Object Oriented Programming with C++-** Balagurusamy, E, TMH,4th edition, 2008.
2. **C++, The Complete Reference -**Herbert Schildt**,** , TMH, 4th edition
3. **Object Oriented Programming with C++**, Farrell,Cengage Learning,First Edition,2008.

REFERENCE BOOKS:

1. **The C++ programming language,**Bjarne Stroustrup, Pearson Education, 3rd edition,2006.
2. **Objected oriented programming with C++,**Bhave, Pearson Education, First Edition,2006.

10EE72 ELECTRICAL POWER UTILIZATION

Subject Code	:	**10EE72**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

HEATING AND WELDING: Advantages and methods of electric of heating, resistance ovens, induction heating, dielectric heating, the arc furnace, heating of building. Electric welding, resistance and arc welding, control devices and welding equipment. **10 Hours**

UNIT - 2

ELECTROLYTIC PROCESS: Fundamental principles, extraction, refining of metals and electroplating. Factors affecting electro deposition process, power supply for electrolytic process. **6 Hours**

UNIT - 3 & 4

ILLUMINATION: Laws of illumination, lighting calculation, factory lighting, flood lighting, street lighting, different types of lamps-incandescent, fluorescent, vapor, CFL and LED lamps and their working, comparision, Glare and its remedy. **10 Hours**

PART - B

UNIT - 5, 6 & 7

ELECTRIC TRACTION: Introduction, requirements of an ideal traction,systems of traction, speed time curve, tractive effort,co-efficient of adhesion, selection of traction motors, method of speed control, energy saving by series parallel control, ac traction equipment. AC series motor, characteristics, regenerative braking, linear induction motor and their use. AC traction, diesel electric equipment, trains lighting system, specific energy, factors affecting specific energy consumption. **20 Hours**

UNIT - 8

INTRODUCTION TO ELECTRIC AND HYBRID VEHICLES: Configuration and performance of electrical vehicles, traction motor characteristics, tractive effort, transmission requirement, vehicle performance and energy consumption. **6 Hours**

TEXT BOOKS:

1. **Utilization Of Electric Energy,**E Openshaw Taylor, 12th Impression,2009,Universities Press.
2. **Modern Electric, Hybrid Electric and Fuel Cell Vehicles**, Mehrdad, Ehsani, Yimin Gao, Sabastien. E. Gay, Ali Emadi- CRC Press.

REFERENCE BOOKS:

1. **A Course in Electrical Power**, Soni Gupta and Bhatnager-Dhanapat Rai & sons.
3. **Electrical Power,** Dr. S.L.Uppal, Khanna Publications

10EE73 HIGH VOLTAGE ENGINEERING

Subject Code	:	10EE73	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
INTRODUCTION: Introduction to HV technology, need for generating high voltages in laboratory. Industrial applications of high voltage, Electrostatic precipitation, separation, painting and printing.
6Hours

UNIT - 2 & 3
BREAKDOWN PHENOMENA: Classification of HV insulating media. Properties of important HV insulating media under each category. Gaseous dielectrics,Ionization: primary and secondary ionization processes. Criteria for gaseous insulation breakdown based on Townsend's theory. Limitations of Townsend's theory. Streamer's theory breakdown in non uniform fields. Corona discharges. Breakdown in electro negative gases. Paschen's law and its significance. Time lags of Breakdown. Breakdown in solid dielectrics: Intrinsic Breakdown, avalanche breakdown, thermal breakdown, and electro mechanic breakdown. Breakdown of liquid dielectrics: Suspended particle theory, electronic Breakdown, cavity breakdown (bubble's theory), electro convection breakdown. **12 Hours**

UNIT - 4
GENERATION OF HV AC AND DC VOLTAGE: HV AC-HV transformer; Need for cascade connection and working of transformers units connected in cascade. Series resonant circuit- principle of operation and advantages. Tesla coil. HV DC- voltage doubler circuit, cock croft- Walton type high voltage DC set. Calculation of high voltage regulation, ripple and optimum number of stages for minimum voltage drop. **8 Hours**

Part - B

UNIT - 5
GENERATION OF IMPULSE VOLTAGE AND CURRENT: Introduction to standard lightning and switching impulse voltages. Analysis of single stage impulse generator-expression for Output impulse voltage. Multistage impulse generator working of Marx impulse. Rating of impulse generator. Components of multistage impulse generator. Triggering of impulse generator by three electrode gap arrangement. Trigatron gap and oscillograph time sweep circuits. Generation of switching impulse voltage. Generation of high impulse current. **6 Hours**

UNIT - 6
MEASUREMENT OF HIGH VOLTAGES: Electrostatic voltmeter-principle, construction and limitation. Chubb and Fortescue method for HV AC measurement. Generating voltmeter- Principle, construction. Series resistance micro ammeter for HV DC measurements. Standard sphere gap measurements of HV AC, HV DC, and impulse voltages; Factors affecting the measurements. Potential dividers-resistance dividers capacitance dividers mixed RC potential dividers. Measurement of high impulse currents-Rogogowsky coil and Magnetic Links. **10 Hours**

UNIT - 7

NON-DESTRUCTIVE INSULATION TESTING TECHNIQUES: Dielectric loss and loss angle measurements using Schering Bridge, Transformer ratio Arms Bridge. Need for discharge detection and PD measurements aspects. Factor affecting the discharge detection. Discharge detection methods-straight and balanced methods. **6 Hours**

UNIT - 8

HIGH VOLTAGE TESTS ON ELECTRICAL APPARATUS: Definitions of terminologies, tests on isolators, circuit breakers, cables insulators and transformers. **4 Hours**

TEXT BOOKS:

1. **High Voltage Engineering**, M.S.Naidu and Kamaraju- 4th Edition, THM, 2008.
2. **High Voltage Engineering Fundamentals**, E.Kuffel and W.S. Zaengl, 2nd Edition, Elsevier Press, 2005.
3. **High Voltage Engineering** ,C.L.Wadhwa, New Age International Private limited, 1995.

REFERENCE BOOKS:

1.**High Voltage Engineering Theory and Practice,** Mazen Abdel-Salam, Hussein Anis, Ahdab El-Morshedy, Roshdy Radwan, 2nd Edn(Revised & Expanded) Marcel-Dekker Publishers(Special Indian Edn.).

10EE752 PROGRAMMABLE LOGIC CONTROLLERS

Subject Code	:	**10EE752**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUTION: Introduction to Programmable logic controller (PLC), role in automation (SCADA), advantages and disadvantages, hardware, internal architecture, sourcing and sinking, characteristics of I/O devices, list of input and output devices, examples of applications. I/O processing, input/output units, signal conditioning, remote connections, networks, processing inputs I/O addresses. **7 Hours**

UNIT - 2

ROGRAMMING: Ladder programming- ladder diagrams, logic functions, latching, multiple outputs, entering programs, functional blocks, programme examples like location of stop and emergency switches **8 Hours**

UNIT - 3 & 4

PROGRAMMING LANGUAGES: Instruction list, sequential functions charts & structured text, jump and call subroutines**.** **10 Hours**

PART - B

UNIT - 5

INTERNAL RELAYS: ladder programmes, battery- backed relays, one - shot operation, set and reset, master control relay. **5 Hours**

UNIT - 6 & 7

Timers and counters: Types of timers, programming timers, ON and OFF- delay timers, pulse timers, forms of counter, programming, up and down counters, timers with counters, sequencer. **12 Hours**

UNIT - 8

Shift register and data handling: shift registers, ladder programs, registers and bits, data handling, arithmetic functions, temperature control and bottle packing applications. **10 Hours**

Note: Programming is to be with reference to only Mitsubhish PLC

TEXT BOOKS:

1. **Programmable Logic controllers-**W Bolton, 5th edition, Elsevier- newness, 2009.
2. **Programmable logic controllers - principles and applications"-**John W Webb, Ronald A Reis, Pearson education, 5th edition, 2nd impression, 2007.

REFERENCE BOOKS:

1. **Programmable Controller Theory and Applications**,L. A Bryan, E. A Bryan, An industrial text company publication, 2nd edition, 1997.
2. **Programmable Controllers, An Engineers Guide**-E. A Paar, newness, 3rd edition, 2003.

10EE836 RENEWABLE ENERGY SOURCES

Subject Code	:	**10EE836**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

UNIT - 1

ENERGY SOURCES: Introduction, Importance of Energy Consumption as Measure of Prosperity, Per Capita Energy Consumption, Classification of Energy Resources; Conventional Energy Resources - Availability and their limitations; Non-Conventional Energy Resources – Classification, Advantages, Limitations; Comparison of Conventional and Non-Conventional Energy Resources; World Energy Scenario; Indian Energy Scenario. **4 Hours**

UNIT - 2

SOLAR ENERGY BASICS: Introduction, Solar Constant, Basic Sun-Earth Angles – definitions and their representation, Solar Radiation Geometry (numerical problems), Estimation of Solar Radiation of Horizontal and Tilted Surfaces (numerical problems); Measurement of Solar Radiation Data – Pyranometer and Pyrheliometer. **6 Hours**

UNIT - 3

SOLAR THERMAL SYSTEMS: Principle of Conversion of Solar Radiation into Heat, Solar Water Heaters (Flat Plate Collectors), Solar Cookers – Box type, concentrating dish type, Solar driers, Solar Still, Solar Furnaces, Solar Green Houses. **6 Hours**

UNIT - 4

SOLAR ELECTRIC SYSTEMS: Solar Thermal Electric Power Generation – Solar Pond and Concentrating Solar Collector (parabolic trough, parabolic dish, Central Tower Collector). Advantages and Disadvantages; Solar Photovoltaic – Solar Cell fundamentals, characteristics, classification, construction of module, panel and array. Solar PV Systems – stand-alone and grid connected; Applications – Street lighting, Domestic lighting and Solar Water pumping systems. **7 Hours**

ENERGY STORAGE: Introduction, Necessity of Energy Storage, and Methods of Energy Storage (classification and brief description using block diagram representation only). **3 Hours**

PART - B

UNIT - 5

WIND ENERGY: Introduction, Wind and its Properties, History of Wind Energy, Wind Energy Scenario – World and India. Basic principles of Wind Energy Conversion Systems (WECS), Classification of WECS, Parts of WECS, Derivation for Power in the wind, Electrical Power Output and Capacity Factor of WECS, Wind site selection consideration, Advantages and Disadvantages of WECS. **8 Hours**

UNIT - 6

BIOMASS ENERGY: Introduction, Photosynthesis process, Biomass fuels, Biomass conversion technologies, Urban waste to Energy Conversion, Biomass Gasification, Biomass to Ethanol Production, Biogas production from waste biomass, factors affecting biogas generation, types of biogas plants – KVIC and Janata model; Biomass program in India. **6 Hours**

UNIT - 7

ENERGY FROM OCEAN: Tidal Energy – Principle of Tidal Power, Components of Tidal Power Plant (TPP), Classification of Tidal Power Plants, Estimation of Energy – Single basin and Double basin type TPP (no derivations. Simple numerical problems), Advantages and Limitations of TPP. Ocean Thermal Energy Conversion (OTEC): Principle of OTEC system, Methods of OTEC power generation – Open Cycle (Claude cycle), Closed Cycle (Anderson cycle) and Hybrid cycle (block diagram description of OTEC); Site-selection criteria, Biofouling, Advantages & Limitations of OTEC. **6 Hours**

UNIT - 8

EMERGING TECHNOLOGIES: Fuel Cell, Small Hydro Resources, Hydrogen Energy, and Wave Energy. (Principle of Energy generation using block diagrams, advantages and limitations). **6 Hours**

TEXT BOOKS:

1. **Non-Conventional Sources of Energy,** Rai, G. D, Khanna Publishers, 4th Edition, 2007
2. **Non-Conventional Energy Resources,** Khan, B. H., TMH, 2nd Edition.

REFERENCE BOOK:

1. **Fundamentals of Renewable Energy Systems,** Mukherjee, D and Chakrabarti, S., New Age International Publishers, 2005.

MATERIAL SCIENCE AND METALLURGY

Subject Code	**: 10ME32A /42A**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Crystal Structure: BCC, FCC and HCP Structures, coordination number and atomic packing factors, crystal imperfections -point line and surface imperfections. Atomic Diffusion: Phenomenon, Ficks laws of diffusion, factors affecting diffusion.

06 Hours

UNIT - 2

Mechanical Behaviour: Stress-strain diagram showing ductile and brittle behaviour of materials, linear and non linear elastic behaviour and properties, mechanical properties in plastic range, yield strength offset yield strength, ductility, ultimate tensile strength, toughness. Plastic deformation of single crystal by slip and twinning.

06 Hours

UNIT - 3

Fracture: Type I, Type II and Type III.

Creep: Description of the phenomenon with examples. three stages of creep, creep properties, stress relaxation.

Fatigue: Types of fatigue loading with examples, Mechanism of fatigue, fatigue properties, fatigue testing and S-N diagram.

07 Hours

UNIT - 4

Solidification: Mechanism of solidification, Homogenous and Heterogeneous nucleation, crystal growth, cast metal structures.

Phase Diagram I: Solid solutions Hume Rothary rule substitutional, and interstitial solid solutions, intermediate phases, Gibbs phase rule.

07 Hours

PART - B

UNIT - 5

Phase Diagram II: Construction of equilibrium diagrams involving complete and partial solubility, lever rule. Iron carbon equilibrium diagram description of phases, solidification of steels and cast irons, invariant reactions.

06 Hours

UNIT - 6

Heat treating of metals: TTT curves, continuous cooling curves, annealing and its types. normalizing, hardening, tempering, martempering, austempering, hardenability, surface hardening methods like carburizing, cyaniding, nitriding, flame hardening and induction hardening, age hardening of aluminium-copper alloys.

07 Hours

UNIT - 7

Ferrous and non ferrous materials: Properties, Composition and uses of

- Grey cast iron, malleable iron, SG iron and steel
- Copper alloys-brasses and bronzes.
  Aluminium alloys-Al-Cu,Al-Si,Al-Zn alloys.

06 Hours

UNIT - 8

Composite Materials: Definition, classification, types of matrix materials & reinforcements, fundamentals of production of FRP's and MMC's advantages and application of composites.

07 Hours

TEXT BOOKS:

1. **Foundations of Materials Science and Engineering,** Smith, 4^{th} Edition McGraw Hill, 2009
2. **Materials Science, Shackleford., & M. K. Muralidhara,** Pearson Publication – 2007.

REFERENCE BOOKS:

1. **An Introduction to Metallurgy; Alan Cottrell**, Universities Press India Oriental Longman Pvt. Ltd., 1974.
2. **Engineering Materials Science**, W.C.Richards, PHI, 1965
3. **Physical Metallurgy**; Lakhtin, Mir Publications
4. **Materials Science and Engineering,** V.Raghavan , PHI, 2002
5. **Elements of Materials Science and Engineering,** H. VanVlack, Addison-Wesley Edn., 1998
6. **Materials Science and Engineering,**William D. Callister Jr., John Wiley & Sons. Inc, 5^{th} Edition, 2001.
7. **The Science and Engineering of Materials,** Donald R. Askland and Pradeep.P. Phule, Cengage Learning, 4^{lh} Ed., 2003.

MECHANICAL MEASUREMENTS AND METROLOGY

Subject Code	**: 10ME32B /42B**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART- A

UNIT-1

Standards of measurement: Definition and Objectives of metrology, Standards of length-International prototype meter, Imperial standard yard, Wave length standard, subdivision of standards, line and

end standard, calibration of end bars (Numerical), Slip gauges, Wringing phenomena, Indian Standards (M-81, M-12), Numerical problems on building of slip gauges.

06 Hours

UNIT-2

System of Limits, Fits, Tolerance and Gauging: Definition of tolerance, Specification in assembly, Principle of interchangeability and selective assembly limits of size, Indian standards, concept of limits of size and tolerances, compound tolerances, accumulation of tolerances, definition of fits, types of fits and their designation (IS 919-1963), geometrical tolerance, positional-tolerances, hole basis system, shaft basis system, classification of gauges, brief concept of design of gauges (Taylor's principles), Wear allowance on gauges, Types of gauges-plain plug gauge, ring gauge, snap gauge, limit gauge and gauge materials.

07 Hours

UNIT-3

Comparators and Angular measurement: Introduction to comparators, characteristics, classification of comparators, mechanical comparators-Johnson Mikrokator, sigma comparators, dial indicator, optical comparators-principles, Zeiss ultra optimeter, electric and electronic comparators-principles, LVDT, pneumatic comparators, back pressure gauges, solex comparators. Angular measurements, bevel protractor, sine principle and use of sine bars, sine centre, use of angle gauges (numericals on building of angles), clinometers.

07 Hours

UNIT-4:

Interferometer and screw thread, gear measurement: Interferometer, interferometry, autocollimator. Optical flats. Terminology of screw threads, measurement of major diameter, minor diameter, pitch, angle and effective diameter of screw threads by 2 - wire and 3 -wire methods, best size wire. Tool maker's microscope, gear tooth terminology, use of gear tooth vernier caliper and micrometer.

06 Hours

PART-B

UNIT-5:

Measurements and measurement systems: Definition, significance of measurement, generalized measurement system, definitions and concept of accuracy, precision, calibration, threshold, sensitivity, hysterisis, repeatability, linearity, loading effect, system response-times delay. Errors in measurement, classification of errors. Transducers, transfer efficiency, primary and secondary transducers, electrical, mechanical, electronic transducers, advantages of each type transducers.

07 Hours

UNIT-6

Intermediate modifying and terminating devices: Mechanical systems, inherent problems, electrical intermediate modifying devices, input circuitry, ballast circuit, electronic amplifiers and telemetry. Terminating devices, mechanical, cathode ray oscilloscope, oscillographs, X-Y plotters.

06 Hours

UNIT-7

Measurement of force, torque and pressure: Principle, analytical balance, platform balance, proving ring. Torque measurement, Prony brake, hydraulic dynamometer. Pressure measurements, principle, use of elastic members, Bridgeman gauge, McLeod gauge, Pirani gauge. **06 Hours**

UNIT-8

Temperature and strain measurement: Resistance thermometers, thermocouple, law of thermo couple, materials used for construction, pyrometer, optical pyrometer. Strain measurements, strain gauge, preparation and mounting of strain gauges, gauge factor, methods of strain measurement.

07 Hours

TEXT BOOKS:

1. **Mechanical Measurements,** Beckwith Marangoni and Lienhard, Pearson Education, 6th Ed., 2006.
2. **Engineering Metrology,** R.K. Jain, Khanna Publishers, 1994.

REFERENCE BOOKS:

1. **Engineering Metrology,** I.C. Gupta, Dhanpat Rai Publications, Delhi.
2. **Mechanical Measurements,** R.K. Jain Khanna Publishers, 1994
3. **Industrial Instrumentation,** Alsutko, Jerry. D. Faulk, Cengage Asia Pvt. Ltd. 2002.
4. **Measurement Systems Applications and Design,** Ernest O. Doebelin, 5th Ed., McGraw Hill Book Co.
5. **Metrology & Measurement,** Anand K. Bewoor & Vinay A. Kulkarni, Tata McGraw Hill Pvt. Ltd., New-Delhi

MANUFACTURING PROCESS – I
(FUNDAMENTALS OF FOUNDRY & WELDING)

Subject Code	**: 10ME35**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

CASTING PROCESS

UNIT - 1

Introduction: Concept of Manufacturing process, its importance. Classification of Manufacturing processes. Introduction to Casting process & steps involved. Varieties of components produced by casting process. Advantages & Limitations of casting process.

Patterns: Definition, functions, Materials used for pattern, various pattern allowances and their importance. Classification of patterns, BIS color coding of Patterns.

Binder: Definition, Types of binder used in moulding sand.

Additives: Need, Types of additives used and their properties..

06 Hours

UNIT - 2

Sand Moulding : Types of base sand, requirement of base sand. Moulding sand mixture ingredients for different sand mixtures. Method used for sand moulding, such as Green sand, dry sand and skin dried moulds.

Cores: Definition, Need, Types. Method of making cores, Binders used, core sand moulding.

Concept of Gating & Risers. Principle and types.

Fettling and cleaning of castings. Basic steps, Casting defects, Causes, features and remedies.

Moulding Machines : Jolt type, Squeeze type, Jolt & Squeeze type and Sand slinger.

07 Hours

UNIT - 3

Special moulding Process: Study of important moulding processes, No bake moulds, Flaskless moulds, Sweep mould, CO_2 mould, Shell mould, Investment mould.

Metal moulds: Gravity die-casting, Pressure die casting, Centrifugal casting, Squeeze Casting, Slush casting, Thixo-casting and Continuous Casting Processes.

07 Hours

UNIT - 4

Melting Furnaces: Classification of furnaces. Constructional features & working principle of coke fired, oil fired and Gas fired pit furnace, Resistance furnace, Coreless Induction furnace, Electric Arc Furnace, Cupola furnace.

06 Hours

PART – B

WELDING

UNIT - 5

Welding process: Definition, Principles, Classification, Application, Advantages & limitations of welding.

Arc Welding: Principle, Metal Arc welding **(MAW)**, Flux Shielded Metal Arc Welding **(FSMAW)**, Inert Gas Welding **(TIG & MIG)** Submerged Arc Welding **(SAW)** and Atomic Hydrogen Welding processes. **(AHW)**

Gas Welding: Principle, Oxy – Acetylene welding, Chemical Reaction in Gas welding, Flame characteristics. Gas torch construction & working. Forward and backward welding.

07 Hours

UNIT - 6

Special types of welding: Resistance welding **-** principles, Seam welding, Butt welding, Spot welding and projection welding.

Friction welding, Explosive welding, Thermit welding, Laser welding and Electron beam welding.

07 Hours

UNIT - 7

Metallurgical aspect, in welding : Structure of welds, Formation of different zones during welding. Heat affected zone **(HAZ).** Parameters affecting **HAZ**. Effect of carbon content on structure and properties of steel. Shrinkage in welds & Residual stresses.

Concept of electrodes, Filler rod and fluxes. Welding defects – Detection causes & remedy.

06 Hours

UNIT - 8

Principles of soldering & brazing: Parameters involved & Mechanism. Different Types of Soldering & Brazing Methods.

Inspection Methods – Methods used for Inspection of casting and welding. Visual, Magnetic particle, Fluorescent particle, Ultrasonic, Radiography, Eddy current, Holography methods of Inspection.

06 Hours

TEXT BOOKS:

1. **"Manufacturing Process-I",** Dr.K.Radhakrishna, Sapna Book House, 5^{th} Revised Edition 2009.
2. **"Manufacturing & Technology**: Foundry Forming and Welding", P.N.Rao, 3^{rd} Ed., Tata McGraw Hill, 2003.

REFERENCE BOOKS:

1. **"Process and Materials of Manufacturing**", Roy A Lindberg, 4^{th} Ed. Pearson Edu. 2006.
2. **"Manufacturing Technology**", Serope Kalpakjian, Steuen. R. Sechmid, Pearson Education Asia, 5^{th} Ed. 2006.

COMPUTER AIDED MACHINE DRAWING

Subject Code	**:10ME36A/10ME46A**	**IA Marks**	**25**
Hours/Week	**: 04(1 Hrs. Theory & 3 Hrs Practical)**	**Exam Hours**	**03**
Total Hours	**: 52**	**Exam Marks**	**100**

Introduction:
Review of graphic interface of the software. Review of basic sketching commands and navigational commands. Starting a new drawing sheet. Sheet sizes. Naming a drawing, Drawing units, grid and snap.

02 Hours

PART-A

UNIT - 1
Sections of Solids: Sections of Pyramids, Prisms, Cubes, Tetrahedrons, Cones and Cylinders resting only on their bases (No problems on axis inclinations, spheres and hollow solids). True shape of sections.
Orthographic Views: Conversion of pictorial views into orthographic projections. of **simple machine parts** with or without section. (Bureau of Indian Standards conventions are to be followed for the drawings) Hidden line conventions. Precedence of lines.

08 Hours

UNIT - 2
Thread Forms: Thread terminology, sectional views of threads. ISO Metric (Internal & External) BSW (Internal & External) square and Acme. Sellers thread, American Standard thread.
Fasteners: Hexagonal headed bolt and nut with washer (assembly), square headed bolt and nut with washer (assembly) simple assembly using stud bolts with nut and lock nut. Flanged nut, slotted nut, taper and split pin for locking, counter sunk head screw, grub screw, Allen screw.

08 Hours

PART-B

UNIT - 3

Keys & Joints :

Parallel key, Taper key, Feather key, Gibhead key and Woodruff key

Riveted Joints: Single and double riveted lap joints, butt joints with single/double cover straps (Chain and Zigzag, using snap head rivets). cotter joint (socket and spigot), knuckle joint (pin joint) for two rods.

08 Hours

UNIT - 4

Couplings:

Split Muff coupling, Protected type flanged coupling, pin (bush) type flexible coupling, Oldham's coupling and universal coupling (Hooks' Joint)

08 Hours

PART - C
Assembly Drawings
(Part drawings should be given)

1. Plummer block (Pedestal Bearing)
2. Rams Bottom Safety Valve
3. I.C. Engine connecting rod
4. Screw jack (Bottle type)
5. Tailstock of lathe
6. Machine vice
7. Tool Head of a shaper

18 Hours

TEXT BOOKS:

1. **'A Primer on Computer Aided Machine Drawing-2007'**, Published by VTU, Belgaum.
2. **'Machine Drawing'**, N.D.Bhat & V.M.Panchal

REFERENCE BOOKS:

1. **'A Text Book of Computer Aided Machine Drawing'**, S. Trymbaka Murthy, CBS Publishers, New Delhi, 2007
2. **'Machine Drawing'**, K.R. Gopala Krishna, Subhash Publication.

3. **'Machine Drawing with Auto CAD'**, Goutam Pohit & Goutham Ghosh, 1st Indian print Pearson Education, 2005
4. **'Auto CAD 2006, for engineers and designers'**, Sham Tickoo. Dream tech 2005
5. **'Machine Drawing'**, N. Siddeshwar, P. Kanniah, V.V.S. Sastri, published by Tata McGraw Hill,2006

NOTE:

Internal assessment: 25 Marks

All the sheets should be drawn in the class using software. Sheet sizes should be A3/A4. All sheets must be submitted at the end of the class by taking printouts.

Scheme of Examination:

Two questions to be set from each Part-A, Part-B and Part-C
Student has to answer one question each from Part-A and Part-B for 20 marks each. And one question from Part-C for 60 marks.

i.e. PART-A 1 x 20 = 20 Marks
PART-B 1 x 20 = 20 Marks
PART-C 1 x 60 = 60 Marks

Total = 100 Marks

FLUID MECHANICS

Subject Code	**: 10ME36B / 46B**	**IA Marks**	**25**
Hours/Week	**: 04**	**Exam Hours**	**03**
Total Hours	**: 52**	**Exam Marks**	**100**

PART – A

UNIT-1

Properties of Fluids: Introduction, Types of fluid, Properties of fluids, viscosity, thermodynamic properties, surface tension, capillarity, vapour pressure and cavitation

06 Hours

UNIT-2

Fluid Statistics: Fluid pressure at a point, Pascal's law, pressure variation in a static fluid, absolute, gauge, atmospheric and vacuum pressures, simple manometers and differential manometers. Total pressure and center of pressure on submerged plane surfaces; horizontal, vertical and inclined plane surfaces, curved surface submerged in liquid.

07 Hours

UNIT-3

Buoyancy and Fluid Kinematics:

Buoyancy, center of buoyancy, metacentre and metacentric height, conditions of equilibrium of floating and submerged bodies, determination of Metacentric height experimentally and theoretically.

<u>Kinematics</u>: Types of fluid flow, continuity equation in 2D and 3D (Cartesian Co-ordinates only), velocity and acceleration, velocity potential function and stream function.

07 Hours

UNIT-4

Fluid Dynamics: Introduction equation of motion, Euler's equation of motion, Bernoulli's equation from first principles and also from Euler's equation, limitations of Bernoulli's equation.

06 Hours

PART-B

UNIT-5

Fluid Flow Measurements : Venturimeter, orificemeter, pitot-tube, vertical orifice, V-Notch and rectangular notches.

<u>Dimensional Analysis</u> : Introduction, derived quantities, dimensions of physical quantities, dimensional homogeneity, Rayleigh's method, Buckingham π theorem, dimensionless numbers, similitude, types of similitudes.

07 Hours

UNIT-6

Flow through pipes : Minor losses through pipes. Darey's and Chezy's equation for loss of head due to friction in pipes. HGL and TEL.

06 Hours

UNIT-7

Laminar flow and viscous effects : Reyonold's number, critical Reynold's number, laminar flow through circular pipe-Hagen Poiseille's equation, laminar flow between parallel and stationary plates.

06 Hours

UNIT-8

Flow past immersed bodies : Drag, Lift, expression for lift and drag, boundary layer concept, displacement, momentum and energy thickness. Introduction to compressible flow : Velocity of sound in a fluid, Mach number, Mach cone, propagation of pressure waves in a compressible fluid.

07 Hours

TEXT BOOKS:

1. **Fluid Mechanics,** Oijush.K.Kundu, IRAM COCHEN, ELSEVIER, 3rd Ed. 2005.
2. **Fluid Mechanics**, Dr. Bansal, R.K.Lakshmi Publications, 2004.

REFERENCE BOOKS:

1. **Fluid Mechanics and hydraulics,** Dr.Jagadishlal: Metropolitan Book Co-Ltd., 1997.
2. **Fluid Mechanics (SI Units),** Yunus A. Cengel John M.Oimbala, 2nd Ed., Tata McGraw Hill, 2006.
3. **Fluid Mechanics,** John F.Douglas, Janul and M.Gasiosek and john A.Swaffield, Pearson Education Asia, 5th ed., 2006
4. **Fluid Mechanics and Fluid Power Engineering**, Kumar.D.S, Kataria and Sons., 2004
5. **Fluid Mechanics** -. Merle C. Potter, Elaine P.Scott. Cengage learning

METALLOGRAPHY AND MATERIAL TESTING LABORATORY

Subject Code	**: 10MEL37A / 47A**	**IA Marks**	**: 25**
Hours/Week	**: 03**	**Exam Hours**	**: 03**
Total Hours	**: 48**	**Exam Marks**	**: 50**

PART – A

1. Preparation of specimen for Metallograpic examination of different engineering materials. Identification of microstructures of plain carbon steel, tool steel, gray C.I, SG iron, Brass, Bronze & composites.
2. Heat treatment: Annealing, normalizing, hardening and tempering of steel. Hardness studies of heat-treated samples.
3. To study the wear characteristics of ferrous, non-ferrous and composite materials for different parameters.
4. Non-destructive test experiments like,
   (a). Ultrasonic flaw detection
   (b). Magnetic crack detection
   (c). Dye penetration testing. To study the defects of Cast and Welded specimens

PART – B

1. Tensile, shear and compression tests of metallic and non metallic specimens using Universal Testing Machine
2. Torsion Test
3. Bending Test on metallic and nonmetallic specimens.
4. Izod and Charpy Tests on M.S, C.I Specimen.
5. Brinell, Rockwell and Vickers's Hardness test.
6. Fatigue Test.

Scheme of Examination:

ONE question from part -A: **20** Marks
ONE question from part -B: 20 Marks
Viva -Voice: 10 Marks

Total : 50 Marks

MECHANICAL MEASUREMENTS AND METROLOGY LABORATORY

Subject Code	**: 10MEL37B / 47B**	**IA Marks**	**: 25**
Hours/Week	**: 03**	**Exam Hours**	**: 03**
Total Hours	**: 48**	**Exam Marks**	**: 50**

PART-A: MECHANICAL MEASUREMENTS

1. Calibration of Pressure Gauge
2. Calibration of Thermocouple
3. Calibration of LVDT
4. Calibration of Load cell
5. Determination of modulus of elasticity of a mild steel specimen using strain gauges.

PART-B: METROLOGY

1. Measurements using Optical Projector / Toolmaker Microscope.
2. Measurement of angle using Sine Center / Sine bar / bevel protractor
3. Measurement of alignment using Autocollimator / Roller set
4. Measurement of cutting tool forces using
    a) Lathe tool Dynamometer
    b) Drill tool Dynamometer.
5. Measurement of Screw thread Parameters using Two wire or Three-wire method.
6. Measurements of Surface roughness, Using Tally Surf/Mechanical Comparator
7. Measurement of gear tooth profile using gear tooth vernier /Gear tooth micrometer
8. Calibration of Micrometer using slip gauges
9. Measurement using Optical Flats

Scheme of Examination:

ONE question from part -A:	**20** Marks
ONE question from part -B:	**20** Marks
Viva -Voice:	**10** Marks
Total :	**50** Marks

FOUNDRY AND FORGING LABORATORY

Subject Code	**: 10MEL38A / 48A**	**IA Marks**	**: 25**
Hours/Week	**: 03**	**Exam Hours**	**: 03**
Total Hours	**: 48**	**Exam Marks**	**: 50**

PART – A

1. Testing of Moulding sand and Core sand

Preparation of sand specimens and conduction of the following tests:

1 Compression, Shear and Tensile tests on Universal Sand Testing Machine.
2 Permeability test
3 Core hardness & Mould hardness tests.
4 Sieve Analysis to find Grain Fineness number of Base Sand
5 Clay content determination in Base Sand

PART – B

2. Foundry Practice

Use of foundry tools and other equipments.

Preparation of moulds using two moulding boxes using patterns or without patterns. (Split pattern, Match plate pattern and Core boxes).

Preparation of one casting (Aluminum or cast iron-Demonstration only)

PART – C

3. Forging Operations :

- Calculation of length of the raw material required to do the model.
- Preparing minimum three forged models involving upsetting, drawing and bending operations.
- Out of these three models, at least one model is to be prepared by using Power Hammer.

Scheme of Examination:

One question is to be set from Part-A: 10 marks
One question is to be set from either
Part-B or Part-C: 30 marks
Calculation part in case of forging is made compulsory

Calculation (Forging)	+ Foundry Model = 05 +25 = 30 Marks
Calculation (Forging)	+ Forging Model = 05 +25 = 30 Marks
Viva-Voce	: **10** marks.
Total	: **50** Marks.

MACHINE SHOP

Subject Code	**: 10MEL38B / 48B**	**IA Marks**	**: 25**
Hours/Week	**: 03**	**Exam Hours**	**: 03**
Total Hours	**: 48**	**Exam Marks**	**: 50**

PART – A

Preparation of three models on lathe involving Plain turning, Taper turning, Step turning, Thread cutting, Facing, Knurling, Drilling, Boring, Internal Thread cutting and Eccentric turning.

PART – B

Cutting of V Groove/ dovetail / Rectangular groove using a shaper.
Cutting of Gear Teeth using Milling Machine.

<u>Scheme of Examination:</u>

ONE question from part -A:	**30**	Marks
ONE question from part -B:	**10**	Marks
Viva -Voice:	**10**	Marks
Total :	**50**	Marks

APPLIED THERMODYNAMICS

Subject Code	**: 10ME43**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART-A

UNIT - 1

Combustion thermodynamics: Theoretical (Stoichiometric) air and excess air for combustion of fuels. Mass balance, actual combustion. Exhaust gas analysis. A./ F ratio, Energy balance for a chemical reaction, enthalpy of formation, enthalpy and internal energy of combustion, Combustion efficiency, adiabatic flow temperature.

07 Hours

UNIT- 2

Gas power cycle: Air Standard cycles: Carnot, Otto, Diesel, Dual and Stirling cycles, P-V and T-S diagrams, description, efficiencies and mean effective pressures, Comparison of Otto, Diesel and dual cycles.

06 Hours

UNIT - 3

I.C. Engine: Testing of two stroke and four stroke SI and CI engines for performance Related numerical problems, heat balance, Motoring Method, Willian's line method, swinging field dynamometer, Morse test.

06 Hours

UNIT - 4

Vapour Power Cycles: Carnot vapour power cycles, drawbacks as a reference cycle, Simple Rankine cycle, description, T- S diagram, analysis for performance , comparison of Carnot and Rankine cycles. Effects of pressure and temperature on Rankine cycle performance. Actual vapour power cycles. Ideal and practical regenerative Rankine cycle, open and closed feed water heaters, Reheat Rankine cycle.

07 Hours

PART-B

UNIT - 5

Reciprocating Compressors: Operation of a single stage reciprocating compressors, work input through P-V diagram and steady state steady flow analysis. Effect of clearance and volumetric efficiency. Adiabatic, isothermal and mechanical efficiencies. Multistage compressor, saving in work, optimum intermediate pressure, inter- cooling, minimum work for compression.

06 Hours

UNIT - 6

Gas turbine and Jet propulsion: Classification of Gas turbines, Analysis of open cycle gas turbine cycle. Advantages and disadvantages of closed cycle. Methods to improve thermal efficiency, Jet propulsion and Rocket propulsion.

07 Hours

UNIT - 7

Refrigeration: Vapour compression refrigeration system ; description, analysis, refrigerating effect, capacity , power required, units of refrigeration, COP , Refrigerants and their desirable properties. Air cycle refrigeration;

reversed Carnot cycle, reversed Brayton cycle, Vapour absorption refrigeration system, steam jet refrigeration.

06 Hours

UNIT - 8

Psychometry: Atmospheric air and psychometric properties; Dry bulb temperature, wet bulb temperature, dew point temperature; partial pressures, specific and relative humidities and the relation between the two enthalpy and adiabatic saturation temperature. Construction and use of psychometric chart . Analysis of various processes; heating, cooling , dehumidifying and humidifying. Adiabatic mixing of moist air. Summer and winter air conditioning.

07 Hours

Data Hand Book :

1. **Thermodynamic data hand book,** B.T. Nijaguna.
2. **Properties of Refrigerant & Psychometric** (tables & Charts in SI Units), Dr. S.S. Banwait, Dr. S.C. Laroiya, Birla Pub. Pvt. Ltd., Delhi, 2008

TEXT BOOKS:

1. **Basic and applied Thermodynamics**, P.K. Nag, 2nd Ed., Tata McGraw Hill Pub.Co,2002
2. **Applied Thermodynamics**, Rajput, Laxmi Publication
3. **Applied Thermodynamics**, B.K. Venkanna, Swati B. Wadavadagi, PHI, New Delhi, 2010

REFERENCE BOOKS:

1. **Thermodynamics , An engineering approach**, Yunus, A. Cengel and Michael A.Boies, 6th Ed., Tata McGraw Hill pub. Co., 2002,
2. **Fundamental of Classical Thermodynamics,** G.J. Van Wylen and R.E. Sontang Wiley eastern.

KINEMATICS OF MACHINES

Subject Code	**: 10ME44**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Introduction: Definitions Link or element, kinematic pairs, Degrees of freedom, Grubler's criterion (without derivation), Kinematic chain, Mechanism, Structure, Mobility of Mechanism, Inversion, Machine.

Kinematic Chains and Inversions: Inversions of Four bar chain; Single slider crank chain and Double slider crank chain.

07 Hours

UNIT - 2

Mechanisms: Quick return motion mechanisms-Drag link mechanism, Whitworth mechanism and Crank and slotted lever Mechanism.

Straight line motion mechanisms Peaucellier's mechanism and Robert's mechanism. Intermittent Motion mechanisms -Geneva wheel mechanism and Ratchet and Pawl mechanism. Toggle mechanism, Pantograph, Ackerman steering gear mechanism.

06 Hours

UNIT - 3

Velocity and Acceleration Analysis of Mechanisms (Graphical Methods)

Velocity and acceleration analysis of Four Bar mechanism, slider crank mechanism and Simple Mechanisms by vector polygons: Relative velocity and acceleration of particles .in a common link, relative velocity and accelerations of coincident Particles on separate links- Coriolis component of acceleration. Angular velocity and angular acceleration of links, velocity of rubbing.

07 Hours

UNIT - 4

Velocity Analysis by Instantaneous Center Method: Definition, Kennedy's Theorem, Determination of linear and angular velocity using instantaneous center method

Klein's Construction: Analysis of velocity and acceleration of single slider crank mechanism.

06 Hours

PART – B

UNIT - 5

Velocity and Acceleration Analysis of Mechanisms (Analytical Methods): Analysis of four bar chain and slider crank chain using analytical expressions. (Use of complex algebra and vector algebra)

06 Hours

UNIT - 6

Spur Gears: Gear terminology, law of gearing, Characteristics of involute action, Path of contact. Arc of contact, Contact ratio of spur, helical, bevel and worm gears, Interference in involute gears. Methods of avoiding interference, Back lash. Comparison of involute and cycloidal teeth. Profile Modification.

07 Hours

UNIT - 7

Gear Trains: Simple gear trains, Compound gear trains for large speed. reduction, Epicyclic gear trains, Algebraic and tabular methods of finding velocity ratio of epicyclic gear trains. Tooth load and torque calculations in epicyclic gear trains.

07 Hours

UNIT - 8

Cams: Types of cams, Types of followers. Displacement, Velocity and, Acceleration time curves for cam profiles. Disc cam with reciprocating follower having knife-edge, roller and flat-face follower, Disc cam with oscillating roller follower. Follower motions including SHM, Uniform velocity, uniform acceleration and retardation and Cycloidal motion.

06 Hours

TEXT BOOKS:

1. **"Theory of Machines",** Rattan S.S, Tata McGraw-Hill Publishing Company Ltd., New Delhi, and 3rd edition -2009.
2. **"Theory of Machines",** Sadhu Singh, Pearson Education (Singapore) Pvt. Ltd, Indian Branch New Delhi, 2nd Edi. 2006

REFERENCE BOOKS:

1. **"Theory of Machines & Mechanisms**", J.J. Uicker, , G.R. Pennock, J.E. Shigley. OXFORD 3rd Ed. 2009.
2. **Mechanism and Machine theory**, Ambekar, PHI, 2007

Graphical Solutions may be obtained either on the Graph Sheets or on the Answer Book itself.

MANUFACTURING PROCESS – II
(Metal Removing Process)

Subject Code	**: 10ME45**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Theory of Metal Cutting: Single point cutting tool nomenclature, geometry. Mechanics of Chip Formation, Types of Chips. Merchants circle diagram and analysis, Ernst Merchant's solution, shear angle relationship, problems of Merchant's analysis. Tool Wear and Tool failure, tool life. Effects of cutting parameters on tool life. Tool Failure Criteria, Taylor's Tool Life equation. Problems on tool life evaluation.

07 Hours

UNIT - 2

Cutting Tool Materials: Desired properties and types of cutting tool materials – HSS, carbides coated carbides, ceramics. Cutting fluids. Desired properties, types and selection. Heat generation in metal cutting, factors

affecting heat generation. Heat distribution in tool and work piece and chip. Measurement of tool tip temperature.

07 Hours

UNIT - 3

Turning (Lathe), Shaping and Planing Machines: Classification, constructional features of Turret and Capstan Lathe. Tool Layout, shaping Machine, Planing Machine, Driving mechanisms of lathe, shaping and planing machines, Different operations on lathe, shaping machine and planing machine. Simple problems on machining time calculations

07 Hours

UNIT - 4

Drilling machines: Classification, constructional features, drilling & related operations. Types of drill & drill bit nomenclature, drill materials.
Introduction to CNC machines**-** Principles of operation. Axes of NC machine-Coordinate systems. Basics of Manual part programming methods.

06 Hours

PART – B

UNIT - 5

Milling machines: Classification, constructional features, milling cutters nomenclature, milling operations, up milling and down milling concepts. Various milling operations.
Indexing: Simple, compound, differential and angular indexing calculations. Simple problems on simple and compound indexing.

06 Hours

UNIT - 6

Grinding machines: Types of abrasives, Grain size, bonding process, grade and structure of grinding wheels, grinding wheel types. Classification, constructional features of grinding machines (Centerless, cylindrical and surface grinding). Selection of grinding wheel. Grinding process parameters. Dressing and truing of grinding wheels.

07 Hours

UNIT - 7:

Broaching process - Principle of broaching. Details of a broach. Types of broaching machines-constructional details. Applications. Advantages and Limitations.

Finishing and other Processes Lapping and Honing operations – Principles, arrangement of set up and application. Super finishing process, polishing, buffing operation and application.

06 Hours

UNIT - 8

Non-traditional machining processes: Need for non traditional machining, Principle, equipment & operation of Laser Beam, Plasma Arc Machining, Electro Chemical Machining, Ultrasonic Machining, Abrasive Jet Machining, Water Jet Machining, Electron Beam Machining, Electron Discharge Machining and Plasma Arc Machining.

06 Hours

TEXT BOOKS:

1. **Workshop Technology,** Hazara Choudhry, Vol-II, Media Promoters & Publishers Pvt. Ltd. 2004
2. **Production Technology,** R.K.Jain, Khanna Publications, 2003.
3. **Production Technology,** HMT, Tata Mc Graw Hill, 2001.

REFERENCE BOOKS:

1. **Manufacturing Science**, Amitabha Ghosh and Mallik, affiliated East West Press, 2003.
2. **Fundamentals of Metal Machining and Machine Tools,** G. Boothroyd, McGraw Hill, 2000.

DESIGN OF MACHINE ELEMENTS-I

Subject Code	**: 10ME52**	**IA Marks**	**25**
Hours/Week	**: 04**	**Exam Hours**	**03**
Total Hours	**: 52**	**Exam Marks**	**100**

PART – A

UNIT- 1

Introduction: Definitions: normal, shear, biaxial and tri axial stresses, Stress tensor, Principal Stresses. Engineering Materials and their mechanical properties, Stress-Strain diagrams, Stress Analysis, Design considerations: Codes and Standards.

05 Hours

UNIT- 2

Design For Static & Impact Strength:

Static Strength: Static loads and factor of safety, Theories of failure: Maximum normal stress theory, Maximum shear stress theory, Maximum strain theory, Strain energy theory, Distortion energy theory. Failure of brittle and ductile materials, Stress concentration, Determination of Stress concentration factor.

Impact Strength: Introduction, Impact stresses due to axial, bending and torsional loads, effect of inertia.

07 Hours

UNIT - 3

Design For Fatigue Strength: Introduction- S-N Diagram, Low cycle fatigue, High cycle fatigue, Endurance limit, Modifying factors: size effect, surface effect, Stress concentration effects, Fluctuating stresses, Goodman and Soderberg relationship, stresses due to combined loading, cumulative fatigue damage.

08 Hours

UNIT - 4

Threaded Fasteners: Stresses in threaded fasteners, Effect of initial tension, Design of threaded fasteners under static, dynamic and impact loads, Design of eccentrically loaded bolted joints.

06 Hours

PART – B

UNIT - 5

Design Of Shafts: Torsion of shafts, design for strength and rigidity with steady loading, ASME codes for power transmission shafting, shafts under fluctuating loads and combined loads.

07 Hours

UNIT - 6

Cotter And Knuckle Joints, Keys And Couplings: Design of Cotter and Knuckle joints, Keys: Types of keys, Design of keys, Couplings: Rigid and flexible couplings, Flange coupling, Bush and Pin type coupling and Oldham's coupling.

07 Hours

UNIT - 7

Riveted and Welded Joints – Types, rivet materials, failures of riveted joints, Joint Efficiency, Boiler Joints, Lozanze Joints, Riveted Brackets. Welded Joints – Types, Strength of butt and fillet welds, eccentrically loaded welded joints.

07 Hours

UNIT - 8

Power Screws: Mechanics of power screw, Stresses in power screws, efficiency and self-locking, Design of Power Screw, Design of Screw Jack: (Complete Design).

05 Hours

TEXT BOOKS:

1. **Mechanical Engineering Design,** Joseph E Shigley and Charles R. Mischke. McGraw Hill International edition, 6^{th} Edition 2009.
2. **Design of Machine Elements,** V.B. Bhandari, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2^{nd} Edition 2007.

DESIGN DATA HANDBOOK:

1. **Design Data Hand Book,** K. Lingaiah, McGraw Hill, 2^{nd} Ed.
2. **Data Hand Book,** K. Mahadevan and Balaveera Reddy, CBS Publication
3. **Design Data Hand Book,** H.G. Patil, I. K. International Publisher, 2010.

REFERENCE BOOKS:

1. **Machine Design,** Robert L. Norton, Pearson Education Asia, 2001.
2. **Design of Machine Elements,** M. F. Spotts, T. E. Shoup, L. E. Hornberger, S. R. Jayram and C. V. Venkatesh, Pearson Education, 2006.
3. **Machine Design,** Hall, Holowenko, Laughlin (Schaum's Outlines series) Adapted by S.K. Somani, Tata McGraw Hill Publishing Company Ltd., New Delhi, Special Indian Edition, 2008.
4. **Fundamentals of Machine Component Design,** Robert C. Juvinall and Kurt M Marshek, Wiley India Pvt. Ltd., New Delhi, 3^{rd} Edition, 2007.

ENERGY ENGINEERING

Subject Code	**: 10ME53**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Steam Power Plant: Different Types of Fuels used for steam generation, Equipment for burning coal in lump form, strokers, different types, Oil burners, Advantages and Disadvantages of using pulverized fuel, Equipment for preparation and burning of pulverized coal, unit system and bin system. Pulverized fuel furnaces, cyclone furnace, Coal and ash handling, Generation of steam using forced circulation, high and supercritical pressures.

07 Hours

UNIT - 2

A Brief Account Of Benson, Velox Schmidt Steam Generators. Chimneys: Natural, forced, induced and balanced draft, Calculations and numericals involving height of chimney to produce a given draft. Cooling towers and Ponds. Accessories for the Steam generators such as Superheaters, De-superheater, control of superheaters, Economizers, Air pre-heaters and re-heaters.

07 Hours

UNIT - 3

Diesel Engine Power Plant: Applications of Diesel Engines in Power field. Method of starting Diesel engines. Auxiliaries like cooling and lubrication system, filters, centrifuges, Oil heaters, intake and exhaust system, Layout of diesel power plant.

06 Hours

UNIT - 4

Hydro-Electric Plants: Hydrographs, flow duration and mass curves, unit hydrograph and numericals. Storage and pondage, pumped storage plants,

low, medium and high head plants, Penstock, water hammer, surge tanks, gates and valves. General layout of hydel power plants.

06 Hours

PART – B

UNIT - 5

Nuclear Power Plant: Principles of release of nuclear energy; Fusion and fission reactions. Nuclear fuels used in the reactors. Multiplication and thermal utilization factors. Elements of the nuclear reactor; moderator, control rod, fuel rods, coolants. Brief description of reactors of the following types-Pressurized water reactor, Boiling water reactor, Sodium graphite reactor, Fast Breeder reactor, Homogeneous graphite reactor and gas cooled reactor, Radiation hazards, Shieldings, Radio active waste disposal.

06 Hours

UNIT - 6

Solar Energy: Solar Extra terrestrial radiation and radiation at the earth surface, radiation-measuring instruments, working principles of solar flat plate collectors, solar pond and photovoltaic conversion (Numerical Examples).

Wind Energy: Properties of wind, availability of wind energy in India, wind velocity and power from wind; major problems associated with wind power, wind machines; Types of wind machines and their characteristics, horizontal and vertical axis wind mills, coefficient of performance of a wind mill rotor (Numerical Examples).

08 Hours

UNIT - 7

Tidal Power: Tides and waves as energy suppliers and their mechanics; fundamental characteristics of tidal power, harnessing tidal energy, limitations.

Ocean Thermal Energy Conversion: Principle of working, Rankine cycle, problems associated with OTEC.

Geothermal Energy Conversion: Principle of working, types of geothermal station with schematic diagram, problems associated with geothermal conversion, scope of geothermal energy.

06 Hours

UNIT - 8

Energy From Bio Mass: Photosynthesis, photosynthetic oxygen production, energy plantation.

Bio Chemical Route: Biogas production from organic wastes by anaerobic fermentation, classification of bio gas plants, factors affecting bio gas generation.

Thermo Chemical Route: Thermo chemical conversion on bio mass, types of gasifiers.

06 Hours

TEXT BOOKS:

1. **Power Plant Engineering**, P. K. Nag Tata McGraw Hill 2nd edn 2001.
2. **Power Plant Engineering,** Domakundawar, Dhanpath Rai sons. 2003

REFERENCE BOOKS:

1. **Power Plant Engineering,** R. K. Rajput, Laxmi publication, New Delhi.
2. **Principles of Energy conversion**, A. W. Culp Jr., McGraw Hill. 1996
3. **Non conventional Energy sources**, G D Rai Khanna Publishers.
4. **Non conventional resources,** B H Khan TMH - 2007

1.

MANUFACTURING PROCESS – III

(METAL FORMING PROCESS)

Subject Code	**: 10ME55**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Introduction And Concepts: Classification of metal working processes, characteristics of wrought products, advantages and limitations of metal working processes.Concepts of true stress, true strain, triaxial & biaxial

stresses. Determination of flow stress. Principal stresses, Tresca & Von-Mises yield criteria, concepts of plane stress & plane strain.

06 Hours

UNIT - 2

Effects Of Parameters: Temperature, strain rate, friction and lubrication, hydrostatic pressure in metalworking, Deformation zone geometry, workability of materials, Residual stresses in wrought products.

06 Hours

UNIT - 3

Forging: Classification of forging processes. Forging machines & equipment. Expressions for forging pressures & load in open die forging and closed die forging by slab analysis, concepts of friction hill and factors affecting it. Die-design parameters. Material flow lines in forging. Forging defects, Residual stresses in forging. Simple problems.

07 Hours

UNIT - 4

Rolling: Classification of Rolling processes. Types of rolling mills, expression for RoIling load. Roll separating force. Frictional losses in bearing, power required in rolling, Effects of front & back tensions, friction, friction hill. Maximum possible reduction. Defects in rolled products. Rolling variables, simple problems.

06 Hours

PART - B

UNIT - 5

Drawing: Drawing equipment & dies, expression for drawing load by slab analysis, power requirement. Redundant work and its estimation, optimal cone angle & dead zone formation, drawing variables, Tube drawing, classification of tube drawing, simple problems.

07 Hours

UNIT - 6

Extrusion: Types of extrusion processes, extrusion equipment & dies, deformation, lubrication & defects in extrusion. Extrusion dies, Extrusion of seamless tubes. Extrusion variables, simple problem

06 Hours

UNIT - 7

Sheet & Metal Forming: Forming methods, dies & punches, progressive die, compound die, combination die. Rubber forming. Open back inclinable press (OBI press), piercing, blanking, bending, deep drawing, LDR in drawing, Forming limit criterion, defects of drawn products, stretch forming. Roll bending & contouring, Simple problems

06 Hours

UNIT - 8

High Energy Rate Forming Methods: Principles, advantages and applications, explosive forming, electro hydraulic forming, Electromagnetic forming.

Powder Metallurgy: Basic steps in Powder metallurgy brief description of methods of production of metal powders, conditioning and blending powders, compaction and sintering application of powder metallurgy components, advantages and limitations.

07 Hours

TEXT BOOKS:

1. **Mechanical metallurgy (SI units),** G.E. Dieter, Mc Graw Hill pub.2001
2. **Manufacturing Process – III,** Dr. K.Radhakrishna, Sapna Book House, 2009.

REFERENCE BOOKS:

1. **Materials and Processes in Manufacturing,** E.paul, Degramo, J.T. Black, Ronald, A.K. Prentice -hall of India 2002
2. **Principles of Industrial metal working process,** G.W. Rowe, CBSpub. 2002
3. **Manufacturing Science,** Amitabha Ghosh & A.K. Malik - East - Westpress 2001
4. **Technology of Metal Forming Process**, Surendra kumar, PHI – 2008

FLUID MECHANICS AND MACHINES LABORATORY

Subject Code	**: 10MEL57**	**IA Marks**	**: 25**
Hours/Week	**: 03**	**Exam Hours**	**: 03**
Total Hours	**: 42**	**Exam Marks**	**: 50**

PART - A

1. Determination of coefficient of friction of flow in a pipe.

2. Determination of minor losses in flow through pipes.

3. Determination of force developed by impact of jets on vanes.

4. Calibration of flow measuring devices

a. Orifice Plate meter
b. Nozzle
c. Venturimeter
d. V-notch

18 Hours

PART - B

5. Performance testing of Turbines
   a. Pelton wheel
   b. Francis Turbine
   c. Kaplan Turbines

6. Performance testing of Pumps
   a. Single stage / Multi stage centrifugal pumps
   b. Reciprocating pump

7. Performance test of a two stage Reciprocating Air Compressor

8. Performance test on an Air Blower

24 Hours

<u>Scheme for Examination:</u>

One Question from Part A	-	15 Marks (05 Writeup + 10)
One Question from Part B	-	25 Marks (05 Writeup + 20)
Viva-Voce	-	10 Marks

	Total	**50 Marks**

ENERGY CONVERSION ENGINEERING LABORATORY

Subject Code	**: 10MEL58**	**IA Marks**	**: 25**
Hours/Week	**: 03**	**Exam Hours**	**: 03**
Total Hours	**: 42**	**Exam Marks**	**: 50**

PART - A

1. Determination of Flash point and Fire point of lubricating oil using Abel Pensky and Marten's (closed) / Cleavland's (Open Cup) Apparatus.

2. Determination of Calorific value of solid, liquid and gaseous fuels.

3. Determination of Viscosity of a lubricating oil using Redwoods, Saybolt and Torsion Viscometers.

4. Valve Timing/port opening diagram of an I.C. engine (4 stroke/2 stroke).

5. Use of planimeter

21 Hours

PART - B

1. Performance Tests on I.C. Engines, Calculations of IP, BP, Thermal efficiencies, Volumetric efficiency, Mechanical efficiency, SFC, FP, A:F Ratio heat balance sheet for

   (a) Four stroke Diesel Engine

   (b) Four stroke Petrol Engine

   (c) Multi Cylinder Diesel/Petrol Engine, (Morse test)

   (d) Two stroke Petrol Engine

   (e) Variable Compression Ratio I.C. Engine.

21 Hours

<u>Scheme for Examination:</u>

One Question from Part A	**-**	15 Marks (05 Writeup+10)
One Question from Part B	**-**	25 Marks (05 Writeup+20)
Viva-Voce	**-**	10 Marks

Total		**50 Marks**

COMPUTER INTEGRATED MANUFACTURING

Subject Code	**: 10ME61**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART-A

UNIT - 1

Computer Integrated Manufacturing Systems: Introduction, Automation definition, Types of automation, CIM, processing in manufacturing, Production concepts, Mathematical Models-Manufacturing lead time, production rate, components of operation time, capacity, Utilization and availability, Work-in-process, WIP ratio, TIP ratio, Problems using mathematical model equations.

8 Hours

UNIT - 2

High Volume Production System: Introduction Automated flow line-symbols, objectives, Work part transport-continuous, Intermittent, synchronous, Pallet fixtures, Transfer Mechanism-Linear-Walking beam,. roller chain drive, Rotary-rack and pinion, Rachet & Pawl, Geneva wheel, Buffer storage, control functions-sequence, safety, Quality, Automation for machining operation.

6 Hours

UNIT - 3

Analysis Of Automated Flow Line & Line Balancing: General terminology and analysis, Analysis of Tranfer Line without storage upper bound approach, lower bound approach and problems, Analysis of Transfer lines with storage buffer, Effect of storage, buffer capacity with simple problem, Partial automation-with numerical problems, flow lines with more than two stages, Manual Assembly lines, line balancing problem.

6 Hours

UNIT - 4

Minimum Rational Work Element: Work station process time, Cycle time, precedence constraints. Precedence diagram, Balance delay methods of line balancing-largest Candidate rule, Kilbridge and Westers method, Ranked positional weight method, Numerical problems covering all above methods and computerized line balancing.

6 Hours

PART-B

UNIT - 5

Automated Assembly Systems: Design for automated assembly systems, types of automated assembly system, Parts feeding devices-elements of parts delivery system-hopper, part feeder, Selectors, feed back, escapement and placement analysis of Multistation Assembly Machine analysis of single station assembly. **Automated Guided Vehicle System:** Introduction, Vehicle guidance and routing, System management, Quantitative analysis of AGV's with numerical problems and application.

8 Hours

UNIT - 6

Computerized Manufacturing Planning System: Introduction, Computer Aided Process Planning, Retrieval types of process planning, Generative type of process planning, Material requirement planning, Fundamental concepts of MRP inputs to MRP, Capacity planning.

6 Hours

UNIT - 7

Cnc Machining Centers: Introduction to CNC, elements of CNC, CNC machining centers, part programming, fundamental steps involved in development of part programming for milling and turning.

6 Hours

UNIT - 8

Robotics: Introduction to Robot configuration, Robot motion, programming of Robots end effectors, Robot sensors and Robot applications.

6 Hours

TEXT BOOKS:

2. **Automation, Production system & Computer Integrated manufacturing,** M. P. Groover Person India, 2007 2nd edition.
3. **Principles of Computer Integrated Manufacturing**, S. Kant Vajpayee, Prentice Hall India.

REFERENCE BOOKS:

1. **Computer Integrated Manufacturing**, J. A. Rehg & Henry. W. Kraebber.
2. **CADlCAM** by Zeid, Tata McGraw Hill.

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DESIGN OF MACHINE ELEMENTS – II

Subject Code	**: 10ME62**	**IA Marks**	**25**
Hours/Week	**: 04**	**Exam Hours**	**03**
Total Hours	**: 52**	**Exam Marks**	**100**

PART – A

UNIT - 1

Curved Beams: Stresses in curved beams of standard cross sections used in crane hook, punching presses & clamps, closed rings and links

Cylinders & Cylinder Heads: Review of Lame's Equations; compound cylinders, stresses due to different types of fits, cylinder heads, flats.

08 Hours

UNIT - 2

Belts Ropes and Chains: Flat belts: Length & cross section, Selection of V-belts, ropes and chains for different applications.

05 Hours

UNIT - 3

Springs: Types of springs - stresses in Helical coil springs of circular and non-circular cross sections. Tension and compression springs, springs under fluctuating loads, Leaf Springs: Stresses in leaf springs.

Equalized stresses, Energy stored in springs, Torsion, Belleville and Rubber springs.

08 Hours

UNIT - 4

Spur & Helical Gears: Spur Gears: Definitions, stresses in gear tooth: Lewis equation and form factor, Design for strength, Dynamic load and wear load. Helical Gears: Definitions, formative number of teeth, Design based on strength, dynamic and wear loads.

07 Hours

PART – B

UNIT - 5

Bevel and Worm Gears: Bevel Gears: Definitions, formative number of teeth, Design based on strength, dynamic and wear loads. Worm Gears: Definitions, Design based on strength, dynamic, wear loads and efficiency of worm gear drives.

07 Hours

UNIT - 6

Clutches & Brakes: Design of Clutches: Single plate, multi plate and cone clutches. Design of Brakes: Block and Band brakes: Self locking of brakes: Heat generation in Brakes.

05 Hours

UNIT - 7

Lubrication and Bearings: Lubricants and their properties, Mechanisms of Lubrication bearing modulus, coefficient of friction, minimum oil film thickness, Heat Generated, Heat dissipated, Bearing Materials, Examples of journal bearing and thrust bearing design.

07 Hours

UNIT - 8

IC Engine Parts: Design of piston, connecting rod and crank shaft.

05 Hours

DESIGN DATA HANDBOOK:

1. **Design Data Hand Book** , K. Lingaiah, McGraw Hill, 2^{nd} Ed.
2. **Data Hand Book,** K. Mahadevan and Balaveera Reddy, CBS Publication
3. **Design Data Hand Book,** H.G. Patil, I. K. International Publisher, 2010.

TEXT BOOKS:

1. **Mechanical Engineering Design,** Joseph E Shigley and Charles R. Mischke. McGraw Hill International edition, 6^{th} Edition 2003.
2. **Design of Machine Elements,** V. B Bhandari, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2^{nd} Edition 2007

REFERNCE BOOKS:

1. **Machine Design,** Robert L. Norton, Pearson Education Asia, 2001.
2. **Design of Machine Elements,** M. F. Spotts, T. E. Shoup, L. E. Hornberger, S. R. Jayram and C. V. Venkatesh, Pearson Education, 2006.
3. **Machine Design,** Hall, Holowenko, Laughlin (Schaum's Outlines series) Adapted by S.K. Somani, Tata McGraw Hill Publishing Company Ltd., New Delhi, Special Indian Edition, 2008.
4. **Machine Design,** A CAD Approach: Andrew D DIMAROGONAS, John Wiley Sons, Inc, 2001.

HEAT AND MASS TRANSFER

Subject Code	**: 10ME63**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Introductory Concepts And Definitions: Modes of heat transfer: Basic laws governing conduction, convection, and radiation heat transfer; Thermal conductivity; convective heat transfer coefficient; radiation heat transfer;

combined heat transfer mechanism. Boundary conditions of 1^{st}, 2^{nd} and 3^{rd} kind

Conduction: Derivation of general three dimensional conduction equation in Cartesian coordinate, special cases, discussion on 3-D conduction in cylindrical and spherical coordinate systems (No derivation). One dimensional conduction equations in rectangular, cylindrical and spherical coordinates for plane and composite walls. Overall heat transfer coefficient. Thermal contact resistance.

07 Hours

UNIT - 2

Variable Thermal Conductivity: Derivation for heat flow and temperature distribution in plane wall. Critical thickness of insulation without heat generation, Thermal resistance concept & its importance. Heat transfer in extended surfaces of uniform cross-section without heat generation, Long fin, short fin with insulated tip and without insulated tip and fin connected between two heat sources. Fin efficiency and effectiveness. Numerical problems.

06 Hours

UNIT - 3

One-Dimensional Transient Conduction: Conduction in solids with negligible internal temperature gradient (Lumped system analysis), Use of Transient temperature charts (Heisler's charts) for transient conduction in slab, long cylinder and sphere; use of transient temperature charts for transient conduction in semi-infinite solids. Numerical Problems.

06 Hours

UNIT - 4

Concepts And Basic Relations In Boundary Layers: Flow over a body velocity boundary layer; critical Reynolds number; general expressions for drag coefficient and drag force; thermal boundary layer; general expression for local heat transfer coefficient; Average heat transfer coefficient; Nusselt number. Flow inside a duct- velocity boundary layer, hydrodynamic entrance length and hydro dynamically developed flow; flow through tubes (internal flow discussion only). Numericals based on empirical relation given in data handbook.

Free Or Natural Convection: Application of dimensional analysis for free convection- physical significance of Grashoff number; use of correlations of free convection in vertical, horizontal and inclined flat plates, vertical and horizontal cylinders and spheres, Numerical problems.

07 Hours

PART – B

UNIT - 5

Forced Convections: Applications of dimensional analysis for forced convection. Physical significance of Reynolds, Prandtl, Nusselt and Stanton numbers. Use of various correlations for hydro dynamically and thermally developed flows inside a duct, use of correlations for flow over a flat plate, over a cylinder and sphere. Numerical problems.

06 Hours

UNIT - 6

Heat Exchangers: Classification of heat exchangers; overall heat transfer coefficient, fouling and fouling factor; LMTD, Effectiveness-NTU methods of analysis of heat exchangers. Numerical problems.

06 Hours

UNIT - 7

Condensation And Boiling: Types of condensation (discussion only) Nusselt's theory for laminar condensation on a vertical flat surface; use of correlations for condensation on vertical flat surfaces, horizontal tube and horizontal tube banks; Reynolds number for condensate flow; regimes of pool boiling, pool boiling correlations. Numerical problems. Mass transfer definition and terms used in mass transfer analysis, Ficks First law of diffusion (no numericals).

07 Hours

UNIT - 8

Radiation Heat Transfer: Thermal radiation; definitions of various terms used in radiation heat transfer; Stefan-Boltzman law, Kirchoff's law, Planck's law and Wein's displacement law. Radiation heat exchange between two parallel infinite black surfaces, between two parallel infinite gray surfaces; effect of radiation shield; intensity of radiation and solid angle;

Lambert’s law; radiation heat exchange between two finite surfaces-configuration factor or view factor. Numerical problems.

07 Hours

TEXT BOOKS:

1. **Heat & Mass transfer,** Tirumaleshwar, Pearson education 2006
2. **Heat transfer-A basic approach,** Ozisik, Tata McGraw Hill 2002

REFERENCE BOOKS:

1. **Heat transfer, a practical approach,** Yunus A- Cengel Tata Mc Graw Hill
2. **Principles of heat transfer,** Kreith Thomas Learning 2001
3. **Fundamentals of heat and mass transfer,** Frenk P. Incropera and David P. Dewitt, John Wiley and son’s.
4. **Heat transfer,** P.K. Nag, Tata McGraw Hill 2002.

FINITE ELEMENT METHODS

Subject Code	**: 10ME64**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART-A

UNIT-1

Introduction: Equilibrium equations in elasticity subjected to body force, traction forces, and stress-strain relations for plane stress and plane strains. General description of Finite Element Method, Application and limitations. Types of elements based on geometry. Node numbering, Half band width.

07 Hours

UNIT-2

Basic Procedure: Euler - Lagrange equation for bar, beam (cantilever / simply supported fixed) Principle of virtual work, principle of minimum potential energy, Raleigh’s Ritz method. Direct approach for stiffness matrix formulation of bar element. Galerkin’s method.

07 Hours

UNIT-3

Interpolation Models: Interpolation polynomials- Linear, quadratic and cubic. Simplex complex and multiplex elements. 2D PASCAL's triangle. CST elements-Shape functions and Nodal load vector, Strain displacement matrix and Jacobian for triangular and rectangular element.

07 Hours

UNIT-4

Solution of 1-D Bars: Solutions of bars and stepped bars for displacements, reactions and stresses by using penalty approach and elimination approach. Guass-elimination technique.

06 Hours

PART-B

UNIT-5

Higher Order Elements: Langrange's interpolation, Higher order one dimensional elements-Quadratic and cubic element and their shape functions. Shape function of 2-D quadrilateral element-linear, quadric element Iso-parametric, Sub parametric and Super parametric elements. numerical integration : 1, 2 and 3 gauge point for 1D and 2D cases.

06 Hours

UNIT-6

Trusses: Stiffness matrix of Truss element. Numerical problems.

06 Hours

UNIT-7

Beams: Hermite shape functions for beam element, Derivation of stiffness matrix. Numerical problems of beams carrying concentrated, UDL and linearly varying loads.

06 Hours

UNIT-8

Heat Transfer: Steady state heat transfer, 1D heat conduction governing equations. Functional approach for heat conduction. Galerkin's approach for heat conduction. 1D heat transfer in thin fins.

07 Hours

TEXT BOOKS:

1. **Finite Elements in Engineering**, T.R.Chandrupatla, A.D Belegunde, 3rd Ed PHI.
2. **Finite Element Method in Engineering**, S.S. Rao, 4th Edition, Elsevier, 2006.

REFERENCE BOOKS:

1. **"Finite Element Methods for Engineers"** U.S. Dixit, Cengage Learning, 2009
2. **Concepts and applications of Finite Element Analysis**, R.D. Cook D.S Maltus, M.E Plesha, R.J.Witt, Wiley 4th Ed, 2009
3. **Finite Element Methods**, Daryl. L. Logon, Thomson Learning 3rd edition, 2001.
4. **Finite Element Method**, J.N.Reddy, McGraw -Hill International Edition.

MECHATRONICS & MICROPROCESSOR

Subject Code	**: 10ME65**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART - A

UNIT - 1

Introduction to Mechatronic Systems: Measurement and control systems Their elements and functions, Microprocessor based controllers.

06 Hours

UNIT - 2

Review of Transducers and Sensors: Definition and classification of transducers. Definition and classification of sensors. Principle of working and applications of light sensors, proximity sensors and Hall effect sensors.

07 Hours

UNIT - 3

Electrical Actuation Systems: Electrical systems, Mechanical switches, solid-state switches, solenoids, DC & AC motors, Stepper motors and their merits and demerits.

06 Hours

UNIT - 4

Signal Conditioning: Introduction to signal conditioning. The operational amplifier, Protection, Filtering, Wheatstone bridge, Digital signals Multiplexers, Data acquisition, Introduction to Digital system. Processing Pulse-modulation.

07 Hours

PART – B

UNIT - 5

Introduction to Microprocessors: Evolution of Microprocessor, Organization of Microprocessors (Preliminary concepts), basic concepts of programming of microprocessors.

Review of concepts - Boolean algebra, Logic Gates and Gate Networks, Binary & Decimal number systems, memory representation of positive and negative integers, maximum and minimum integers. Conversion of real, numbers, floating point notation, representation of floating point numbers, accuracy and range in floating point representation, overflow and underflow, addition of floating point numbers, character representation.

07 Hours

UNIT - 6

Logic Function: Data word representation. Basic elements of control systems 8085A processor architecture terminology such as CPU, memory and address, ALU, assembler data registers, Fetch cycle, write cycle, state, bus, interrupts. Micro Controllers. Difference between microprocessor and micro controllers. Requirements for control and their implementation in microcontrollers. Classification of micro controllers.

07 Hours

UNIT - 7

Organization & Programming of Microprocessors: Introduction to organization of INTEL 8085-Data and Address buses, Instruction set of 8085, programming the 8085, assembly language programming.

06 Hours

UNIT - 8

Central Processing Unit of Microprocessors: Introduction, timing and control unit basic concepts, Instruction and data flow, system timing, examples of INTEL 8085 and INTEL 4004 register organization.

06 Hours

TEXT BOOKS:

1. **Mechatronics,** W.Bolton, Longman, 2Ed, Pearson Publications, 2007.
2. **Microprocessor Architecture, Programming And Applications With 8085/8085A,** R.S. Ganokar, Wiley Eastern.

REFERENCE BOOKS:

1. **Mechatronics and Microprocessors,** K.P.Ramchandran, G.K.Vijayraghavan, M.S.Balasundran, Wiley, 1st Ed, 2009
2. **Mechatronics - Principles, Concepts and applications** – Nitaigour and Premchand Mahilik **-** Tata McGraw Hill**-** 2003.
3. **Mechatronics Principles & applications**, Godfrey C. Onwubolu, Elsevier..
4. **Introduction Mechatronics & Measurement systems**, David.G. Aliciatore & Michael. B. Bihistaned, Tata McGraw Hill, 2000.

HEAT & MASS TRANSFER LABORATORY

Subject Code	**: 10MEL67**	**IA Marks**	**: 25**
Hours/Week	**: 03**	**Exam Hours**	**: 03**
Total Hours	**: 42**	**Exam Marks**	**: 50**

PART - A

1. Determination of Thermal Conductivity of a Metal Rod.
2. Determination of Overall Heat Transfer Coefficient of a Composite wall.
3. Determination of Effectiveness on a Metallic fin.
4. Determination of Heat Transfer Coefficient in a free Convection on a vertical tube.

5. Determination of Heat Transfer Coefficient in a Forced Convention Flow through a Pipe.
6. Determination of Emissivity of a Surface.

21 Hours

PART – B

1. Determination of Steffan Boltzman Constant.
2. Determination of LMDT and Effectiveness in a Parallel Flow and Counter Flow Heat Exchangers
3. Experiments on Boiling of Liquid and Condensation of Vapour
4. Performance Test on a Vapour Compression Refrigeration.
5. Performance Test on a Vapour Compression Air - Conditioner
6. Experiment on Transient Conduction Heat Transfer

21 Hours

Scheme for Examination:

One Question from Part A	-	20 Marks (05 Write up +15)
One Question from Part B	-	20 Marks (05 Write up +15)
Viva-Voce	-	10 Marks

Total		**50 Marks**

COMPUTER AIDED MODELING AND ANALYSIS LABORATORY

Subject Code	**: 10MEL68**	**IA Marks**	**: 25**
Hours/Week	**: 03**	**Exam Hours**	**: 03**
Total Hours	**: 42**	**Exam Marks**	**: 50**

PART - A

Study of a FEA package and modeling stress analysis of

a. Bars of constant cross section area, tapered cross section area and stepped bar

6 Hours

b. Trusses – (Minimum 2 exercises)

3 Hours

c. Beams – Simply supported, cantilever, beams with UDL, beams with varying load etc (Minimum 6 exercises)

12 Hours

PART - B

a) Stress analysis of a rectangular plate with a circular hole

3 Hours

b) Thermal Analysis – 1D & 2D problem with conduction and convection boundary conditions(Minimum 4 exercises)

9 Hours

c) Dynamic Analysis
   1) Fixed – fixed beam for natural frequency determination
   2) Bar subjected to forcing function
   3) Fixed – fixed beam subjected to forcing function

9 Hours

REFERENCE BOOKS:

1. **A first course in the Finite element method,** Daryl L Logan, Thomason, Third Edition
2. **Fundaments of FEM,** Hutton – McGraw Hill, 2004
3. **Finite Element Analysis,** George R. Buchanan, Schaum Series

<u>Scheme for Examination:</u>

One Question from Part A	-	20 Marks (05 Write up +15)
One Question from Part B	-	20 Marks (05 Write up +15)
Viva-Voce	-	10 Marks

Total		**50 Marks**

HYDRAULICS AND PNEUMATICS

Subject Code	**: 10ME73**	**IA Marks**	**25**
Hours/Week	**: 04**	**Exam Hours**	**03**
Total Hours	**: 52**	**Exam Marks**	**100**

PART – A

UNIT -1

Introduction to Hydraulic Power: Definition of hydraulic system, advantages, limitations, applications, Pascal's law, structure of hydraulic control system, problems on Pascal's law.

The source of Hydraulic Power: Pumps Classification of pumps, Pumping theory of positive displacement pumps, construction and working of Gear pumps, Vane pumps, Piston pumps, fixed and variable displacement pumps, Pump performance characteristics, pump Selection factors, problems on pumps.

07 Hours

UNIT -2

Hydraulic Actuators and Motors: Classification cylinder and hydraulic motors, Linear Hydraulic Actuators [cylinders], single and double acting cylinder, Mechanics of Hydraulic Cylinder Loading, mounting arrangements, cushioning, special types of cylinders, problems on cylinders, construction and working of rotary actuators such as gear, vane, piston motors, Hydraulic Motor Theoretical Torque, Power and Flow Rate, Hydraulic Motor

Performance, problems, symbolic representation of hydraulic actuators (cylinders and motors).

06 Hours

UNIT - 3

Control Components in Hydraulic Systems: Classification of control valves, Directional Control Valves- Symbolic representation, constructional features of poppet, sliding spool, rotary type valves solenoid and pilot operated DCV, shuttle valve, check valves, Pressure control valves - types, direct operated types and pilot operated types. Flow Control Valves - compensated and non-compensated FCV, needle valve, temperature compensated, pressure compensated, pressure and temperature compensated FCV, symbolic representation.

07 Hours

UNIT - 4

Hydraulic Circuit Design And Analysis: Control of Single and Double - Acting Hydraulic Cylinder, Regenerative circuit, Pump Unloading Circuit, Double Pump Hydraulic System, Counter balance Valve Application, Hydraulic Cylinder Sequencing Circuits, Automatic cylinder reciprocating system, Locked Cylinder using Pilot check Valve, Cylinder synchronizing circuit using different methods, factors affecting synchronization, Hydraulic circuit for force multiplication, Speed Control of Hydraulic Cylinder, Speed Control of Hydraulic Motors, Safety circuit, Accumulators, types, construction and applications with circuits.

06 Hours

PART – B

UNIT - 5

Maintenance of Hydraulic System: Hydraulic Oils **-** Desirable properties, general type of Fluids, Sealing Devices, Reservoir System, Filters and Strainers, wear of Moving Parts due to solid -particle Contamination, temperature control (heat exchangers), Pressure switches, trouble shooting.

06 Hours

UNIT - 6

Introduction to Pneumatic Control: Definition of pneumatic system, advantages, limitations, applications, Choice of working medium. Characteristic of compressed air. Structure of Pneumatic control System, fluid conditioners and FRL unit.

Pneumatic Actuators: Linear cylinder - Types, Conventional type of cylinder- working, End position cushioning, seals, mounting arrangements- Applications. Rod - Less cylinders types, working, advantages, Rotary cylinders- types construction and application, symbols.

07 Hours

UNIT-7

Pneumatic Control Valves: DCV such as poppet, spool, suspended seat type slide valve, pressure control valves, flow control valves, types and construction, use of memory valve, Quick exhaust valve, time delay valve, shuttle valve, twin pressure valve, symbols. Simple Pneumatic Control: Direct and indirect actuation pneumatic cylinders, speed control of cylinders - supply air throttling and Exhaust air throttling and Exhaust air throttling.

Signal Processing Elements: Use of Logic gates - OR and AND gates in pneumatic applications. Practical Examples involving the use of logic gates, Pressure dependant controls- types - construction - practical applications, Time dependent controls principle. Construction, practical applications.

07 Hours

UNIT-8

Multi- Cylinder Application: Coordinated and sequential motion control, Motion and control diagrams. Signal elimination methods, Cascading method- principle, Practical application examples (up to two cylinders) using cascading method (using reversing valves).

Electro- Pneumatic Control: Principles - signal input and out put, pilot assisted solenoid control of directional control valves, Use of relay and contactors. Control circuitry for simple signal cylinder application.

Compressed Air: Production of compressed air- Compressors Preparation of compressed air-Driers, Filters, Regulators, Lubricators, Distribution of compressed air Piping layout.

06 Hours

TEXT BOOKS:

1. **“Fluid Power with Applications”,** Anthony Esposito**,** Sixth edition, Pearson Education, Inc, 2000.
2. **'Pneumatics and Hydraulics',** Andrew Parr, Jaico Publishing Co

REFERENCE BOOKS:

1. **'Oil Hydraulic systems', Principles and Maintenance** S. R. Majurr, Tata McGraw Hill Publishing Company Ltd. - 2001
2. **'Industrial Hydraulics', Pippenger, Hicks"** McGraw Hill, New York
3. **'Hydraulic & Pneumatic Power for Production'**, Harry L. Stewart
4. **'Pneumatic Systems',** S. R. Majumdar, Tata McGraw Hill Publish 1995
5. **Power Hydraulics'** Michael J Pinches & John G Ashby, Prentice Hall

OPERATION RESEARCH

Subject Code	**: 10ME74**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART- A

UNIT -1

Introduction: Evolution of OR, definition of OR, scope of OR, application areas of OR, steps (phases) in OR study, characteristics and limitations of OR, models used in OR, linear programming (LP) problem-formulation and solution by graphical method.

04 Hours

UNIT -2

Solution Of Linear Programming Problems: The simplex method-canonical and standard form of an LP problem, slack, surplus and artificial variables, big M method and concept of duality, dual simplex method.

08 Hours

UNIT -3

Transportation Problem: Formulation of transportation problem, types, initial basic feasible solution using different methods, optimal solution by MODI method, degeneracy in transportation problems, application of transportation problem concept for maximization cases. Assignment Problem-formulation, types, application to maximization cases and travelling salesman problem.

08 Hours

UNIT -4

Integer Programming: Pure and mixed integer programming problems, solution of Integer programming problems-Gomory's all integer cutting plane method and mixed integer method, branch and bound method, Zero-One programming.

06 Hours

PART- B

UNIT -5

Pert-CPM Techniques: Introduction, network construction **-** rules, Fulkerson's rule for numbering the events, AON and AOA diagrams; Critical path method to find the expected completion time of a project, floats; PERT for finding expected duration of an activity and project, determining the probability of completing a project, predicting the completion time of project; crashing of simple projects.

08 Hours

UNIT -6

Queuing Theory: Queuing systems and their characteristics, Pure-birth and Pure-death models (only equations), empirical queuing models – M/M/1 and M/M/C models and their steady state performance analysis.

06 Hours

UNIT -7

Game Theory: Formulation of games, types, solution of games with saddle point, graphical method of solving mixed strategy games, dominance rule for solving mixed strategy games.

06 Hours

UNIT -8

Sequencing: Basic assumptions, sequencing 'n' jobs on single machine using priority rules, sequencing using Johnson's rule-'n' jobs on 2 machines, 'n' jobs on 3 machines, 'n' jobs on 'm' machines. Sequencing 2 jobs on 'm' machines using graphical method.

06 Hours

TEXT BOOKS:

1. **Operations Research,** P K Gupta and D S Hira, Chand Publications, New Delhi - 2007
2. **Operations Research,** Taha H A, Pearson Education

REFERNCE BOOKS:

1. **Operations Research,** A P Verma, S K Kataria &Sons, 2008
2. **Operations Research,** Paneerselvan, PHI
3. **Operations Research,** A M Natarajan, P Balasubramani, Pearson Education, 2005
4. **Introduction to Operations Research,** Hillier and Liberman,8th Ed., McGraw Hill
5. **Operations Research** S.D. Sharma, Ledarnath Ramanath & Co, 2002

NON-CONVENTIONAL ENERGY SOURCES

Subject Code	**: 10ME754**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART A

UNIT – 1

Introduction : Energy source, India's production and reserves of commercial energy sources, need for non-conventional energy sources, energy alternatives, solar, thermal, photovoltaic. Water power, wind bio-mass, ocean temperature difference, tidal and waves, geothermal, tarsands and oil shale, nuclear (Brief descriptions); advantages and disadvantages, comparison (Qualitative and Quantitative).

6 Hours

UNIT – 2

Solar Radiation : Extra-Terrestrial radiation, spectral distribution of extra terrestrial radiation, solar constant, solar radiation at the earth's surface, beam, diffuse and global radiation, solar radiation data.

Measurement of Solar Radiation : Pyrometer, shading ring pyrheliometer, sunshine recorder, schematic diagrams and principle of working.

Solar Radiation Geometry : Flux on a plane surface, latitude, declination angle, surface azimuth angle, hour angle, zenith angle, solar altitude angle expression for the angle between the incident beam and the normal to a plane surface (No derivation) local apparent time. Apparent motion of sum, day length, numerical examples.

9 Hours

UNIT – 3

Radiation Flux on a Tilted Surface : Beam, diffuse and reflected radiation, expression for flux on a tilted surface (no derivations) numerical examples.

Solar Thermal Conversion : Collection and storage, thermal collection devices, liquid flat plate collectors, solar air heaters concentrating collectors (cylindrical, parabolic, paraboloid) (Quantitative analysis); sensible heat storage, latent heat storage, application of solar energy water heating. Space heating and cooling, active and passive systems, power generation, refrigeration. Distillation (Qualitative analysis) solar pond, principle of working, operational problems.

9 Hours

UNIT – 4

Performance Analysis of Liquid Flat Plate Collectors : General description, collector geometry, selective surface (qualitative discussion) basic energy-balance equation, stagnation temperature, transmissivity of the cover system, transmissivity – absorptivity product, numerical examples. The overall loss coefficient, correlation for the top loss coefficient, bottom and side loss coefficient, problems (all correlations to be provided). Temperature distribution between the collector tubes, collector heat removal factor, collector efficiency factor and collector flow factor, mean plate temperature, instantaneous efficiency (all expressions to be provided). Effect of various parameters on the collector performance; collector orientation, selective surface, fluid inlet temperature, number covers, dust.

4 Hours

PART B

UNIT – 5

Photovoltaic Conversion : Description, principle of working and characteristics, applications.

Wind Energy : Properties of wind, availability of wind energy in India, wind velocity and power from wind; major problems associated with wind power, wind machines; Types of wind machines and their characteristics, horizontal and vertical axis wind mills, elementary design principles; coefficient of performance of a wind mill rotor, aerodynamic considerations of wind mill design, numerical examples.

8 Hours

UNIT – 6

Tidal Power : Tides and waves as energy suppliers and their mechanics; fundamental characteristics of tidal power, harnessing tidal energy, limitations.

Ocean Thermal Energy Conversion : Principle of working, Rankine cycle, OTEC power stations in the world, problems associated with OTEC.

Geothermal Energy Conversion : Principle of working, types of geothermal station with schematic diagram, geothermal plants in the world, problems associated with geothermal conversion, scope of geothermal energy.

7 Hours

UNIT – 7

Energy from Bio Mass : Photosynthesis, photosynthetic oxygen production, energy plantation, bio gas production from organic wastes by anaerobic fermentation, description of bio-gas plants, transportation of bio-gas, problems involved with bio-gas production, application of bio-gas, application of bio-gas in engines, advantages.

4 Hours

UNIT – 8

Hydrogen Energy : Properties of Hydrogen with respected to its utilization as a renewable form of energy, sources of hydrogen, production of hydrogen, electrolysis of water, thermal decomposition of water, thermo chemical production bio-chemical production.

Storage & Transportation Methods : Gaseous, cryogenic and metal hydrides, application of hydrogen, domestic and industrial safe burning of hydrogen.

5 Hours

TEXT BOOKS:

1. Non-Conventional Energy Sources by *G.D Rai K*, Khanna Publishers, 2003.
2. Solar energy, by *Subhas P Sukhatme* – Tata McGraw Hill, 2nd Edition, 1996.

REFERENCE BOOKS:

1. Renewable Energy Sources and Conversion Technology by *N.K.Bansal, Manfred Kleeman & Mechael Meliss*, Tata McGraw Hill, 2001.
2. Renewable Energy Resources, *John W.Twidell Anthony D. Weir El*, BG 2001.
3. Solar Power Engineering, *P.K.Nag*, Tata McGraw Hill, 2003.

CONTROL ENGINEERING

Subject Code	**: 10ME82**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Introduction: Concept of automatic controls, Open loop and closed loop systems, Concepts of feedback, requirements of an ideal control system, Types of controllers- Proportional, Integral Proportional Integral, Proportional Integral Differential controllers.

06 Hours

UNIT- 2

Mathematical Models: Transfer function models, models of mechanical systems, models of electrical circuits, DC and AC motors in control systems, models of thermal systems, models of hydraulic systems, pneumatic system, Analogous systems: Force voltage, Force current.

06 Hours

UNIT - 3

Block Diagrams and Signal Flow Graphs: Transfer Functions definition, function, block representation of systems elements, reduction of block diagrams, Signal flow graphs: Mason’s gain formula.

07 **Hours**

UNIT- 4

Transient and Steady State Response Analysis: Introduction, first order and second order system response to step, ramp and impulse inputs, concepts of time constant and its importance in speed of response. System stability: Routh's-Hurwitz Criterion.

06 Hours

PART - B

UNIT - 5

Frequency Response Analysis: Polar plots, Nyquist stability criterion, Stability analysis, Relative stability concepts, Gain margin and phase margin, M&N circles.

06 Hours

UNIT - 6

Frequency Response Analysis Using Bode Plots: Bode attenuation diagrams, Stability analysis using Bode plots, Simplified Bode Diagrams.

07 Hours

UNIT - 7

Root Locus Plots: Definition of root loci, General rules for constructing root loci, Analysis using root locus plots.

06 Hours

UNIT 8

System Compensation and State Variable Characteristics of Linear Systems: Series and feedback compensation, Introduction to state concepts, state equation of linear continuous data system. Matrix representation of state equations, controllability and observability, Kalman and Gilberts test.

07 Hours

TEXT BOOKS :

1. **Modern Control Engineering,** Katsuhiko Ogatta, Pearson Education,2004.
2. **Control Systems Principles and Design,** M.Gopal, 3rd Ed., TMH,2000.

REFERENCE BOOKS :

1. **Modern Control Systems**, Richard.C.Dorf and Robert.H.Bishop, Addison Wesley,1999
2. **System dynamics & control**, Eronini-Umez, Thomson Asia pte Ltd. singapore, 2002.
3. **Feedback Control System**, Schaum's series. 2001.

ELECTIVE-IV (GROUP - D)

TRIBOLOGY

Subject Code	**: 10ME831**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Introduction To Tribology: Properties of oils and equation of flow: Viscosity, Newton's Law of viscosity, Hagen-Poiseuille Law, Flow between parallel stationary planes, viscosity measuring apparatus. Lubrication principles, classification of lubricants.

06 Hours

UNIT - 2

Hydrodynamic Lubrication: Friction forces and power loss in lightly loaded bearing, Petroff's law, Tower's experiments, mechanism of pressure development in an oil film, Reynold's investigation and Reynold's equation in 2D.

06 Hours

UNIT - 3

Idealized Journal Bearing: Introduction to idealized journal bearing, load carrying capacity, condition for equilibrium, Sommerfeld's numbers and significance of it; Partial bearings, end leakages in journal bearing, numerical problems.

07 Hours

UNIT - 4

Slider / Pad Bearing With A Fixed And Pivoted Shoe: Pressure distribution, Load carrying capacity, coefficient of friction, frictional resistance in a pivoted shoe bearing, numerical examples.

07 Hours

PART – B

UNIT - 5

Oil Flow And Thermal Equilibrium Of Journal Bearing: Oil flow through bearings, self-contained journal bearings, bearings lubricated under pressure, thermal equilibrium of journal bearings.

06 Hours

UNIT - 6

Hydrostatic Lubrication: Introduction to hydrostatic lubrication, hydrostatic step bearings, load carrying capacity and oil flow through the hydrostatic step bearing.

06 Hours

UNIT - 7

Bearing Materials: Commonly used bearings materials, properties of typical bearing materials. Advantages and disadvantages of bearing materials.

07 Hours

UNIT - 8

Behavior Of Tribological Components: Selection, friction, Wear of ceramic materials, wear measurements, effects of speed, temperature and pressure. Tribological measures, Material selection, improved design, surface engineering

07 Hours

TEXT BOOKS:

1. **Fundamentals of Tribology** , Basu S K., Sengupta A N., Ahuja B. B., , PHI 2006
2. **Introduction to Tribology Bearings,** Mujumdar B. C., S. Chand company pvt. Ltd 2008.

REFERENEC BOOKS:

1. **Theory and Practice of Lubrication for Engineers,** Fuller, D., New York company 1998
2. **Principles and Applications of Tribology,** Moore, Pergamaon press 1998
3. **Tribology in Industries,** Srivastava S., S Chand and Company limited, Delhi 2002
4. **Lubrication of bearings – Theoretical Principles and Design,** Redzimovskay E I., Oxford press company 2000

AUTOMOTIVE ENGINEERING

Subject Code	**: 10ME844**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Engine Components And Cooling & Lubrication Systems: Spark Ignition (SI) & Compression Ignition (CI) engines, cylinder – arrangements and their relatives merits, Liners, Piston, connecting rod, crankshaft, valves, valve actuating mechanisms, valve and port timing diagrams, Types of combustion chambers for S.I.Engine and C.I.Engines, Compression ratio, methods of a Swirl generation, choice of materials for different engine components, engine positioning, cooling requirements, methods of cooling, thermostat valves, different lubrication arrangements.

07 Hours

UNIT - 2

Fuels, Fuel Supply Systems For Si And Ci Engines: Conventional fuels, alternative fuels, normal and abnormal combustion, cetane and octane numbers, Fuel mixture requirements for SI engines, types of carburetors, C.D.& C.C. carburetors, multi point and single point fuel injection systems, fuel transfer pumps, Fuel filters, fuel injection pumps and injectors.

07 Hours

UNIT - 3

Superchargers And Turbochargers: Naturally aspirated engines, Forced Induction, Types pf superchargers, Turbocharger construction and operation, Intercooler, Turbocharger lag.

06 Hours

UNIT - 4

Ignition Systems: Battery Ignition systems, magneto Ignition system, Transistor assist contacts. Electronic Ignition, Automatic Ignition advance systems.

06 Hours

PART – B

UNIT - 5

Power Trains: General arrangement of clutch, Principle of friction clutches, Torque transmitted, Constructional details, Fluid flywheel, Single plate, multi-plate and centrifugal clutches.

Gear box: Necessity for gear ratios in transmission, synchromesh gear boxes, 3, 4 and 5 speed gear boxes. Free wheeling mechanism, planetary gears systems, over drives, fluid coupling and torque converters, Epicyclic gear box, principle of automatic transmission, calculation of gear ratios, Numerical calculations for torque transmission by clutches.

08 Hours

UNIT - 6

Drive To Wheels: Propeller shaft and universal joints, Hotchkiss and torque tube drives, differential, rear axle, different arrangements of fixing the wheels to rear axle, steering geometry, camber, king pin inclination, included angle, castor, toe in & toe out, condition for exact steering, steering gears, power steering, general arrangements of links and stub axle, over steer, under steer and neutral steer, numerical problems, types of chassis frames.

06 Hours

UNIT - 7

Suspension, Springs And Brakes: Requirements, Torsion bar suspension systems, leaf spring, coil spring, independent suspension for front wheel and rear wheel. Air suspension system.

Types of brakes, mechanical compressed air, vacuum and hydraulic braking systems, construction and working of master and wheel cylinder, brake shoe arrangements, Disk brakes, drum brakes, Antilock –Braking systems, purpose and operation of antilock-braking system, ABS Hydraulic Unit, Rear-wheel antilock & Numerical Problems

06 Hours

UNIT - 8

Automotive Emission Control Systems: Automotive emission controls, Controlling crankcase emissions, Controlling evaporative emissions, Cleaning the exhaust gas, Controlling the air-fuel mixture, Controlling the combustion process, Exhaust gas recirculation, Treating the exhaust gas, Air-injection system, Air-aspirator system, Catalytic converter, Emission standards- Euro I, II, III and IV norms, Bharat Stage II, III norms.

6 Hours

TEXT BOOKS:

1. **Automotive mechanics,** William H Crouse & Donald L Anglin, 10th Edition Tata McGraw Hill Publishing Company Ltd., 2007
2. **Automotive Mechanics,** S. Srinivasan, 2nd Ed., Tata McGraw Hill 2003.

REFERENCE BOOKS:

1. **Automotive mechanics: Principles and Practices**, Joseph Heitner, D Van Nostrand Company, Inc
2. **Fundamentals of Automobile Engineering,** K.K.Ramalingam, Scitech Publications (India) Pvt. Ltd.
3. **Automobile Engineering**, R. B. Gupta, Satya Prakashan, 4th edn. 1984.
4. **Automobile engineering**, Kirpal Singh. Vol I and II 2002.

MANAGEMENT & ORGANIZATIONAL BEHAVIOUR

SubjectCode	:16MBA11	IA Marks	: 20
No. of Lecture Hours / Week: 03		Exam Hours	: 03
Number ofLectureHours	56	Exam Marks	: 80
PracticalComponent	: 02 Hours /Week		

Course Objectives:

- To make students understand fundamental concepts and principles of management, including the basic roles, skills, and functions of management
- To make students knowledgeable of historical development, theoretical aspects and practice applications of managerialprocess
- To understand the basic concepts and theories underlying individual behavior besides developing better insights into one's own self
- To make students aware of Individual behavior in groups, dynamics of groups and team building besides developing a better awareness of how they can be better facilitators for building effective teams as leadersthemselves

Course Outcomes:

At the end of the course students are able to:

- Comprehend & correlate all the management activities which are happening around them with fundamental concepts and principles ofmanagement.
- Get an overview of management, theory of management and practical applications of thesame.
- Effectively use their individual skill to work in groups to achieve organizational goals and ability to leadgroups/teams.

- Demonstrate their acumen in applying managerial and behavioral concept in realworld/situation.

Part A - Principles of Management

Unit1: **(8Hours)**
Introduction: Management: Introduction, Definition of management, Nature, Purpose and Functions, Levels and types of managers, managerial roles, skills for managers, evolution of management thought, Fayol's fourteen principles of management, Recent trends in management.

Unit2: **(12 Hours)**
Planning and Organizing:
Planning: Nature of Planning, Planning Process, Objectives, MBO, Strategies, level of strategies, policies, methods and programs, Planning Premises, Decision-making, Process of decision-making, Types of decisions, Techniques in decision-making.
Organizing: Organization structure, Formal and informal organizations, Principles of organizations-chain of command, span of control, delegation, decentralization, and empowerment. Functional, divisional, geographical, customer based and matrix organizations, tram based structures, virtual organizations, boundary less organizations.

Unit3: **(5 Hours)**
Controlling: Controlling, importance of controlling, controlling process, types of control, factors influencing control effectiveness.

RECOMMENDED BOOKS

- Essentials of Management-Koontz, 8/e, McGrawHill
- Management: Text and Cases-VSP Rao, ExcelBooks
- MGMT, An Innovative approach to teaching and learning Principles of Management, Chuck Williams, Cengage Publications,2010
- Principles and practices of Management, Kiran Nerkar, Vilas Chopde, Dreamtech Press,2011
- Management Theory & practice – Chandan J. S, Vikas Publishing House.
- Management Theory & Practice Text & Cases – Subba Rao P &HimaBindu, HimalayaPublication.

REFERENCE BOOKS:

- Masters of Management Thought – MahanandCharati& M MMunshi, Sapna Book House, Bangalore, 2015.

Part B - Organizational Behaviour

Unit4: **(6hours)**
Introduction: Organizational Behaviour: Introduction, definition, historical development, fundamental principles of OB, contributing disciplines, challenges and opportunities.

Unit5: **(15Hours)**
Foundations of Individual Behaviour: Individual behaviour: Foundations of individual behaviour. Ability: Intellectual abilities, Physical ability, the role of disabilities.

Personality: Meaning, formation, determinants, traits of personality, big five and MBTI, personality attributes influencing OB.
Attitude: Formation, components of attitudes, relation between attitude and behaviour.
Perception: Process of perception, factors influencing perception, link between perception and individual decision-making.

Unit6: (10 Hours)
Motivation: Meaning, theories of motivation-needs theory, two factor theory, Theory X and Y, application of motivational theories.
Leadership: Meaning, styles of leadership, leadership theories, trait theory, behavioural theories, managerial grid, situational theories.

Note: Related case studies to be discussed.

Practical Components:

- Studying organizational structures of any 10 companies and classifying them into different types of organizations which are studied in Unit 2 and justifying why such structures are chosen by those organizations.
- Preparing the leadership profiles of any 5 business leaders and studying their leadership qualities and behaviours with respects to the trait, behavioural and contingency theoriesstudied.
- Identifying any five job profiles and listing the various types, abilities required for those jobs and also the personality traits/attributes required for the jobsidentified.

Note: Faculty can either identify the organizations/ leaders/jobs or students can be allowed to choose the same.

RECOMMENDED BOOKS:

- Organizational behaviour, Stephen P Robbins, Timothy A. Judge, Neharika Vohra, 14th Edition, Pearson,2012.
- Introduction to OrganisationalBehaviour – Michael Butler, Jaico Publishing House,
- Organization Behaviour – Ashwathappa, Himalaya Publication House
- ORGB - Nelson, Quick, Khanelwal, 2/e, Cengage Learning,2012.
- Organizational Behaviour - Anada Das Gupta, Biztantra,2011.
- Organizational Behaviour: A modern approach - Arun Kumar and Meenakshi, Vikas Publishing House,2011.
- Organizational Behaviour – Rao V. S. P, Excel BOOKS,2009.

REFERENCE BOOKS:

- Organizational Behaviour - Fred Luthans, 12/e, McGraw Hill International,2011.
- Management and Organizational Behaviour - Laurie J Mullins, Pearson education

ACCOUNTING FOR MANAGERS

SubjectCode	:16MBA13	IA Marks	: 20
No. of Lecture Hours / Week: 03		Exam Hours	: 03
Number ofLectureHours	56	Exam Marks	: 80
PracticalComponent	: 02 Hours /Week		

Objectives:

- To explain fundamental accounting concepts andconventions.
- To explain and use the accountingequation.
- To prepare basic journal entries for business transactions and present the data in an accuratemanner
- To present financial statements in vertical and horizontalformat.
- To analyze a company's financial statements using various ratios for decisionmaking.
- To understand emerging issues in accounting andtaxation.

Course Outcomes:

At the end of the course students are able to:

- Acquire the knowledge about the concepts and fundamental principles ofaccounting.
- Demonstrate theoretical knowledge and its application in real time accounting.
- Capable of preparing financial statement of sole trading concerns and companies.
- Independently undertake financial statement analysis and take decisions.
- Comprehend emerging trends in accounting andtaxation.

Unit1: **(6Hours)**
Introduction to Accounting: Need and Types of Accounting, Users of Accounting, concepts and conventions of Accounting, Accounting Equation (problems on accounting equation).

Unit2: **(10 Hours)**
Preparation of books of Accounts: Journals, three column cash book, ledgers and trial balance. Depreciation- Straight line and Written down Value Methods.

Unit3: **(14 Hours)**
Preparation of Financial Statements: Preparation of final accounts of sole traders. Preparation of final accounts of companies, vertical form of financial statements. (Basic problems Final Accounts)

Unit4: **(12 Hours)**
Analysis of Financial Statements: Ratio Analysis, Preparation of financial statements using ratios, Preparation of Cash flow Statement (only indirect method).

Unit5: **(8 Hours)**
Emerging issues in Accounting: Human Resource Accounting, Forensic Accounting, Sustainability Reporting -**Accounting Standards and IFRS:** Nature andsignificance

Unit6: **(6 Hours)**
Fundamentals of Taxation: Heads of Income, Deductions u/s 80C, Income Tax Rates and Returns for Individuals only (only theory)

Practical Components:

- Collecting Annual reports of the companies and analyzing the financial statements using different techniques and presenting the same in theclass.
  - Analyzing the companies' cash flow statements and presenting the same in theclass.=
- Exposing the students to usage of accounting software's (Preferably Tally)
- Filling up of ITRforms
- Identify the sustainability report of a company and study the contents.

Note 1: Related case studies to be discussed.
Note 2: 25 percent theory and 75 percent problems

RECOMMENDED BOOKS:

- Financial Accounting: A Managerial Perspective, Narayanaswamy R, 5/e , PHI,2014
- A Text book of Accounting For Management, Maheswari S. N,MaheswariSharadK.Maheswari,2/e,VikasPublishinghouse (P) Ltd.
- Financial Accounting, Tulsian P. C, 1/e, PearsonEducation.
- Accounting for managers, Madegowda J, Himalaya Publishing House.
- Advanced Accountancy, Gupta R. L &Radhaswamy M, Sultan Chand Publications.
- Financial Accounting, Jain S. P and Narang K L, KalyaniPublishers.
- Business Taxation, Akhileshwar Pathak and SavanGodiawala, 2/e, McGraw Hill Education (India) Pvt. Ltd,2013.

REFERENCE BOOKS:

- Financial Accounting for Management: An Analytical Perspective, Ambrish Gupta, 4/e, Pearson Education.
- Introduction to Financial Statement Analysis, Ashish K Bhattacharya, ElsevierIndia.
- Financial Accounting – Raman B. S,Vol I & Vol II, 1/e, United Publishers,2011.
- Financial Accounting (IFRS update), Gary A. Porter & Curtis L. Norton, 6/e, CengageLearning.

- Accounting For Management, Arora M. N, Himalaya Publishing House.
- Essentials of Financial Accounting (Based on IFRS), Bhattacharya, 3/e, Prentice HallIndia.
- Comdex (Computer and Financial Accounting with Tally 9.0 Course Kit), DreamTech.
- Comdex – Tally 9, Namrata Agrawal - DreamTech.
- IFRS: A Practical approach, Jasmine Kaur, McGrawHill.

MANAGERIAL COMMUNICATION

SubjectCode	:16MBA16	IA Marks	: 20
No. of Lecture Hours / Week: 03		Exam Hours	: 03
Number ofLectureHours	56	Exam Marks	: 80
PracticalComponent	: 02 Hours /Week		

Objective:
To enhance students communication skills through verbal, non-verbal, correspondence, presentations, interviews and negotiation.

Course Outcomes:
At the end of the course students are able to:

- Describe and develop written and oralcommunication.
- Independently prepare business letters andreports.
- Exhibit, develop and apply negotiationstrategies.
- Gain exposure to media management and demonstrate the skill in analyzing businesssituation.

Unit1: **(10Hours)**
Introduction: Meaning & Definition, Role, Classification – Purpose of communication – Communication Process – Characteristics of successful communication – Importance of communication in management – Communication structure in organization – Communication in conflict resolution - Communication in crisis. Communication and negotiation - Communication in a cross-cultural setting

Unit 2: **(8 Hours)**
Oral Communication: Meaning – Principles of successful oral communication – Barriers to communication – Conversation control – Reflection and Empathy: two sides of effective oralcommunication.

Modes of Oral Communication - Listening as a Communication Skill, Non-verbal communication

Unit3: **(8Hours)**

Written Communication: Purpose of writing – Clarity in writing – Principles of effective writing – Approaching the writing process systematically: The 3X3 writing process for business communication: Pre writing – Writing – Revising – Specific writing features – CoherenceElectronic writingprocess.

Unit4: **(12 Hours)**

Business Letters and Reports: Introduction to business letters – Types of Business Letters - Writing routine and persuasive letters – Positive and Negative messages Writing Reports: Purpose, Kinds and Objectives of reports – Organization & Preparing reports, short and long reports Writing Proposals: Structure & preparation - Writingmemos

Media Management: The press release – Press conference – Media interviews

Group Communication: Meetings – Planning meetings – objectives – participants – timing – venue of meetings.

Meeting Documentation: Notice, Agenda, and Resolution & Minutes

Unit5: **(10 Hours)**

Presentation skills: What is a presentation – Elements of presentation – Designing & Delivering Business Presentations – Advanced Visual Support for managers.

Case Methods of learning: Understanding the case method of learning. **Negotiation skills:** What is negotiation – Nature and need for negotiation – Factors affecting negotiation – Stages of negotiation process – Negotiation strategies.

Unit6: **(8Hours)**

Employment communication: Introduction – Composing Application Messages - Writing CVs – Group discussions – Interview skills

Impact of Technological Advancement on Business Communication
– Technology-enabled Communication-**Communication networks**– Intranet–Internet–E-mails–SMS– teleconferencing –videoconferencing

Practical Components:

- Demonstrate the effect of noise as a barrier tocommunication
- Make students enact and analyze the non-verbalcues
- Give exercises for clarity and conciseness in writtencommunication.
- Demonstrating using Communication Equipments like Fax, Telex, Intercoms, etc,
- Demonstrating Video conferencing & teleconferencing in theclass.
- Conduct a mock meeting of students in the class identifying an issue of their concern. The students should prepare notice, agenda and minutes of themeeting.
- Each student to give presentation of 5 minutes (this can be spread throughout the semester)and to be evaluated by thefaculty

RECOMMENDED BOOKS:

- Business Communication : Concepts, Cases And Applications – Chaturvedi P. D, &MukeshChaturvedi ,2/e, PearsonEducation,2011
- Business Communication: Process and Product – Mary Ellen Guffey, 3/e, Cengage Learning,2002.
- Business Communication – Renuka Murthy T P and YathishChandra M S,HPH.
- Business Communication – Lesikar, Flatley, Rentz&Pande, 11/e, TMH, 2010
- Advanced Business Communication – Penrose, Rasberry, Myers, 5/e, Cengage Learning,2004.
- BCOM – Lehman, DuFrene, Sinha, Cengage Learning, 2/e,2012

- Business Communication – Madhukar R. K, 2/e, Vikas Publishing House.

REFERENCE BOOKS:

- Effective Technical Communication - Ashraf Rizvi M, TMH,2005.
- Business Communication - Sehgal M. K &Khetrapal V, Excel Books.
- Business Communication – Krizan, Merrier, Jones, 8/e, Cengage Learning, 2012.
- Basic Business Communication – Raj Kumar, Excel Books,2010.

FINANCIAL MANAGEMENT

Subject Code	: 16MBA22	IA Marks	: 20
No. of Lecture Hours / Week	: 03	Exam Hours	: 03
Total Number of Lecture Hours	: 56	Exam Marks	: 80
Practical Component	: 02 Hours / Week		

Course Objectives:

- To familiarize the students with basic concepts of financialmanagement.
- To understand time value of money and cost ofcapital.
- To analyze capital structure, capital budgeting and dividenddecision.
- To understand the short term and long term financing and working capitalmanagement.

Course Outcome:

At the end of the course studentswillbe able to:

- Understand the basic financialconcepts
- Apply time value ofmoney
- Evaluate the investmentdecisions
- Analyze the capital structure and dividenddecisions.
- Estimate working capitalrequirements.

Unit 1: **(8Hours)**

Financial management – Introduction to financial management, objectives of financial management – profit maximization and wealth maximization. Changing role of finance managers. Interface of Financial Management with other functionalareas.

SourcesofFinancing: Shares, Debentures, Term loans, Lease financing, Hybrid financing, Venture Capital, Angel investing and private equity, Warrants and convertibles (Theory Only) **Emerging Issues:** Risk management, Behavioral finance and Financialengineering.

Unit 2: **(10Hours)**

Time value of money –Future value of single cash flow & annuity, present value of single cash flow, annuity & perpetuity.Simple interest & Compound interest, Capital recovery & loan amortization.

Unit 3: **(10Hours)**

Cost of Capital Cost of capital – basic concepts. Cost of debenture capital, cost of preferential capital, cost of term loans, cost of equity capital (Dividend discounting and CAPM model) - Cost of retained earnings - Determination of Weighted average cost of capital (WACC) and Marginal cost of capital.

Unit 4: **(12Hours)**

Investment decisions – Capital budgeting process, Investment evaluation techniques – Net present value, Internal rate of return, Modified internal rate of return, Profitability index, Payback period, discounted payback period, accounting rate ofreturn.

Unit 5: **(8Hours)**

Working capital management – factors influencing working capital requirements - Current asset policy and current asset finance policy- Determination of operating cycle and cash cycle - Estimation of working capital requirements of a firm (Does not include Cash, Inventory & ReceivablesManagement)

Unit 6: **(8Hours)**

Capital structure and dividend decisions – Planning the capital structure. (No capital structure theories to be covered) Leverages – Determination of operating leverage, financial leverage and total leverage. Dividend policy – Factors affecting the dividend policy - Dividend Policies- Stable Dividend, Stable Payout (No dividend theories to becovered)

Practical Components:

- Identifying the small or medium sized companies and understanding the Investment evaluation techniques used bythem.
- Using the annual reports of selected companies, students can study the working capital management employed by them. Students can also compare the working capital management of companies in the samesector.
- Students can choose the companies that have gone for stock split and Bonus issue in the last few years and study the impact of the same on the stockprice.

RECOMMENDED BOOKS:

- Financial Management -Prasanna Chandra, 8/e, TMH,2011.
- Financial Management,Shashi K Gupta and R K Sharma, 8th Revised Edition, Kalyani Publishers,-2014
- Financial Management,Khan M. Y.& Jain P. K, 6/e, TMH,2011.
- Financial Management,Rajiv Srivastava and Anil Misra, Second edition, Oxford UniversityPress,2011
- Financial Management ,I M Pandey, 10th Edition, Vikas Publishing House-2014
- Financial Management & Policy-Vanhorne, James C., 12/e, Pearson,2002
- Financial Management, PralhadRathod, Babitha&S.HarishBabu, Himalaya Publishing House,2015

REFERENCE BOOKS:

- Financial Management,V K Bhalla ,1st Edition- S.Chand2014,
- Fundamentals of Financial Management,Brigham& Houston, 10/e, CengageLearning.
- Corporate Finance,Damodaran , 2/e, Wiley India (P) Ltd.,2004
- Financial Management,Paresh P., Shah 2/e,Biztantra.
- Fundamentals of Financial Management,Sheeba Kapil,Pearson,2013
- Financial Management, Sumit Gulati & Y P Singh,McGraw Hill, New Delhi –2013

RESEARCH METHODS

SubjectCode	:16MBA23	IAMarks	20
No. of Lecture Hours/Week	:03	Exam Hours	03
Total Number ofLectureHours	:56	Exam Marks	80
PracticalComponent	: 02 Hours /Week		

Objectives:

- To understandthe basic components of researchdesign
- To Gain an insight into the applications of researchmethods
- To equip students with various research analytical tools used in businessresearch

Course outcome:

At the end of the course students are able to:

- Understand various research approaches, techniques and strategies in theappropriate in business.
- Apply a range of quantitative / qualitative research techniques tobusiness and day to day managementproblems
- Demonstrate knowledge and understanding of data analysis, interpretation and report writing
- Develop necessary critical thinking skills in order to evaluate different researchapproaches inBusiness.

Unit 1: **(8hours)**

Business Research – Meaning, types, process of research- management problem, defining the research problem, formulating the research Hypothesis, developing the research proposals, research design formulation, sampling design, planning and collecting the data for research, data analysis and interpretation. Research Application in business decisions, Features of good research study.

Unit 2: **(10hours)**

Business Research Design: Meaning and significance - **Types**: Exploratory and Conclusive Research Design.

Exploratory Research: Meaning, purpose, methods- Literature search, experience survey, focus groups and comprehensive case methods.

Conclusive Research Design - Descriptive Research - Meaning, Types – Cross sectional studies and longitudinalstudies.

Experimental Research Design – Meaning and classification of experimental designs- formal and informal, Pre experimental design, Quasi-experimental design, True experimental design, statistical experimentaldesign.

Unit 3: **(8hours)**

Sampling: Concepts- Types of Sampling - Probability Sampling – simple random sampling, systematic sampling, stratified random sampling, cluster sampling -Non Probability Sampling –

convenience sampling- judgemental sampling, snowball sampling- quota sampling - Errors in sampling.

Unit 4: **(12hours)**

Data Collection: Primary and Secondary data

Primary data collection methods - Observations, survey, Interview and Questionnaire, Qualitative Techniques of data collection, Questionnaire design – Meaning - process of designing questionnaire. Secondary data -Sources – advantages anddisadvantages.

Measurement and Scaling Techniques: Basic measurement scales-Nominal scale, Ordinal scale, Interval scale, Ratio scale. Attitude measurement scale - Likert's Scale, Semantic Differential Scale, Thurstone scale, Multi-DimensionalScaling

Unit5: **(10 hours)**

Hypothesis - types, characteristics, source, formulation of hypotheses, errors in hypotheses. Parametric and Non-Parametric Tests- t-test, z-test, f-test, u-test, K-W Test (problems on all tests) Statistical analysis- Bivariate and Multivariate Analysis- (only theory). ANOVA-one-way and two-way classification (theoryonly)

Unit6: **(8 hours)**

Data Analysis and Report Writing: Editing, Coding, Classification, Tabulation, Validation Analysis and Interpretation- **Report writing and presentation of results:** Importance of report writing, types of research report, report structure, guidelines for effective documentation.

Practical Components:

- To identify research problem and collect relevant literatures for dataanalysis
- To write the research design by using Exploratory and Descriptive Researchmethods
- To prepare the questionnaire on brand awareness, effectiveness of training in public sector organization, Investors attitude towards Mutual funds in any financialinstitutions.
- To conduct Market survey and to investigate consumer perception towards anyFMCG.
- To demonstrate Report writing and Presentationmethods

RECOMMENDED BOOKS

- Business Research Methods: A South-Asian Perspective with course Mate William G.Zikmund/Barry J.Babin/Jon C.Carr/AtanuAdhikari/Mitch Griffin, Cengagelearning
- Business Research Methods: S.N.Murthy&U.Bhojanna. ExcelBooks
- Business Research Methods. Donald R. Cooper & Pamela s Schindler, 9/e, TMH/2007
- Research Methods – M MMunshi& K Gayathri Reddy, Himalaya Publishing House, 2015
- Research Methods for Business, Uma Sekaran& Roger Bougie, 6th Edition, Wiley,2013
- Business Research Methods-SL Guptah and HeteshGuptha, McGraw hill -2012
- Marketing Research- Naresh K Malhotrs- 5th Edition, Pearson Education /PHI2007

REFERENCE BOOKS

- Research Methods- William M C Trochi,- 2/e, Biztantra,2007

- Methodology of Research in social Sciences- O R Krishnaswami, M Ranganatham, HPH, 2007
- Research Methodology – C.R.Kothari,VishwaPrakashan
- Business Research Methodology – J K Sachdeva – 2nd Edition - HPH,2011
- Research Methodology – concepts and cases – Deepak Chawla and NeenaSondhi - Vikas Publication -2014

INDUSTRIAL RELATIONS AND

LEGISLATIONS

Subject Code	: 16MBA HR301	IA Marks :20
Number of Lecture Hours/Week	: 03	Exam Hours: 03
Number of Lecture Hours	: 56	Exam Marks: 80
Practical Component	: 02 Hours/ Week	

Course Objectives:

- To enable students to understand and apply the principles of IR and develop an awareness of the significance of industrialpeace.
- To provide a conceptual basis of IndustrialRelations.
- To give an understanding of the components and meaning of sustaining Industrial peace anchored on harmonious Employee-Managementrelations.
- To discuss the various Industrialacts.

Course Outcomes:

The students should be able to

- Gain the insights of IR practices in theindustry.
- Develop the knowledge related to employee-managementrelations
- Implementation of various industrialacts

PART A:
INDUSTRIALRELATIONS **(32hours)**

Unit 1 **(8hours)**
Introduction:
Background of Industrial Relations – Definition, scope, objectives, factors affecting IR, participants of IR, importance of IR. Approaches to Industrial relations, system of IR in India –Historical perspective & post-independence period, Code of Discipline and historical initiatives for harmonious IR, Government policies relating to labor, ILO and its influence on Legal enactments inIndia.

Unit2 **(8Hours)**
Collective Bargaining & Negotiation:
Collective Bargaining: Definition, Meaning, Nature, essential conditions for the success of collective bargaining, functions of collective bargaining, importance of Collective Bargaining, collective bargaining process, prerequisites for collective bargaining, implementation and administration ofagreements.

Negotiations-Types of Negotiations-Problem solving attitude, Techniques of negotiation, negotiation process, essential skills for negotiation, Workers Participation in Management

Unit3 **(8Hours)**
Trade Union
Trade Unions: Meaning, trade union movement in India, Objective, role and functions of the Trade Unions in Modern Industrial Society of India, Procedure for registration of Trade Unions, Grounds for the withdrawal and cancellation of registration, union structure, Rights and responsibilities of TUs, Problems of trade unions, Employee relations in ITsector

Unit5 **(8Hours)**
Grievance procedure and Discipline management:
Grievance - Meaning and forms, sources of grievance, approaches to grievance machinery, Grievance procedures, model grievance procedure. Disciplinary procedures, approaches to manage discipline in Industry, Principles of Hot stoverule.
RECOMMENDED BOOKS:
- Employee Relations Management, P N Singh, Singh P. N., - Pearson Publications,2011.
- Dynamics of Industrial Relations, Mamoria&Mamoria, Himalaya Publications,2012
- Human Resource Management Principles & Practice, Aquinas, VikasPublication.
- Personnel Management & Industrial Relations, Nair N G, Nair L, S. Chand Limited,2001
- Essentials of Human Resource Management and Industrial Relations, Subba Rao, 3rd Revised edition, Himalaya Publishing House,2010.

REFERENCE BOOKS:
Industrial Relations, Trade Unions &Labour Legislation, P R N Sinha et al, Pearson Education, 2004.
- BareActs
- Industrial Relations and labor laws, ArunMonappa, RanjeetNambudiri, PatturajuSelvaraj, TMH, 1997.
- Industrial relations, trade unions and labor legislations, P R N Sinha, InduBala Sinha, Seema PriyadarshiniShekar, Pearson Education, 2013, ISBN:9788131731642

PARTB: **(24Hours)**
Unit 5
INDUSTRIALLEGISLATIONS **(16hours)**
Only basic objectives and major provisions of the following legislations:
- Factories Act1948,
- Industrial Employment (Standing orders) Act,1946
- Employees' State Insurance (ESI) Act,1948,
- Maternity Benefit Act,1961
- Contract LabourAct,
- Shops and EstablishmentsAct
- Child Labour (Prohibition & Regulation) Act,1986
- Industrial disputes act of1947

Unit6 **(8Hours)**
- Minimum Wages Act, 1948
- Payment of Wages Act,1936

- Payment of Gratuity Act1972,
- Employees' Provident Fund and Miscellaneous Provisions Act1952;
- Payment of Bonus Act,1965.
- Employees Compensation Act in2013

NO PRACTICAL COMPONENT

RECOMMENDED BOOKS:

- Labor Laws for Managers, BD Singh, Excel Books,2009
- Industrial Relations and Labor laws, SC Srivatava, 5th Edition, VikasPublications.
- Elements of Mercantile Law - N. D Kapoor, Sultan Chand,2004.
- Industrial Relations and Labour Legislations, Piyali Ghosh &ShefaliNandan,TMH.
- Labor Industrial Laws, Dr. V. G. Goswami, Eighth Edition, Central Law Agency,Allahabad

REFERENCE BOOKS:

- Industrial Relations, Trade Unions &Labour Legislation, P R N Sinha et al, Pearson Education,2004.
- BareActs
- Industrial Relations and labor laws, ArunMonappa, RanjeetNambudiri, PatturajuSelvaraj, TMH,1997.
- Industrial relations, trade unions and labor legislations, P R N Sinha, InduBala Sinha, Seema PriyadarshiniShekar, Pearson Education,2013.

RECRUITMENT & SELECTION

Subject Code	: 16MBA HR302	IAMarks 20
Number of Lecture Hours/Week	: 03	Exam Hours:03
Number of Lecture Hours	: 56	Exam Marks: 80
Practical Component	: 02 Hours/ Week	

Course Objectives:

To understand and apply the policies and procedures of recruitment
- To provide a conceptual framework of Selection Procedure in theIndustry.
- To understand the new concepts and techniques of recruitment and Selection in the Corporate.

Course Outcomes:

The students should be able to
- Learn the various recruitment policies andprocedures.
- Equip with conceptual framework of selectionprocedures.
- Gain insights of the latest concepts and techniques used in recruitment andselection.

Unit1: **(6 Hours)**

Job Analysis: Meaning, definition and purpose. Methods of job analysis: job analysis interviews, job analysis questionnaire, task analysis inventory, position analysis questionnaire, subject expert workshops, critical incident technique, F1eisclunann job analysis survey, functional job analysis, job element method, repertory grid, critical incident technique

Unit2: **(9 Hours)**
Hiring Process & Hiring decision: Nature of hiring: regular, temporary, full time, part time, apprentice, contractual, and outsourcing, Existing post or new post to be created, Need analysis, cost analysis and job analysis.

Unit3: **(7Hours)**
Hiring internally: Meaning and definition of internal recruitment, Advantages and disadvantages in terms of cost, time, quality and suitability. Sources of internal recruitment: - circulars, intranet advertisements, employee referrals, Appointment or promotion, Policy guidelines and union settlements.

Unit4: **(10 Hours)**
External Hiring: Meaning and definition of external recruitment. Sources of recruitment:- advertisement, in newspaper, TV/Radio, Internet, search on the internet, wanted signboards, consultants, employment exchange, campus recruitment, employee referrals and unsolicited applications. Advantages and disadvantages of the above sources in terms of cost, time, convenience, reach of the targeted population, and quality of applicant pool.
Job advertisement: drafting, size and contents. Contents of public sector recruitment: single or multiple sources and choosing the best source
Unit5: **(8Hours)**
Screening the candidates: Application Forms: bio-data / resume / curriculum vitae and Weighted application blanks: meaning definition, purpose, advantages and disadvantages – taking a Behavioral approach to recruitment: spotting personality patterns, making basic assumptions, Predicting the future, strategy Vs. Technique, Pinning down what is needed: targeted interviewing, focusing on behavior, assessing how person performs, assuming they have been hired. – Identifying the ingredients of success: the winning candidate's profile, challenges in the Interview, the starting point, day to day execution, dealing with people, the inner person, additional characteristics. Studying the CV.

Unit6: **(16Hours)**
Testing,Reference checking & Appointment orders: Meaning, definition, purpose, advantages and disadvantages, Ability tests clerical ability test, mechanical ability test, mental ability test, physical ability test, personality assessment test, typing test, shorthand test, computer proficiency test Interviewing: Planning the interview, Interview process - Interview in public sector undertaking. Statutory requirements.
Reference checking: meaning, definition and purpose. Verification of character, criminal antecedents, previous work behavior and education qualifications. Verification of community certificates in public sectorcompanies.
Appointment orders: Meaning, definition, and purpose. Contents of appointment letter, hard copy (or softcopy),

Practical Components:

- Students need to identify two jobs in the college and need to do job analysis for those positions using any of the job analysismethods.

- In teams students can be asked to give presentations about various types of jobs (regular, temporary, full time, part time, apprentice, contractual, and outsourcing) in different industries along with its advantages anddisadvantages
- In Teams, select and analyze any two of the Job postings advertisements in Newspapers to know more about job description and job specification mentioned in each advertisement for every post.
- Obtain online access to the resume data base of Naukri.com or Monsterindia.com for a week give at least four Job Descriptions and specification to each student, to search and download from the data base at least five resumes for eachpositions.
- Students can identify 4 or 5 jobs of their interest and can create Advertisements for the same imaging that they are Proprietors of the companies and hiring for thesepositions.
- Debate on Advantages and disadvantages of hiring external and Internal for the selected jobs like
- Police Constable, Doctor, CEO, Mechanical Engineer, Professoretc.,
- Role play: Students can do the role play for the entire process of hiring and selecting 3 or 4 selected roles in a specificindustry.

RECOMMENDED BOOKS:

- Human Resource Selection, Robert D. Gatewood and Hubert S. I, South western Cengage Learning, Mason, Ohio,2001.
- Recruitment and Selection -Theory and Practice. Dipak kumar Bhattacharya Cengage Learning.
- StaffingOrganization,HerbertG.HenemanIII,TimothyA.Judge,5th Edition,McGraw Hill International.
- Recruitment and Selection, Elearn, Revised Edition, Routledge,2009.
- Online Recruiting and Selection: Innovations in Talent Acquisition, Douglas H. Reynolds, John A. Weiner, John Wiley & Sons,2009.
- Effective Recruitment and Selection Practices, R. L. Compton, William J. Morrissey, Alan R. Nankervis, Bill Morrissey, CCH Australia Limited,2009.

REFERENCE BOOKS:

- Employee Selection, Lilly M Berry, 1 edition, Cengage Learning,2002.
- Hiring & keeping the best people, HBS Press, 2013, ISBN: 1422131785,9781422131787
- Human Resource Planning, Dipak Kumar Bhattacharyya, 2nd edition, Excel Books, 2009, ISBN: 8174464980,9788174464989
- High performance hiring by Robert W. Wendover, Crisp Publication, California,1991.

CONCRETE TECHNOLOGY
(COMMON TO CV/TR/CTM)

Sub Code	**:**	**10 CV 42**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

Unit- 1

Cement, Chemical composition, hydration of cement, Types of cement, manufacture of OPC by wet and dry, process (flow charts only) Testing of cement - Field testing, Fineness by sieve test and Blaine's air permeability test, Normal consistency, testing time, soundness, Compression strength of cement and grades of cement, Quality of mixing water. –7 Hours

Unit-2

Fine aggregate - grading, analysis, Specify gravity, bulking, moisture content, deleterious materials. Coarse aggregate – Importance of size, shape and texture.Grading of aggregates - Sieve analysis, specific gravity, Flakiness and elongation index, crushing, impact and abrasion tests. - 6 Hours

Unit-3

Workability - factors affecting workability, Measurement of workability - slump, flow tests, Compaction factor and vee-bee consistometer tests, Segregation and bleeding, Process of manufactures of concrete : Batching, Mixing, Transporting, Placing, Compaction, Curing. -7 Hours

Unit-4

Chemical admixtures - plasticizers, accelerators, retarders and air entraining agents, Mineral admixtures - Fly ash, Silica fumes and rice husk ash. -6 Hours

Part-B

Unit-5

Factors affecting strength, w/c ratio, gel/space ratio, maturity concept, Effect of aggregate properties, relation between compressive strength, and tensile strength, bond strength, modulus of rupture, Accelerated curing, aggregate - cement bond strength, Testing of hardened concrete - compressive strength, split tensile strength, Flexural strength, factors influencing strength test results. - 6Hours

Unit-6

Elasticity - Relation between modulus of elasticity and Strength, factors affecting modulus of elasticity, Poisson , Ratio, Shrinkage - plastic shrinkage and drying shrinkage, Factors affecting shrinkage, Creep - Measurement of creep, factors affecting creep, effect of creep, - 7 Hours

Unit-7

Durability - definition, significance, permeability, Sulphate attack, Chloride attack, carbonation, freezing and thawing, Factors contributing to cracks in concrete - plastic shrinkage, settlement cracks, construction joints, Thermal expansion, transition zone, structural design deficiencies, - 6 Hours

Unit-8

Concept of Concrete Mix design, variables in proportioning , exposure conditions, Procedure of mix design as per IS 10262-1982, Numerical examples of Mix Design - 7 Hours

TEXT BOOKS:

1. "Concrete Technology" - Theory and Practice, M.S.Shetty, S.Chand and Company, New Delhi, 2002.

REFERENCES :

1. "Properties of Concrete"Neville, A.M. : , ELBS, London
2. "Concrete Technology" – A.R.Santakumar. Oxford University Press (2007)'
3. "Concrete Manual" - Gambhir Dhanpat Rai & Sons, New Delhi.
4. "Concrete Mix Design" - N.Krishna Raju, Sehgal - publishers.
5. "Recommended guidelines for concrete mix design" - IS:10262,BIS Publication

2. **Fundamentals of Surveying** - S.K. Roy – Prentice Hall of India
3. **Surveying**, Arther Bannister et al., Pearson Education, India

STRUCTURAL ANALYSIS –I
(COMMON TO CV/TR)

Sub Code	**:**	**10 CV 43**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:
STRUCTURAL SYSTEMS AND ENERGY CONCEPT
1.1 Forms of structures, 1.2 Conditions of equilibrium, 1.3 Degree of freedom, 1.4 Linear and Non linear structures, 1.5 One, two, three dimensional structural systems, 1.6 Determinate and indeterminate structures [Static and Kinematics]. 1.7 Strain energy and complimentary strain energy, 1.8 Strain energy due to axial load, bending and shear, 1.9 Theorem of minimum potential energy, 1.10 Law of conservation of energy, 1.11 Principle of virtual work,

7 Hours

UNIT 2:
DEFLECTION OF BEAMS
2.1 Moment area method, 2.2 Conjugate beam method

6 Hours

UNIT 3:
DEFLECTION OF BEAMS AND FRAMES BY STRAIN ENERGY
3.1 The first and second theorem of Castigliano, problems on beams, frames and trusses, 3.2 Betti's law, 3.3 Clarke - Maxwell's theorem of reciprocal deflection.

7 **Hours**

UNIT 4:
ANALYSIS OF BEAMS AND PLANE TRUSSES BY STRAIN ENERGY
4.1 Analysis of beams (Propped cantilever and Fixed beams) and trusses using strain energy and unit load methods

7 Hours

PART – B

UNIT 5:
ARCHES AND CABLES

5.1 Three hinged circular and parabolic arches with supports at same levels and different levels, 5.2 Determination of thrust, shear and bending moment, 5.3 Analysis of cables under point loads and UDL, length of cables (Supports at same levels and at different levels).

6 Hours

UNIT 6:
ANALYSIS OF BEAMS

6.1 Consistent deformation method – Propped cantilever and fixed beams

6 Hours

UNIT 7:

7.1 Clapeyron's theorem of three moments – continuous beams and fixed beams

6 Hours

UNIT 8:
ANALYSIS OF ARCHES

8.1 Two hinged parabolic arch, 8.2 Two hinged Circular Arch

7 Hours

TEXT BOOKS:

1. **Theory of Structures**, Pandit and Guptha, Vol. – I, Tata McGraw Hill, New Delhi.
2. **Basic Structural Analysis** Reddy C. S., Tata McGraw Hill, New Delhi.
3. **Strength of Materials and theory of structures** Vol I & II, B.C. Pumia , R.K., Jain Laxmi Publication New Delhi

REFERENCE BOOKS:

1. **Elementary Structural Analysis**, Norris and Wilbur, International Student Edition. McGraw Hill Book Co: New York
2. **Structural Analysis**, 4th SI Edition by Amit Prasanth & Aslam Kassimali, Thomson Learning.
3. **Analysis of Structures**, Thandava Murthy, Oxford University Press, Edition 2005.

SURVEYING – II
(COMMON TO CV/TR/EV/CTM)

Sub Code	**:**	**10 CV 44**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:
THEODOLITE SURVEY
1.1 Thedolite and types, 1.2 Fundamental axes and parts of a transit theodolite, 1.3 Uses of theodolite, 1.4 Temperary adjustments of a transit thedolite, 1.5 Measurement of horizontal angles – Method of repetitions and reiterations, 1.6 Measurements of vertical angles, 1.7 Prolonging a straight line by a theodolite in adjustment and theodolite not in adjustment

6 Hours

UNIT 2:
PERMANENT ADJUSTMENT OF DUMPY LEVEL AND TRANSIT THEODOLITE
2.1 Interrelationship between fundamental axes for instrument to be in adjustment and step by step procedure of obtaining permanent adjustments

7 Hours

UNIT 3:
TRIGONOMETRIC LEVELING
3.1 Determination of elevation of objects when the base is accessible and inaccessible by single plane and double plane method, 3.2 Distance and difference in elevation between two inaccessible objects by double plane method. Salient features of Total Station, Advantages of Total Station over conventional instruments, Application of Total Station.

8 Hours

UNIT 4:
TACHEOMETRY
4.1 Basic principle, 4.2 Types of tacheometric survey, 4.3 Tacheometric equation for horizontal line of sight and inclined line of sight in fixed hair method, 4.4 Anallactic lens in external focusing telescopes, 4.5 Reducing the constants in internal focusing telescope, 4.6 Moving hair method and

tangential method, 4.7 Subtance bar, 4.8 Beaman stadia arc.

7 Hours

PART – B

UNIT 5:
CURVE SETTING (Simple curves)
5.1 Curves – Necessity – Types, 5.2 Simple curves, 5.3 Elements, 5.4 Designation of curves, 5.5 Setting out simple curves by linear methods, 5.6 Setting out curves by Rankines deflection angle method.

6 Hours

UNIT 6:
CURVE SETTING (Compound and Reverse curves)
6.1 Compound curves 6.2 Elements 6.3 Design of compound curves 6.4 Setting out of compound curves 6.5 Reverse curve between two parallel straights (Equal radius and unequal radius).

6 Hours

UNIT 7:
CURVE SETTING (Transition and Vertical curves)
7.1 Transition curves 7.2 Characteristics 7.3 Length of Transition curve 7.4 Setting out cubic Parabola and Bernoulli's Lemniscates, 7.5 Vertical curves – Types – Simple numerical problems.

6 Hours

UNIT 8:
AREAS AND VOLUMES
8.1 Calculation of area from cross staff surveying, 8.2 Calculation of area of a closed traverse by coordinates method. 8.3 Planimeter – principle of working and use of planimeter to measure areas, digital planimter, 8.4 Computations of volumes by trapezoidal and prismoidal rule, 8.5 Capacity contours

6 Hours

TEXT BOOKS:
1.'**Surveying'** Vol 2 and Vol 3 - B. C. Punmia, Laxmi Publications
2**.'Plane Surveying'** A. M. Chandra – New age international (P) Ltd
3**.'Higher Surveying'** A.M. Chandra New age international (P) Ltd

REFERENCE BOOKS:
1. **Fundamentals of Surveying** - Milton O. Schimidt – Wong, Thomson Learning.

DESIGN OF RCC STRUCTURAL ELEMENTS

Subject Code	**: 10CV52**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

GENERAL FEATURES OF REINFORCED CONCRETE: Introduction, Design Loads, Materials for Reinforced Concrete and Code requirements. Design Philosophy – Limit State Design principles. Philosophy of limit state design, Principles of limit states, Factor of Safety, Characteristic and design loads, Characteristic and design strength.

6 Hours

UNIT - 2

PRINCIPLES OF LIMIT STATE DESIGN AND ULTIMATE STRENGTH OF R.C. SECTION: General aspects of Ultimate strength, Stress block parameters for limit state of collapse, Ultimate flexural strength of singly reinforced rectangular sections, Ultimate flexural strength of doubly reinforced rectangular sections, Ultimate flexural strength of flanged sections, Ultimate shear strength of RC sections, Ultimate torsional strength of RC sections, Concepts of development length and anchorage, Analysis examples of singly reinforced, doubly reinforced, flanged sections, shear strength and development length.

7 Hours

UNIT - 3

FLEXURE AND SERVICEABILITY LIMIT STATES: General Specification for flexure design of beams-practical requirements, size of beam, cover to reinforcement-spacing of bars. General aspects of serviceability-Deflection limits in IS: 456 – 2000-Calculation of deflection (Theoretical method), Cracking in structural concrete members, Calculation of deflections and crack width.

6 Hours

UNIT - 4

DESIGN OF BEAMS: Design procedures for critical sections for moment and shears. Anchorages of bars, check for development length, Reinforcement requirements, Slenderness limits for beams to ensure lateral stability, Design examples for Simply supported and Cantilever beams for rectangular and flanged sections.

8 Hours

PART - B

UNIT - 5

DESIGN OF SLABS: General consideration of design of slabs, Rectangular slabs spanning one direction, Rectangular slabs spanning in two directions for various boundary conditions. Design of simply supported, cantilever and continuous slabs as per IS: 456 – 2000.

8 Hours

UNIT - 6

DESIGN OF COLUMNS: General aspects, effective length of column, loads on columns, slenderness ratio for columns, minimum eccentricity, design of short axially loaded columns, design of column subject to combined axial load and uniaxial moment and biaxial moment using SP – 16 charts.

5 Hours

UNIT - 7

DESIGN OF FOOTINGS: Introduction, load for footing, Design basis for limit state method, Design of isolated rectangular footing for axial load and uniaxial moment, design of pedestal.

6 Hours

UNIT - 8

DESIGN OF STAIR CASES: General features, types of stair case, loads on stair cases, effective span as per IS code provisions, distribution of loading on stairs, Design of stair cases. With waistslabs.

6 Hours

REFERENCE BOOKS:

1. **Limit State Design of Reinforced concrete-**by P.C. Varghese, PHI Learning Private Limited 2008-2009
2. **Fundamentals of Reinforced concrete Design-**by M.L.Gambhir, PHI Learning Private Limited 2008-2009.
3. **Reinforced concrete Design-**by Pallai and Menon, TMH Education Private Limited,
4. **Reinforced concrete Design-**by S.N.Shinha, TMH Education Private Limited,

5. **Reinforced concrete Design**-by Karve & Shaha, Structures Publishers Pune.
6. **Design of RCC Structural Elements** S. S. Bhavikatti, Vol-I, New Age International Publications, New Delhi.
7. **IS-456-2000 and SP-16**

GEOTECHNICAL ENGINEERING – I

Subject Code	**: 10CV54**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT- 1

INTRODUCTION: History of soil mechanics, Definition, origin and formation of soil. Phase Diagram, Voids ratio, Porosity, Percentage Air Voids, Air content, Degree of saturation, Water content, Specific Gravity of soil solids and soil mass, Densities and Unit weights - Bulk, Dry, Saturated & Submerged and their inter relationships.

6 Hours

UNIT - 2

INDEX PROPERTIES OF SOIL AND THEIR DETERMINATION: Index Properties of soil- Water content , Specific Gravity, Particle size distribution, Relative Density, Consistency limits and indices, in-situ density, Activity of Clay, Laboratory methods of determination of index properties of soil: Water content (Oven Drying method & Rapid Moisture method), Specific gravity of soil solids (Pycnometer and density bottle method), Particle size distribution (Sieve analysis and Hydrometer analysis only), Liquid Limit- (Casagrande and Cone penetration methods), Plastic limit and shrinkage limit.

7 Hours

UNIT - 3

CLASSIFICATION OF SOILS: Purpose of soil classification, Particle size classification – MIT classification and IS classification, Textural classification. IS classification - Plasticity chart and its importance, Field identification of soils.

CLAY MINERALOGY AND SOIL STUCTURE: Single grained, honey combed, flocculent and dispersed structures, Valence bonds, Soil-Water system, Electrical diffuse double layer, adsorbed water, base-exchange capacity, Isomorphous substitution. Common clay minerals in soil and their structures- Kaolinite, Illite and Montmorillonite.

8 Hours

UNIT - 4

FLOW OF WATER THROUGH SOILS: Darcy's law- assumption and validity, coefficient of permeability and its determination (laboratory and field), factors affecting permeability, permeability of stratified soils, Seepage

velocity, Superficial velocity and coefficient of percolation, quick sand phenomena, Capillary Phenomena**.**

6 Hours

PART - B

UNIT - 5

SHEAR STRENGTH OF SOIL: Concept of shear strength, Mohr-coulomb theory, conventional and modified failure envelops, Effective stress concept-total stress, effective stress and Neutral stress, Concept of pore pressure, Total and effective shear strength parameters, factors affecting shear strength of soils, Sensitivity and Thixotropy of clay.

7 Hours

UNIT - 6

COMPACTION OF SOIL: Definition, Principle of compaction, Standard and Modified proctor's compaction tests, factors affecting compaction, effect of compaction on soil properties, Field compaction control – compactive effort & method, lift thickness and number of passes, Proctor's needle, Compacting equipment.

6 Hours

UNIT - 7

CONSOLIDATION OF SOIL: Definition, Mass-spring analogy, Terzaghi's one dimensional consolidation theory-assumption and limitations (no derivation), Normally consolidated, under consolidated and over consolidated soils, pre-consolidation pressure and its determination by Casagrande's method. Consolidation characteristics of soil (C_c, a_v, m_v and C_v).

UNIT- 8

DETERMINATION OF SHEAR STRENGTH AND CONSOLIDATION OF SOIL: Measurement of shear parameters- Direct shear test, unconfined compression test, Triaxial compression test and vane shear test, Test under different drainage conditions.

Laboratory one dimensional consolidation test, Determination of consolidation characteristics of soils-compression index and coefficient of consolidation (square root of time fitting method, logarithmic time fitting method).

6 Hours

TEXT BOOKS:

1. **Soil Mechanics and Foundation Engg**.- Punmia B.C. (2005), 16th Edition Laxmi Publications Co. , New Delhi.
2. **Principles of Soil Mechanics and Foundation Engineering**-Murthy V.N.S. (1996), 4th Edition, UBS Publishers and Distributors, New Delhi.

3. **Geotechnical Engineering**; Braja, M. Das (2002), Fifth Edition, Thomson Business Information India (P) Ltd., India

REFERENCES BOOKS:

1. **Foundation Analysis and Design**- Bowles J.E. (1996), 5th Edition, McGraw Hill Pub. Co. New York.
2. **Soil Engineering in Theory and Practice**- Alam Singh and Chowdhary G.R. (1994), CBS Publishers and Distributors Ltd., New Delhi.
3. **Basic and Applied Soil Mechanics**- Gopal Ranjan and Rao A.S.R. (2000), New Age International (P) Ltd., Newe Delhi.
4. **Geotechnical Engineering**- Donold P Coduto Phi Learning Private Limited, New Delhi
5. **Geotechnical Engineering**- Shashi K. Gulathi & Manoj Datta. (2009), " Tata Mc Graw Hill.
6. **Text Book of Geotechnical Engineering**- Iqbal H. Khan (2005),, 2nd Edition, PHI, India.
7. **Numerical Problems, Examples and objective questions in Geotechnical Engineering**- Narasimha Rao A. V. & Venkatrahmaiah C. (2000), Universities Press., Hyderabad.

Hydrology and Irrigation Engineering

Sub Code	**:**	**10CV55**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART-A
HYDROLOGY

UNIT 1: INTRODUCTION & PRECIPITATION

Introduction ,Hydrologic cycle (Horton's representation). Water budget equation

Precipitation: introduction, forms of precipitation, types of precipitation, measurement of precipitation (Simon's gauge & Syphon gauge only), selection of rain gauge station. Adequacy of raingauges, methods of computing average rainfall, interpolation of missing data, adjustment of missing data by double mass curve method. Hyetograph and mass curve of rainfall, 07 hrs

UNIT 2 : LOSSES FROM PRECIPITATION

Evaporation: Definition, factors affecting, measurement (Class A pan). Estimation using empirical methods (Meyer's and Rohwer's equation), evaporation control.
Evapo-transpiration: Definition, factors affecting, measurement, estimation (Blaney criddle method)
Infiltration: Definition, factors affecting, measurement (double ring infiltrometer), infiltration indices, Horton's equation of infiltration. 07 hrs

UNIT 3: HYDROGRAPHS
Definition, components of hydrographs, unit hydrograph and its derivation from simple storm hydrograph, base flow separation, Prepositions of unit hydrograph- problems
06 hrs

UNIT 4: ESTIMATION OF FLOOD & FLOOD ROUTING
Definition of flood, factors affecting flood, methods of estimation (envelope curves, empirical formulae, rational method).
Flood routing: Introduction to hydrological routing, relationship of out flow and storage, general storage equation, Muskingum routing method. 07 hrs

PART-B
IRRIGATION ENGINEERING

UNIT 5 : INTRODUCTION
Introduction, need for irrigation, advantages and disadvantages of irrigation, environmental impacts of irrigation, Systems of irrigation: Gravity irrigation, lift irrigation, well irrigation, tube well irrigation, infiltration galleries, sewage irrigation, supplemental irrigation.
06 hrs

UNIT 6: SOIL-WATER-CROP RELATIONSHIP

Introduction, soil profile, physical properties of soil, soil classification. Indian soils, functions of irrigation soils, maintaining soil fertility, soil-water-plant relationship, soil-moisture. Irrigation relationship, frequency of irrigation.
06 hrs

UNIT 7: WATER REQUIREMENT OF CROPS

Introduction, definitions, crop seasons of India, water requirement of a crop, duty, delta, base period. Consumptive use. Irrigation efficiencies. Assessment of irrigation water.

07 hrs

Unit 8: Canals

Definition, Types of canals, Alignment of canals, Design of canals by Kenedy's and Lacey's methods- Problems
06 hrs

TEXT BOOKS:

1. Engineering Hydrology – Subramanya.K; Tata Mcgraw Hill NewDelhi-2008 (Ed)
2. Hydrology- Madan Mohan Das, Mim Mohan Das-PHI Learning private Ltd. New Delhi-2009 (Ed)
3. A Text Book Of Hydrology- Jayarami Reddy, Laksmi Publications, New Delhi-2007 (Ed)
4. Irrigation, water Resources and water power Engineering- P.N.Modi- standard book house, New Delhi.
5. Irrigation and Water Power Engineering-Madan Mohan Das & Mimi Das Saikia; PHILearning pvy. Ltd. New Delhi 2009 (Ed).

REFERENCE BOOKS:

1. Hydrology & Soil Conservation Engineering- Ghanshyam Das- PHI Learning Private Ltd., New Delhi- 2009 (Ed)

2. Hydrology & Water Resources Engineering- Patra K.C. Narosa Book Distributors Pvt. Ltd. New Delhi-2008 (Ed)

3. Hydrology & Water Resources Engineering- R.K.Sharma & Sharma, Oxford and Ibh, New Delhi

4. Irrigation Engineering and Hydraulic structures- S. K. garg- Khanna Publication, New Delhi.

TRANSPORTATION ENGINEERING I

Subject Code :10CV56
I A Marks :25
No. of lecture Hours/week :04
Exam Hours :03
Total No. of Lecture Hours :52
Exam Marks :100

PART – A

UNIT – 1

PRINCIPLES OF TRANSPORTATION ENGINEERING: Importance of transportation, Different modes of transportation and comparison, Characteristics of road transport Jayakar committee recommendations, and implementation – Central Road Fund, Indian Roads Congress, Central Road Research Institute

04 Hrs

UNIT – 2

HIGHWAY DEVELOPMENT AND PLANNING: Road types and classification, road patterns, planning surveys, master plan – saturation system of road planning, phasing road development in India, problems on best alignment among alternate proposals Salient Features of 3rd and 4th twenty year

road development plans and Policies, Present scenario of road development in India (NHDP & PMGSY) and in Karnataka (KSHIP & KRDCL) Road development plan - vision 2021.

06 Hrs

UNIT – 3

HIGHWAY ALIGNMENT AND SURVEYS: Ideal Alignment, Factors affecting the alignment, Engineering surveys-Map study, Reconnaissance, Preliminary and Final location & detailed survey, Reports and drawings for new and re-aligned projects **04 Hrs**

HIGHWAY GEOMETRIC DESIGN – I: Importance, Terrain classification, Design speed, Factors affecting geometric design, **Cross sectional elements**-Camber- width of pavement-Shoulders-, Width of formation- Right of way, Typical cross sections **05 Hrs**

UNIT – 4

HIGHWAY GEOMETRIC DESIGN – II: Sight Distance-Restrictions to sight distance- Stopping sight distance-Overtaking sight distance- overtaking zones- Examples on SSD and OSD- Sight distance at intersections, **Horizontal alignment**-Radius of Curve- Superelevation – Extra widening-Transition curve and its length, setback distance – Examples, **Vertical alignment**-Gradient-summit and valley curves with examples. **07 Hrs**

PART - B

UNIT – 5

PAVEMENT MATERIALS: Subgrade soil - desirable properties-HRB soil classification-determination of CBR and modulus of subgrade reaction-Examples on CBR and Modulus of subgrade reaction, **Aggregates-** Desirable properties and list of tests, **Bituminous materials**-Explanation on Tar, bitumen,cutback and emulsion-List of tests on bituminous materials **06 Hrs**

UNIT – 6

PAVEMENT DESIGN: Pavement types, component parts of flexible and rigid pavements and their functions,design factors, ESWL and its determination-Examples, **Flexible pavement**-Design of flexible pavements as per IRC;37-2001-Examples, **Rigid pavement**- Westergaard’s equations for load and temperature stresses- Examples- Design of slab thickness only as per IRC:58-2002

06 Hrs

UNIT – 7

PAVEMENT CONSTRUCTION: Earthwork –cutting-Filling, Preparation of subgrade, Specification and construction of i) Granular Subbase, ii) WBM Base, iii) WMM base, iv) Bituminous Macadam, v) Dense Bituminous Macadam vi) Bituminous Concrete, vii) Dry Lean Concrete sub base and PQC viii) concrete roads **05 Hrs**

HIGHWAY DRAINAGE: Significance and requirements, Surface drainage system and design-Examples, sub surface drainage system, design of filter materials

03 Hrs

UNIT – 8

HIGHWAY ECONOMICS: Highway user benefits, VOC using charts only-Examples, Economic analysis - annual cost method-Benefit Cost Ratio method-NPV-IRR methods-Examples, Highway financing-BOT-BOOT concepts

06 Hrs

TEXT BOOKS:

1. **Highway Engineering –** S K Khanna and C E G Justo, Nem Chand Bros, Roorkee

2. **Highway Engineering** - L R Kadiyali, Khanna Publishers, New Delhi
3. **Transportation Engineering** – K P Subramanium, Scitech Publications, Chennai
4. **Transportation Engineering – James** H Banks, Mc. Graw. Hill Pub. New Delhi
5. **Highway Engineeering** –R. Sreenivasa Kumar, University Press. Pvt.Ltd. Hyderabad

REFERENCE BOOKS:

1. **Relevant IRC Codes**
2. **Specifications for Roads and Bridges-MoRT&H, IRC, New Delhi.**
3. **Transportation Engineering** – C. Jotin Khisty, B. Kent lal, PHI Learning Pvt. Ltd. New Delhi.

VI SEMESTER

ENVIRONMENTAL ENGINEERING-I

Subject Code	: 10CV61	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

Part - A

Unit - 1

INTRODUCTION: Human activities and environmental pollution. Water for various beneficial uses and quality requirement. Need for protected water supply.

2 Hours

DEMAND OF WATER: Types of water demands- domestic demand in detail, institutional and commercial, public uses, fire demand. Per capita consumption –factors affecting per capita demand, population forecasting, different methods with merits &demerits- variations in demand of water. Fire demand – estimation by Kuichling's formula, Freeman formula & national board of fire underwriters formula, peak factors, design periods & factors governing the design periods

6 Hours

Unit - 2

SOURCES: Surface and subsurface sources – suitability with regard to quality and quantity.

3 Hours

COLLECTION AND CONVEYANCE OF WATER: Intake structures – different types of intakes; factor of selection and location of intakes. Pumps- Necessity, types – power of pumps; factors for the selection of a pump. Pipes – Design of the economical diameter for the rising main; Nomograms – use; Pipe appurtenances.

6 Hours

Unit - 3

QUALITY OF WATER: Objectives of water quality management. wholesomeness & palatability, water borne diseases. Water quality parameters – Physical, chemical and Microbiological. Sampling of water for examination. Water quality analysis (IS: 3025 and IS: 1622) using analytical and instrumental techniques. Drinking water

standards BIS & WHO guidelines. Health significance of Fluoride, Nitrates and heavy metals like Mercury, Cadmium, Arsenic etc. and toxic / trace organics.

6 Hours

Unit - 4

WATER TREATMENT: Objectives – Treatment flow-chart. Aeration-Principles, types of Aerators.

2 Hours

SEDIMENTATION: Theory, settling tanks, types, design. Coagulant aided sedimentation, jar test, chemical feeding, flash mixing, and clari-flocculator.

4 Hours

Part - B

Unit - 5

FILTRATION: Mechanism – theory of filtration, types of filters, slow sand, rapid sand and pressure filters including construction, operation, cleaning and their design – excluding under drainage system – back washing of filters. Operational problems in filters.

6 Hours

Unit - 6

DISINFECTION: Theory of disinfection, types of disinfection, Chlorination, chlorine demand, residual chlorine, use of bleaching powder. UV irradiation treatment – treatment of swimming pool water

4 Hours

SOFTENING – definition, methods of removal of hardness by lime soda process and zeolite process RO & Membrane technique.

3 Hours

Unit - 7

MISCELLANEOUS TREATMENT: Removal of color, odor, taste, use of copper sulfate, adsorption technique, fluoridation and defluoridation.

4 Hours

DISTRIBUTION SYSTEMS: System of supply, service reservoirs and their capacity determination, methods of layout of distribution systems.

4
Hours

Unit - 8
MISCELLANEOUS: Pipe appurtenances, various valves, type of fire hydrants, pipefitting, Layout of water supply pipes in buildings.
2
Hours

TEXT BOOKS:
1. Water supply Engineering –S.K.Garg, Khanna Publishers
2. Environmental Engineering I –B C Punima and Ashok Jain
3. Manual on Water supply and treatment –CPHEEO, Minstry of Urban Development, New Delhi

REFERENCES

1. Hammer, M.J., (1986), **Water and Wastewater Technology** –SI Version, 2nd
Edition, John Wiley and Sons.

2. Karia, G.L., and Christian, R.A., (2006), **Wastewater Treatment – Concepts and Design Approach,** Prentice Hall of India Pvt. Ltd., New Delhi.

3. Metcalf and Eddy, (2003), **Wastewater Engineering, Treatment and Reuse ,** 4th Edition, Tata McGraw Hill Edition, Tata McGraw Hill Publishing Co. Ltd.

4. Peavy, H.S., Rowe, D.R., and Tchobanoglous, G., (1986),**Environmental Engineering**–Mc Graw Hill Book Co.

5. Raju, B.S.N., (1995), **Water Supply and Wastewater Engineering, T**ata McGraw Hill Pvt. Ltd., New Delhi.

6. Sincero, A.P., and Sincero, G.A., (1999), **Environmental Engineering – A Design Approach**–Prentice Hall of India Pvt. Ltd., New Delhi.

GEOTECHNICAL ENGINEERING – II

Subject Code	**: 10CV64**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

SUBSURFACE EXPLORATION: Importance of exploration program, Methods of exploration: Boring, Seismic refraction method of grophysical exploration, Types of samples - undisturbed, disturbed and representative samples, Samplers, sample disturbance, area ratio, Recovery ratio, clearance, Stabilisation of boreholes - Typical bore log. Number and depth of borings for various civil engineering structures, soil exploration report.

DRAINAGE AND DEWATERING: Determination of ground water level by Hvorselev's method, Control of ground water during excavation: Dewatering - Ditches and sumps, well point system, Vacuum method, Electro- Osmosis method.

8 Hours

UNIT - 2

STRESSES IN SOILS: Boussinesq's and Westergaard's theories for concentrated, circular and rectangular loads. Comparison of Boussinesq's and westergaard's analysis. Pressure distribution diagrams, Contact pressure, Newmark's chart.

6 Hours

UNIT - 3

FLOWNETS: Laplace equation (no derivation) assumptions and limitations only, characteristics and uses of flownets, Methods of drawing flownets for Dams and sheet piles. Estimating quantity of seepage and Exit gradient. Determination of phreatic line in earth dams with and without filter. Piping and protective filter.

5 Hours

UNIT - 4

LATERAL EARTH PRESSURE: Active and Passive earth pressures, Earth pressure at rest. Rankine's and Coulomb's Earth pressure theories-–assumptions and limitations, Graphical solutions for active earth pressure (cohesionless soil only) – Culmann's and Rebhann's methods, Lateral earth pressure in cohesive and cohesionless soils, Earth pressure distribution.

7 Hours

PART - B

UNIT - 5

STABILITY OF EARTH SLOPES: Types of slopes, causes and type of failure of slopes. Definition of factor of safety, Stability of infinite slopes, Stability of finite slopes by Method of slices and Friction Circle method, Taylor's stability number, Fellineous method,.

7 Hours

UNIT - 6

BEARING CAPACITY: Definitions of ultimate, net and safe bearing capacities, Allowable bearing pressure. Terzaghi's and Brinch Hansen's bearing capacity equations - assumptions and limitations, Bearing capacity of footing subjected to eccentric loading. Effect of ground water table on bearing capacity. Field methods of evaluation of bearing capacity - Plate load test, Standard penetration test and cone penetration test.

8 Hours

UNIT - 7

FOUNDATION SETTLEMENT: Importance and Concept of Settlement Analysis, Immediate, Consolidation and Secondary settlements (no derivations, but, computation using relevant formula for Normally Consolidated soils), Tolerance. BIS specifications for total and differential settlements of footings and rafts.

5 Hours

UNIT – 8

PROPORTIONING SHALLOW AND PILE FOUNDATIONS

Allowable Bearing Pressure, Factors influencing the selection of depth of foundation, Factors influencing Allowable Bearing Pressure, Factors influencing the choice of foundation, Proportioning isolated, combined, strip and mat foundations, Classification of pile foundation, Pile load capacity, Proportioning pile foundation.

6 Hours

TEXT BOOKS:

1. **Soil Engineering in Theory and Practice**- Alam Singh and Chowdhary G.R. (1994), CBS Publishers and Distributors Ltd., New Delhi.
2. **Soil Mechanics and Foundation Engg.**- Punmia B.C. (2005), 16th Edition Laxmi Publications Co. , New Delhi.

REFERENCES BOOKS:

1. **Foundation Analysis and Design**- Bowles J.E. (1996), 5th Edition, McGraw Hill Pub. Co. New York.

2. **Soil Mechanics and Foundation Engineering**- Murthy V.N.S. (1996), 4th Edition, UBS Publishers and Distributors, New Delhi.
3. **Basic and Applied Soil Mechanics**- Gopal Ranjan and Rao A.S.R. (2000), New Age International (P) Ltd., Newe Delhi.
4. **Geotechnical Engineering**- Venkatrahmaiah C. (2006), 3rd Edition New Age International (P) Ltd., Newe Delhi.
5. **Soil Mechanics**- Craig R.F. (1987), Van Nostrand Reinhold Co. Ltd.
6. **Principles of Geotechnical Engineering**- Braja M. Das (2002), 5th Edition, Thomson Business Information India (P) Ltd., India.
7. **Text Book of Geotechnical Engineering**- Iqbal H. Khan (2005), 2nd Edition, PHI, India.

ALTERNATIVE BUILDING MATERIALS AND TECHNOLOGIES

Subject Code	**: 10CV662**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1
INTRODUCTION:

1. Energy in building materials
2. Environmental issues concerned to building materials
3. Global warming and construction industry
4. Environmental friendly and cost effective building technologies.
5. Requirements for building of different climatic regions.
6. Traditional building methods and vernacular architecture.

6 Hours

UNIT - 2
ALTERNATIVE BUILDING MATERIALS:

1. Characteristics of building blocks for walls
2. Stones and Laterite blocks
3. Bricks and hollow clay blocks
4. Concrete blocks
5. Stabilized blocks: Mud Blocks, Steam Cured Blocks, Fal-G Blocks and Stone Masonry Block

6 Hours

UNIT - 3
LIME-POZZOLANA CEMENTS

1. Raw materials
2. Manufacturing process
3. Properties and uses
4. Fibre reinforced concretes
5. Matrix materials
6. Fibers : metal and synthetic
7. Properties and applications
8. Fibre reinforced plastics
9. Matrix materials
10. Fibers : organic and synthetic
11. Properties and applications
12. Building materials from agro and industrial wastes
13. Types of agro wastes

14. Types of industrial and mine wastes
15. Properties and applications
16. Field quality control test methods

6 Hours

UNIT - 4

ALTERNATIVE BUILDING TECHNOLOGIES

1. Alternative for wall construction
2. Types
3. Construction method
4. Masonry mortars
5. Types
6. Preparation
7. Properties
8. Ferrocement and ferroconcrete building components
9. Materials and specifications
10. Properties
11. Construction methods
12. Applications
13. Alternative roofing systems
14. Concepts
15. Filler slabs
16. Composite beam panel roofs
17. Masonry vaults and domes

8 ours

PART - B

UNIT - 5

STRUCTURAL MASONRY

1. Compressive strength of masonry elements
2. Factors affecting compressive strength
3. Strength of units, prisms / wallettes and walls
4. Effect of brick work bond on strength
5. Bond strength of masonry : Flexure and shear
6. Elastic properties of masonry materials and masonry

6 Hours

UNIT - 6

1. IS Code provisions
2. Design of masonry compression elements
3. Concepts in lateral load resistance

8 Hours

UNIT - 7
COST EFFECTIVE BUILDING DESIGN

1. Cost concepts in buildings
2. Cost saving techniques in planning, design and construction
3. Cost Analysis : Case studies using alternatives.

6 Hours

UNIT - 8
EQUIPMENT FOR PRODUCTION OF ALTERNATIVE MATERIALS

1. Machines for manufacture of concrete
2. Equipments for production of stabilized blocks
3. Moulds and methods of production of precast elements.

6 Hours

TEXT BOOKS:

1. **Alternative building methodologies for engineers and architects, lecture notes edited**: K.S. Jagadish and B.V. Venkatarama Reddy, Indian Institute of cience, Bangalore.
2. **Structural Masonry** by Arnold W. Hendry.

REFERENCE BOOKS:

1. **Relevant IS Codes.**
2. **Alternative building materials and technologies.**
3. **Proceedings of workshop on Alternative building material and technology,** 19th to 20th December 2003 @ BVB College of Engineering. & Tech., Hubli.

GROUND WATER HYDROLOGY

Subject Code	**: 10CV665**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1
INTRODUCTION: Importance. Vertical distribution of sub-surface water. Occurrence in different types of rocks and soils. Definition of aquifer, Aquifuge, Aquitard and Aquiclude. Confined and unconfined aquifers.

6 Hours

UNIT - 2
AQUIFER PROPERTIES: Aquifer parameters – Specific yield, Specific retention, Porosity, Storage coefficient, derivation of the expression. Determination of specific yield. Land subsidence due to ground water withdrawals.

6 Hours

UNIT - 3
DARCY'S LAW AND HYDRAULIC CONDUCTIVITY: Introduction. Darcy's law. Hydraulic conductivity. Coefficient of permeability and Intrinsic permeability, Transmissibility, Permeability in Isotropic, Unisotropic layered soils. Steady one dimensional flow, different cases with recharge.

7 Hours

UNIT - 4
WELL HYDRAULICS – STEADY FLOW: Introduction. Steady radial flow in confined and unconfined aquifers. Pumping tests.

7 Hours

PART - B

UNIT - 5
WELL HYDRAULICS – UNSTEADY FLOW: Introduction. General equation derivation; Theis method, Cooper and JaCob method, Chow's method. Solution of unsteady flow equations.

7 Hours

UNIT - 6

GROUND WATER DEVELOPMENT: Types of wells. Methods of constructions. Tube well design. Dug wells. Pumps for lifting water: Working principles, Power requirements.

7 Hours

UNIT - 7

GROUND WATER EXPLORATION: Seismic method, Electrical resistivity method, Bore hole geo-physical techniques; Electrical logging, Radio active logging, Induction logging, Sonic logging and Fluid logging.

6 Hours

UNIT - 8

GROUND WATER RECHARGE AND RUNOFF: Recharge by vertical leakage. Artificial recharge. Ground water runoff. Ground water budget.

6 Hours

TEXT BOOKS:

1. **Ground Water**- H.M. Raghunath, - Wiley Eastern Limited, New Delhi.
2. **Ground Water Hydrology**- K. Todd, - Wiley and Sons, New Delhi.
3. **Numerical Ground Water Hydrology**- A.K. Rastogi, - Penram, International Publishing (India), Pvt. Ltd., Mumbai.

REFERENCE BOOKS:

1. **Ground Water Hydrology**- Bower H.- McGraw Hill, New Delhi.
2. **Ground Water and Tube Wells**- Garg Satya Prakash, - Oxford and IBH, New Delhi.
3. **Ground Water Resource Evaluation**- W.C. Walton, - McGraw Hill - Kogakusha Ltd., New Delhi.
4. **Water wells and Pumps** – Michel D.M., Khepar. S.D., Sondhi. S.K., McGraw Hill Education – 2nd Edition.

TRAFFIC ENGINEERING

Subject Code	**: 10CV667**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

INTRODUCTION: Definition, objectives of Traffic Engineering and scope of Traffic Engineering.

2

Hours

UNIT - 2

TRAFFIC CHARACTERISTICS: Road user characteristics, vehicular characteristics – static and dynamic characteristics, power

performance of vehicles, Resistance to the motion of vehicles – Reaction time of driver – Problems on above.

6 Hours

UNIT - 3

TRAFFIC STUDIES: Various types of traffic engineering studies, data collection, analysis objectives and method of study – Definition of study area – Sample size and analysis.

6 Hours

UNIT - 4

INTERPRETATION OF TRAFFIC STUDIES: Classified traffic Volume at mid block and intersections, PCU, origin and destination, spot speed, speed and delay, parking – on street parking, off street parking, Accident – causes, analysis measures to reduce accident – problems on above.

6 Hours

PART - B

UNIT - 5

TRAFFIC FLOW THEORIES: Traffic flow theory, Green shield theory – Goodness of fit, - correlation and regression analysis (linear only) – Queuing theory, Car following theory and relevant problems on above.

8 Hours

UNIT - 6

STATISTICAL ANALYSIS: Poisson's distribution and application to traffic engineering. Normal Distribution – Significance tests for observed traffic data, Chi Square test – problems on above. Traffic forecast – simulation technique.

12 Hours

UNIT - 7

TRAFFIC REGULATION AND CONTROL: Driver, vehicle and road controls – Traffic regulations – one way – Traffic markings, Traffic signs, Traffic signals – Vehicle actuated and synchronized signals – Signals co-ordination. Webster's method of signal design, IRC method, traffic rotary elements and designs, traffic operation – Street lighting, Road side furniture, Relevant problems on above.

10 Hours

UNIT - 8

INTELLIGENT TRANSPORT SYSTEM: Definition, Necessities, Application in the present traffic scenario

2 Hours

TEXT BOOKS:

1. **Traffic Engineering & Transport Planning** – L.R. Kadiyali- Khanna Publishers.
2. **Highway Engineering Nemchand & Bros**- Khanna & Justo- Roorkee (UA).
3. **Traffic Engg.** - Matson & Smith:-Mc.Graw Hill and Co.
4. **Traffic flow theory** – Drew- Mc. Graw Hill and Co.

REFERENCE BOOKS:

1. **Traffic Engineering.** Pignataro- Prentice Hall.
2. **Highway Capacity Manual** – 2000.
3. **An introduction to traffic engineering**- Jotin Khistey and Kentlal- PHI.
4. **Traffic Engineering**- Mc Shane & Roess- PHI.

ESTIMATION & VALUATION

Subject Code	**: 10CV73**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

ESTIMATION: Study of various drawings with estimates, important terms, units of measurement, abstract Methods of taking out quantities and cost – center line method, long and short wall method or crossing method. Preparation of detailed and abstract estimates for the following Civil Engineering works – Buildings – RCC framed structures with flat, sloped RCC roofs with all Building components.

16 Hours

PART - B

ESTIMATE: Different type of estimates, approximate methods of estimating buildings, cost of materials. Estimation of wooden joineries such as doors, windows & ventilators.

5 Hours

ESTIMATES: Steel truss (Fink and Howe truss), manhole and septic tanks, RCC Culverts.

6 Hours

SPECIFICATIONS: Definition of specifications, objective of writing specifications, essentials in specifications, general and detail specifications of common item of works in buildings.

5 Hours

PART - C

RATE ANALYSIS: Definition and purpose. Working out quantities and rates for the following standard items of works – earth work in different types of soils, cement concrete of different mixes, bricks and stone masonry, flooring, plastering, RCC works, centering and form work for different RCC items, wood and steel works for doors, windows and ventilators.

6 Hours

MEASUREMENT OF EARTHWORK FOR ROADS: Methods for computation of earthwork – cross sections – mid section formula or average end area or mean sectional area, trapezoidal & prismoidal formula with and without cross slopes.

6 Hours

CONTRACTS: Types of contract – essentials of contract agreement – legal aspects, penal provisions on breach of contract. Definition of the terms – Tender, earnest money deposit, security deposit, tender forms, documents and types. Acceptance of contract documents. Termination of contract, completion certificate, quality control, right of contractor, refund of deposit. Administrative approval – Technical sanction. Nominal muster roll, measurement books – procedure for recording and checking measurements – preparation of bills.
Valuation- Definitions of various terms, method of valuation, Freehold & Leasehold properties, Sinking fund, depreciation and method of estimating depreciation, Outgoings.

8 Hours

REFERENCE BOOKS:

1. **Estimating & Costing**, B. N. Dutta, Chand Publisher
2. **Quantity Surveying**- P.L. Basin S. Chand : New Delhi.
3. **Estimating & Specification** - S.C. Rangwala :: Charotar publishing house, Anand.
4. **Text book of Estimating & Costing**- G.S. Birde, Dhanpath Rai and sons : New Delhi.
5. **A text book on Estimating, Costing and Accounts**- D.D. Kohli and R.C. Kohli S. Chand : New Delhi.
6. **Contracts and Estimates,** B. S. Patil, University Press, 2006.

DESIGN OF PRE-STRESSED CONCRETE STRUCTURES

Subject Code	**: 10CV74**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1
MATERIALS: High strength concrete and steel, Stress-Strain characteristics and properties.

2 Hours

BASIC PRINCIPLES OF PRESTRESSING: Fundamentals, Load balancing concept, Stress concept, centre of Thrust. Pre-tensioning and post-tensioning systems, tensioning methods and end anchorages.

4 Hours

UNIT - 2
ANALYSIS OF SECTIONS FOR FLEXURE: Stresses in concrete due to pre-stress and loads, stresses in steel due to loads, Cable profiles.

8 Hours

UNIT - 3
LOSSES OF PRE-STRESS: Various losses encountered in pre-tensioning and post tensioning methods, determination of jacking force.

6 Hours

UNIT - 4
DEFLECTIONS: Deflection of a pre-stressed member – Short term and long term deflections, Elastic deflections under transfer loads and due to different cable profiles. Deflection limits as per IS 1343. Effect of creep on deflection, load verses deflection curve, methods of reducing deflection

6 Hours

PART - B

UNIT - 5
LIMIT STATE OF COLLAPSE: Flexure -IS Code recommendations – Ultimate flexural strength of sections.

5 Hours

UNIT - 6
LIMIT STATE OF COLLAPSE (cont…): Shear - IS Code recommendations, shear resistance of sections, shear reinforcement. Limit state of serviceability – control of deflections and cracking.

7 Hours

UNIT - 7
DESIGN OF END BLOCKS: Transmission of prestress in pretensioned members, transmission length, Anchorage stress in post-tensioned members. Bearing stress and bursting tensile force-stresses in end blocks-Methods, I.S. Code, provision for the design of end block reinforcement.

6 Hours

UNIT - 8
DESIGN OF BEAMS: Design of pre-tensioned and post-tensioned symmetrical and asymmetrical sections. Permissible stress, design of prestressing force and eccentricity, limiting zone of pre-stressing force cable profile.

8 Hours

REFERENCE BOOKS:

1. **Pre-stressed Concrete**- N. Krishna Raju - Tata Mc. Graw Publishers.
2. **Pre-stressed Concrete**- P. Dayarathnam : Oxford and IBH Publishing Co.

3. **Design of pre-stressed concrete structures**- T.Y. Lin and Ned H. Burns - John Wiley & Sons, New York.
4. **Fundamental of pre-stressed concrete**- N.C. Sinha & S.K. Roy
5. IS : 1343 : 1980
6. **Pre-stressed Concrete**- N. Rajgopalan

PAVEMENT MATERIALS AND CONSTRUCTION

Subject Code	**: 10CV763**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A
PAVEMENT MATERIALS

UNIT - 1

AGGREGATES: Origin, classification, requirements, properties and tests on road aggregates, concepts of size and gradation – design gradation, maximum aggregate size, aggregate blending by different methods to meet specification.

6 Hours

UNIT - 2

BITUMEN AND TAR: Origin, preparation, properties and chemical constitution of bituminous road binders; requirements.

4 Hours

UNIT - 3

BITUMINOUS EMULSIONS AND CUTBACKS: Preparation, characteristics, uses and tests. Adhesion of Bituminous Binders to Road Aggregates: Adhesion failure, mechanism of stripping, tests and methods of improving adhesion.

8 Hours

UNIT - 4

BITUMINOUS MIXES: Mechanical properties, dense and open textured mixes, flexibility and brittleness, (no Hveem Stabilometer & Hubbar – Field Tests) bituminous mix, design methods using Rothfuch's Method only and

specification, Marshal mixed design criteria- voids in mineral aggregates, voids in total mix, density, flow, stability, percentage voids filled with bitumen.

6 Hours

PART - B

PAVEMENT CONSTRUCTION

UNIT - 5

EQUIPMENT IN HIGHWAY CONSTRUCTION: Various types of equipment for excavation, grading and compaction – their working principle, advantages and limitations. Special equipment for bituminous and cement concrete pavement and stabilized soil road construction.

6 Hours

UNIT - 6

SUBGRADE: Earthwork grading and construction of embankments and cuts for roads. Preparation of subgrade, quality control tests.

6 Hours

UNIT - 7

FLEXIBLE PAVEMENTS: Specifications of materials, construction method and field control checks for various types of flexible pavement layers.

8 Hours

UNIT - 8

CEMENT CONCRETE PAVEMENTS: Specifications and method of cement concrete pavement construction (PQC Importance of providing DLC as sub-base and polythene thin layer between PQC and sub-base); Quality control tests; Construction of various types of joints.

8 Hours

TEXT BOOKS:

1. **Highway Engineering**- Khanna, S.K., and Justo, C.E.G., : Nem Chand and Bros. Roorkee
2. **Construction Equipment and its Management**- Sharma, S.C. : Khanna Publishers.
3. **Hot Mix Asphalt Materials, Mixture Design and Construction**- Freddy L. Roberts, Kandhal, P.S. : University of Texas Austin, Texas. NAPA Education Foundation Lanham, Maryland.

REFERENCES BOOKS:

1. RRL, DSIR, '**Bituminous Materials in Road Construction**', HMSO Publication.
2. RRL, DSIR, '**Soil Mechanics for Road Engineers**', HMSO Publication.
3. Relevant IRC codes and MoRT & H specifications.

CONCRETE AND HIGHWAY MATERIALS LABORATORY

Subject Code	**: 10CVL78**	IA Marks	: 25
No. of Practical Hours/Week	: 03	Exam Hours	: 03
Total No. of Practical Hours	: 42	Exam Marks	: 50

PART - A

CEMENT: Normal Consistency, Setting time, Soundness by Autoclave method, Compression strength test and Air permeability test for fineness, Specific gravity of cement.

FRESH CONCRETE: Workability – slump, Compaction factor and Vee Bee tests.

HARDENED CONCRETE: Compression strength and Split tensile tests. Test on flexural strength of RCC beams, Permeability of concrete.

PART - B

SOIL: Density of Soil by Sand replacement method, CBR Text.

AGGREGATES: Crushing, abrasion, impact and Shape tests (Flaky, Elongation, Angularity number) Specific gravity and water absorption.

BITUMINOUS MATERIALS AND MIXES: Specific Gravity, Penetration,Ductility, Softening point, Flash and fire point, Viscosity, proportioning of aggregate mixes by Rothfutch Method, Marshall Stability tests.

REFERENCE BOOK:

1. Relevant IS Codes and IRC Codes.

2. **Highway Material Testing Laboratory Manual** by Khanna S K and Justo, – CEG Nemi Chand & Bros.
3. M. L. Gambhir : Concrete Manual : Dhanpat Rai & sons New – Delhi.

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VIII -SEMESTER

ADVANCED CONCRETE TECHNOLOGY

Subject Code	**: 10CV81**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

Importance of Bogue's compounds, Structure of a Hydrated Cement Paste, Volume of hydrated product, porosity of paste and concrete, transition Zone, Elastic Modulus, factors affecting strength and elasticity of concrete, Rheology of concrete in terms of Bingham's parameter.

7 Hour

UNIT - 2

CHEMICAL ADMIXTURES- Mechanism of chemical admixture, Plasticizers and super Plasticizers and their effect on concrete property in fresh and hardened state, Marsh cone test for optimum dosage of super plasticizer, retarder, accelerator, Air-entraining admixtures, new generation superplasticiser.

MINERAL ADMIXTURE-Fly ash, Silica fume, GCBS, and their effect on concrete property in fresh state and hardened state.

6 Hours

UNIT - 3

MIX DESIGN - Factors affecting mix design, design of concrete mix by BIS method using IS10262 and current American (ACI)/ British (BS) methods. Provisions in revised IS10262-2004.

6 Hours

UNIT - 4

DURABILITY OF CONCRETE - Introduction, Permeability of concrete, chemical attack, acid attack, efflorescence, Corrosion in concrete. Thermal conductivity, thermal diffusivity, specific heat. Alkali Aggregate Reaction, IS456-2000 requirement for durability.

7 Hours

PART - B

UNIT - 5

RMC concrete - manufacture, transporting, placing, precautions, Methods of concreting- Pumping, under water concreting, shotcrete, High volume fly ash concrete concept, properties, typical mix

Self compacting concrete concept, materials, tests, properties, application and Typical mix.

6 Hours

UNIT - 6

Fiber reinforced concrete - Fibers types and properties, Behavior of FRC in compression, tension including pre-cracking stage and post-cracking stages, behavior in flexure and shear, Ferro cement - materials, techniques of manufacture, properties and application

7 Hours

UNIT - 7

Light weight concrete-materials properties and types. Typical light weight concrete mix High density concrete and high performance concrete-materials, properties and applications, typical mix.

6 Hours

UNIT - 8

Test on Hardened concrete-Effect of end condition of specimen, capping, H/D ratio, rate of loading, moisture condition. Compression, tension and flexure tests. Tests on composition of hardened concrete-cement content, original w/c ratio. NDT tests concepts-Rebound hammer, pulse velocity methods.

7 Hours

TEXT / REFERENCE BOOKS:

1. **Properties of Concrete**- Neville, A.M. - ELBS Edition, Longman Ltd., London
2. **Concrete Technology-** M.S. Shetty
3. **Concrete Technology**- A.R. Santhakumar,-Oxford University Press.
4. **Concrete**- P.K. Mehta, P J M Monteiro,- Prentice Hall, New Jersey (Special Student Edition by Indian Concrete Institute Chennai)
5. ACI Code for Mix Design
6. IS 10262-2004
7. **Concrete Mix Design**- N. Krishna Raju - Sehgal Publishers
8. **Concrete Manual**- Gambhir M.L.- Dhanpat Rai & Sons, New Delhi
9. **Advanced Concrete Technology Processes**- John Newman, Ban Seng Choo, - London.
10. **Advanced Concrete Technology Constituent materials**- John Newman, Ban Seng Choo- London
11. **Non-Destructive Test and Evaluation of Materials**- J.Prasad, C G K Nair,-Mc Graw Hill.
12. **High Performance Concrete**- Prof Aitcin P C- E and FN, London.
13. **Properties of Fresh Concrete**- Power T.C.- E and FN, London

ENVIRONMENTAL IMPACT ASSESSMENT

Subject Code	**: 10CV847**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

Development Activity and Ecological Factors EIA, Rapid and Comprehensive EIA, EIS, FONSI. Need for EIA Studies, Baseline Information,

6 Hours

UNIT - 2

Step-by-step procedures for conducting EIA, Limitations of EIA.

6 Hours

UNIT - 3

Frame work of Impact Assessment. Development Projects-Environmental Setting, Objectives and Scope, Contents of EIA, Methodologies, Techniques of EIA.

8 Hours

UNIT - 4

Assessment and Prediction of Impacts on Attributes Air, Water, Noise, Land Ecology, Soil, Cultural and Socio-economic Environment. EIA guidelines for Development Projects, Rapid and Comprehensive EIA.

6 Hours

PART - B

UNIT - 5

EIA guidelines for Development Projects, Rapid and Comprehensive EIA.

6 Hours

UNIT - 6

Public Participation in Environmental Decision making. Practical Considerations in preparing Environmental Impact Assessment and Statements.

6 Hours

UNIT - 7

Salient Features of the Project Activity-Environmental Parameter Activity Relationships- Matrices.

4 Hours

UNIT - 8

EIA for Water resource developmental projects, Highway projects: Nuclear-Power plant projects, Mining project (Coal, Iron ore), Thermal Power Plant, Infrastructure Construction Activities.

10 Hours

REFERENCES

1. **Environmental Impact Analysis**-Jain R.K.-Van Nostrand Reinhold Co.
2. **Environment Impact Assessment.-** Anjaneyalu. Y.
3. Guidelines for EIA of developmental Projects Ministry of Environment and Forests, GOI.
4. **Environment Impact Assessment** - Larry W. Canter - McGraw Hill Publication.

ADVANCED DESIGN OF RCC STRUCTURES

Subject Code	**: 14CSE12**	IA Marks	: 50
No. of Lecture Hrs./ Week	: 04	Exam Hrs	: 03
Total No. of Lecture Hrs.	: 50	Exam Marks	: 100

Objectives:

The objectives of this course is to make students to learn principles of Structural Design, To design different types of structures and to detail the structures. To evaluate performance of the structures.

Course Outcomes: On completion of this course, students are able to

- **Achieve Knowledge of design and development of problem solving skills.**
- **Understand the principles of Structural Design**
- **Design and develop analytical skills.**
- **Summarize the principles of Structural Design and detailing**
- **Understands the structural performance.**

1. Yield line method of design of slabs. Design of flat slabs.
2. Design of grid floors.
3. Design of continuous beams with redistribution of moments
4. Design of Chimneys, Design of silos and bunkers.
5. Art of detailing earthquake resistant structures. Expansion and contraction joints

REFERENCE BOOKS:

1. A Park and Paulay, **“Reinforced Reinforced and Prestressed Concrete**”
2. Lin TY and Burns N H, “**Reinforced Concrete Design**".
3. Kong KF and Evans T H “**Design of Prestressed Concrete Structures**
4. P.C.Varghese, "**Advanced Reinforced Concrete Design**”, Prentice-Hall of India, New Delhi, 2005.
5. Dr.B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, **“Comprehensive RCC Design”**

STRUCTURAL DYNAMICS

Subject Code	**: 14CSE14**	IA Marks	: 50
No. of Lecture Hrs./ Week	: 04	Exam Hrs	: 03
Total No. of Lecture Hrs.	: 50	Exam Marks	: 100

Objectives:

The objectives of this course is to make students to learn principles of Structural Dynamics, To implement these principles through different methods and to apply the same for free and forced vibration of structures. To evaluate the dynamic characteristics of the structures.

Course Outcomes: On completion of this course, students are able to

- **Achieve Knowledge of design and development of problem solving skills.**
- **Understand the principles of Structural Dynamics**
- **Design and develop analytical skills.**
- **Summarize the Solution techniques for dynamics of Multi-degree freedom systems**
- **Understand the concepts of damping in structures.**

1. Introduction: Introduction to Dynamic problems in Civil Engineering, Concept of degrees of freedom, D'Alembert's principle, principle of virtual displacement and energy principles Dynamics of Single-degree-of-freedom systems: Mathematical models of Single-degree-of-freedom systems system, Free vibration response of damped and undamped systems. Methods of evaluation of damping.

2. Response of Single-degree-of-freedom systems to harmonic loading (rotation unbalance, reciprocating unbalance) including support motion, vibration isolation, transmissibility, Numerical methods applied to Single-degree-of-freedom systems - Duhamel integral, principle of vibration-measuring instruments – seismometer and accelerometer.

3. Dynamics of Multi-degree freedom systems: Mathematical models of multi-degree-of-freedom systems, Shear building concept, free vibration of undamped multi-degree-of-freedom systems - Natural frequencies and mode shapes – orthogonality property of modes.

4. Response of Shear buildings for harmonic loading without damping using normal mode approach. Response of Shear buildings for forced vibration for harmonic loading with damping using normal mode approach, condition of damping uncoupling.

5. Approximate methods: Rayleigh's method Dunkarley's method, Stodola's method. Dynamics of Continuous systems: Free longitudinal vibration of bars, flexural vibration of beams with different end conditions,. Stiffness matrix, mass matrix (lumped and consistent); equations of motion for the discretised beam in matrix form.

Books for Reference:

1. **Dynamics of Structures – Theory and Application to Earthquake Engineering"- 2nd ed., Anil K. Chopra, Pearson Education.**
2. **Earthquake Resistant Design of Building Structures, Vinod Hosur, WILEY (india)**
3. **Vibrations, structural dynamics- M. Mukhopadhaya : Oxford IBH**
4. **Structural Dynamics- Mario Paz : CBS publishers.**
5. **Structural Dynamics- Clough & Penzien : TMH**
6. **Vibration Problems in Engineering Timoshenko, S, Van-Nostrand Co.**

ELECTIVE - I

SPECIAL CONCRETE

Subject Code	**: 14CSE152**	IA Marks	: 50
No. of Lecture Hrs./ Week	: 04	Exam Hrs	: 03
Total No. of Lecture Hrs.	: 50	Exam Marks	: 100

The objectives of this course is to make students to learn principles of Concrete mix design, To differentiate between different types of concrrete . To characterize the high Performance concrete.

Course Outcomes: On completion of this course, students are able to

- **Achieve Knowledge of design and development of problem solving skills.**
- **Understand the principles of Concrete mix design**
- **Design and develop analytical skills.**
- **Summerize the Light Weight concrete, Fibre reinforced concrete and High Performance concrete:**
- **Understand the concepts of high Performance concrete.**

1. Components of modern concrete and developments in the process and constituent materials : Role of constituents, Development in cements and cement replacement materials, pozzolona, fly ash, silica fume, rice husk ash, recycled aggregates, chemical admixtures. Mix proportioning of Concrete: Principles and methods.

2. Light Weight concrete: Introduction, classification, properties, strength and durability, mix proportioning and problems. High density concrete: Radiation shielding ability of concrete, materials for high density concrete, mix proportioning, properties in fresh and hardened state, placement methods.

3. Ferro cement: Ferrocement materials, mechanical properties, cracking of ferrocement, strength and behaviour in tension, compression and flexure, Design of ferrocement in tension, ferrocement constructions, durability, and applications.

4. ***Fibre reinforced concrete:*** Fibre materials, mix proportioning, distribution and orientation, interfacial bond, properties in fresh state, strength and behavior in tension, compression and flexure of steel fibre reinforced concrete, mechanical properties, crack arrest and toughening mechanism, applications.

5. High Performance concrete: constituents, mix proportioning, properties in fresh and hardened states, applications and limitations. Ready Mixed Concrete, Self Compacting Concrete, Reactive powder concrete, bacterial concrete.

REFERENCE BOOKS:

1. Neville A.M, "**Properties of Concrete"** Pearson Education Asis, 2000
2. P. Kumar Mehta, Paul J.N.Monterio, CONCRETE, "**Microstructure, Properties and Materials"-** Tata McGraw Hill
3. A.R.Santhakumar, (2007) "**Concrete Technology**"-Oxford University Press, New Delhi, 2007
4. Gambhir "Concrete Technology" TMH.
5. Short A and Kinniburgh.W, "**Light Weight Concrete"**- Asia Publishing House, 1963
6. Aitcin P.C**. "High performance concrete"**-E and FN, Spon London 1998
7. Rixom.R. and Mailvaganam.N., "**Chemical admixtures in concrete"**- E and FN, Spon London 1999
8. Rudnai.G., "**Light Wiehgt concrete"**- Akademiaikiado, Budapest, 1963.

STRUCTURAL ENGINEERING LAB-1

Subject Code	**: 14CSE16**	IA Marks	: 25
No. of Lab Hrs./ Week	: 03	Exam Hrs	: 03
Total No. of Lab Hrs.	**: 48**	Exam Marks	:50

The objectives of this course is to make students to learn principles of design of experiments, To investigate the performance of structural elements . To evaluate the different testing methods and equipments. .

Course Outcomes: On completion of this course, students are able to

- **Achieve Knowledge of design and development of experimenting skills.**
- **Understand the principles of design of experiments**
- **Design and develop analytical skills.**
- **Summerize the testing methods and equipments.**

1. Testing of beams for deflection, flexure and shear 12 Hrs
2. Experiments on Concrete, including Mix design 12 Hrs
3. Experiments on vibration of multi storey frame models for Natural frequency and modes. 12Hrs
4. Use of Non destructive testing (NDT) equipments – Rebound hammer, Ultra sonic pulse velocity meter and Profometer 12 Hrs

EARTHQUAKE RESISTANT STRUCTURES

Subject Code	**: 14CSE22**	IA Marks	: 50
No. of Lecture Hrs./ Week	: 04	Exam Hrs	: 03
Total No. of Lecture Hrs.	: 50	Exam Marks	: 100

The objectives of this course is to make students to learn principles of engineering seismology, To design the reinforced concrete buildings for earthquake resistance. To evaluate the seismic response of the structures.

Course Outcomes: On completion of this course, students are able to

- **Achieve Knowledge of design and development of problem solving skills.**
- **Understand the principles of engineering seismology**
- **Design and develop analytical skills.**
- **Summarize the Seismic evaluation and retrofitting of structures.**
- **Understand the concepts of earthquake resistance of reinforced concrete buildings.**

1. Introduction to engineering seismology, Geological and tectonic features of India, Origin and propagation of seismic waves, characteristics of earthquake and its quantification – Magnitude and Intensity scales, seismic instruments. Earthquake Hazards in India, Earthquake Risk Evaluation and Mitigation. Structural behavior under gravity and seismic loads, Lateral load resisting structural systems, Requirements of efficient earthquake resistant structural system, damping devises, base isolation systems.
2. The Response history and strong motion characteristics. Response Spectrum – elastic and inelastic response spectra, tripartite (D-V-A) response spectrum, use of response spectrum in earthquake resistant design.Computation of seismic forces in multi-storeyed buildings – using procedures (Equivalent lateral force and dynamic analysis) as per IS-1893.
3. Structural Configuration for earthquake resistant design, Concept of plan irregularities and vertical irregularities, Soft storey, Torsion in buildings. Design provisions for these in IS-1893. Effect of infill masonry walls on frames, modeling concepts of infill masonry walls. Behaviour of masonry buildings during earthquakes, failure patterns, strength of masonry in shear and flexure, Slenderness concept of masonry walls, concepts for earthquake resistant masonry buildings – codal provisions.
4. Design of Reinforced concrete buildings for earthquake resistance-Load combinations, Ductility and energy absorption in buildings. confinement of concrete for ductility, design of columns and beams for ductility, ductile detailing provisions as per IS-1893. Structural behavior, design and ductile detailing of shear walls.
5. Seismic response control concepts – Seismic demand, seismic capacity, Overview of linear and nonlinear procedures of seismic analysis. Performance Based Seismic Engineering methodology, Seismic evaluation and retrofitting of structures.

Books for Reference:

1. **Dynamics of Structures – Theory and Application to Earthquake Engineering- 2nd ed. – Anil K. Chopra, Pearson Education.**
2. **Earthquake Resistant Design of Building Structures, Vinod Hosur, WILEY (india)**
3. **Earthquake Resistant Design of Structures, Duggal, Oxford University Press**
4. **Earthquake resistant design of structures - Pankaj Agarwal, Manish Shrikande - PHI India**
5. **IS – 1893 (Part I): 2002, IS – 13920: 1993, IS – 4326: 1993, IS-13828: 1993**
6. **Design of Earthquake Resistant Buildings, Minoru Wakabayashi, McGraw Hill Pub.**
7. **Seismic Design of Reinforced Concrete and Masonry Buildings, T Paulay and M J N Priestley, John Wiley and Sons**

FINITE ELEMENT METHOD OF ANALYSIS

Subject Code	**: 14CSE23**	IA Marks	: 50
No. of Lecture Hrs./ Week	: 04	Exam Hrs	: 03
Total No. of Lecture Hrs.	: 50	Exam Marks	: 100

The objectives of this course is to make students to learn principles of Analysis of Stress and Strain, To apply the Finite Element Method for the analysis of one and two dimensional problems. To evaluate the stress and strain parameters and their inter relations of the continuum.

Course Outcomes: On completion of this course, students are able to

- **Achieve Knowledge of design and development of problem solving skills.**
- **Understand the principles of stress-strain behaviour of continuum**
- **Design and develop analytical skills.**
- **Describe the state of stress in a continuum**
- **Understand the concepts of elasticity and plasticity.**

1. Basic concepts of elasticity – Kinematic and Static variables for various types of structural problems – approximate method of structural analysis – Rayleigh – Ritz method – Finite difference method – Finite element method. Variation method and minimization of Energy approach of element formulation.Principles of finite element method – advantages & disadvantages – Finite element procedure. Finite elements used for one, two & three dimensional problems – Element aspect ratio – mesh refinement vs. higher order elements – Numbering of nodes to minimize band width.

2. Nodal displacement parameters – Convergence criterion – Compatibility requirements – Geometric invariance – Shape function – Polynomial form of displacement function. Generalized and Natural coordinates – Lagrangian interpolation function – shape functions for one, two & three dimensional elements.

3. Isoparametric elements - Internal nodes and higher order elements – Serendipity and Lagrangian family of Finite Elements – Sub parametric and Super parametric elements – Condensation of internal nodes – Jacobian transformation Matrix. Development of strain – displacement matrix and stiffness matrix, consistent load vector, numerical integration.

4. Application of Finite Element Method for the analysis of one & two dimensional problems - Analysis of simple beams and plane trusses – Application to plane stress / strain / axisymmetric problems using CST & Quadrilateral Elements.

5. Application to Plates & Shells- Choice of displacement function (C^0, C^1 and C^2 type) – Techniques for Non – linear Analysis.

REFERENCE BOOKS:

1. Krishnamoorthy C S, "**Finite Element Analysis"-** Tata McGraw Hill
2. Desai C and Abel J F, "**Introduction to the Finite Element Method**"- East West Press Pvt. Ltd., 1972
3. Bathe K J, "**Finite Element Procedures in Engineering Analysis**"- Prentice Hall
4. Rajasekaran. S, "**Finite Element Analysis in Engineering Design"-**Wheeler Publishing
5. Cook R D, Malkan D S & Plesta M.E, "**Concepts and Application of Finite Element Analysis" -** 3rd Edition, John Wiley and Sons Inc., 1989
6. Shames I H and Dym C J, "**Energy and Finite Element Methods in Structural Mechanics**"- McGraw Hill, New York, 1985

DESIGN CONCEPTS OF SUBSTRUCTURES

Subject Code	**: 14CSE24**	IA Marks	: 50
No. of Lecture Hrs./ Week	: 04	Exam Hrs	: 03
Total No. of Lecture Hrs.	: 50	Exam Marks	: 100

The objectives of this course is to make students to learn principles of subsoil exploration, To design the sub structures. To evaluate the soil shear strength parameters.

Course Outcomes: On completion of this course, students are able to

- **Achieve Knowledge of design and development of problem solving skills.**
- **Understand the principles of subsoil exploration**
- **Design and develop analytical skills.**
- **Identify and evaluate the soil shear strength parameters .**
- **Understand the concepts of Settlement analysis.**

1. Introduction, Site investigation, In-situ testing of soils, Subsoil exploration, Classification of foundations systems.General requirement of foundations, Selection of foundations, Computations of Loads, Design concepts.
2. Concept of soil shear strength parameters, Settlement analysis of footings, Shallow foundations in clay, Shallow foundation in sand & C-Φ soils, Footings on layered soils and sloping ground, Design for Eccentric or Moment Loads.
3. Types of rafts, bearing capacity & settlements of raft foundation, Rigid methods, Flexible methods, soil-structure interaction, different methods of modeling the soil. Combined footings (rectangular & trapezoidal), strap footings & wall footings, Raft – super structure interaction effects & general concepts of structural design, Basement slabs.
4. Deep Foundations: Load Transfer in Deep Foundations, Types of Deep Foundations, Ultimate bearing capacity of different types of piles in different soil conditions, Laterally loaded piles, tension piles & batter piles, Pile groups: Bearing capacity, settlement, uplift capacity, load distribution between piles, Proportioning and design concepts of piles.
5. Types of caissons, Analysis of well foundations, Design principles, Well construction and sinking. Foundations for tower structures: Introduction, Forces on tower foundations, Selection of foundation type, Stability and design considerations, Ring foundations – general concepts.

IMPORTANT NOTE:
Only design principles of all type footings as per relevant BIS codes are to be covered, design of RC elements need not be covered

REFERENCE BOOKS:

1. Swami Saran – "**Analysis & Design of Substructures**"- Oxford & IBH Pub. Co. Pvt. Ltd., 1998.
2. Nainan P Kurian – "**Design of Foundation Systems**"- Narosa Publishing House, 1992.
3. R.B. Peck, W.E. Hanson & T.H. Thornburn – "**Foundation Engineering"-** Wiley Eastern Ltd.,Second Edition, 1984.
4. J.E. Bowles – "**Foundation Analysis and Design**"- McGraw-Hill Int. Editions, Fifth Ed., 1996.
5. W.C. Teng – "**Foundation Design"-** Prentice Hall of India Pvt. Ltd., 1983.
6. Bureau of Indian Standards:IS-1498, IS-1892, IS-1904, IS-6403, IS-8009, IS-2950, IS-11089, IS-11233, IS-2911 and all other relevant codes.

DESIGN OF TALL STRUCTURES

Subject Code	**: 14CSE252**	IA Marks	: 50
No. of Lecture Hrs./ Week	: 04	Exam Hrs	: 03
Total No. of Lecture Hrs.	: 50	Exam Marks	: 100

The objectives of this course is to make students to learn principles of stability of tall buildings, To design the tall buildings for earthquake and wind resistance. To evaluate the performance of tall structures for strength and stability.

Course Outcomes: On completion of this course, students are able to

- **Achieve Knowledge of design and development of problem solving skills.**
- **Understand the principles of strength and stability**
- **Design and develop analytical skills.**
- **Summarize the behavior of various structural systems.**
- **Understand the concepts of P-Delta analysis.**

1. **Design Criteria:** Design philosophy, loading, sequential loading, and materials – high performance concrete, fiber reinforced concrete, lightweight concrete, design mixes. Loading and Movement: Gravity loading: Dead and live load, methods of live load reduction, Impact, Gravity loading, Construction loads
2. **Wind loading**: static and dynamic approach, Analytical and wind tunnel experimentation method. Earthquake loading: Equivalent lateral force, modal analysis, combinations of loading, working stress design, Limit state design, Plastic design.
3. **Behavior of Various Structural Systems:** Factors affecting growth, Height and structural form; High rise behavior, Rigid frames, braced frames, in-filled frames, shear walls, coupled shear walls, wall-frames, tubular, cores, Futigger – braced and hybrid mega system.
4. **Analysis and Design:** Modeling for approximate analysis, accurate analysis and reduction techniques, analysis of building as total structural system considering overall integrity and major subsystem interaction, analysis for member forces; drift and twist, computerized general three dimensional analyses. .
5. **Stability of Tall Buildings:** Overall buckling analysis of frames, wall frames, approximate methods, second order effects of gravity of loading, P-Delta analysis, simultaneous first order and P-Delta analysis, Transnational, Torsional instability, out of plum effects, stiffness of member in stability, effect of foundation rotation. Structural elements: sectional shapes, properties and resisting capacities, design, deflection, cracking, pre-stressing, shear flow. Design for differential movement, creep and shrinkage effects, temperature effects and fire

REFERENCE BOOKS:

1. Taranath B.S, "**Structural Analysis and Design of Tall Buildings**"- McGraw Hill
2. Wilf gang Schuller, "**High rise building structures**"- John Wiley
3. Bryan Stafford Smith & Alexcoull, "**Tall building structures Analysis and Design**"- John Wiley
4. T.Y Lin & D.Stotes Burry, "**Structural concepts and system for Architects and Engineers"-** John Wiley
5. Lynn S.Beedle, "**Advances in Tall Buildings**"- CBS Publishers and Distributors.
6. Dr. Y.P. Gupta – Editor, "**Proceedings National Seminar on High Rise Structures- Design and Construction practices for middle level cities"-** New Age International Limited.
7.

STRUCTURAL ENGINEERING LAB-2

Subject Code	**: 14CSE26**	IA Marks	: 25
No. of Lab Hrs./ Week	: 03	Exam Hrs	: 03
Total No. of Lab Hrs.	**: 48**	Exam Marks	:50

The objectives of this course is to make students to learn the soft wares for structural analysis and design, To investigate the performance of structures for static and dynamic forces.

Course Outcomes: On completion of this course, students are able to

- **Achieve Knowledge of design and development of programming skills.**
- **Understand the principles of structural analysis and design**
- **Design and develop analytical skills.**
- **Summerize the performance of structures for static and dynamic forces..**

1. Static and Dynamic analysis of Building structure using software (ETABS / STAADPRO)	12 Hrs
2. Design of RCC and Steel structure using software (ETABS / STAADPRO)	12 Hrs
3. Analysis of folded plates and shells using software.	12 Hrs
4. Preparation of EXCEL sheets for structural design.	12 Hrs

SOFTWARE ENGINEERING

Subject Code: 10IS51	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT – 1 6 Hours

Overview: Introduction: FAQ's about software engineering, Professional and ethical responsibility.
Socio-Technical systems: Emergent system properties; Systems engineering; Organizations, people and computer systems; Legacy systems.

UNIT – 2 6 Hours

Critical Systems, Software Processes: Critical Systems: A simple safety-critical system; System dependability; Availability and reliability.
Software Processes: Models, Process iteration, Process activities; The Rational Unified Process; Computer Aided Software Engineering.

UNIT – 3 7 Hours

Requirements: Software Requirements: Functional and Non-functional requirements; User requirements; System requirements; Interface specification; The software requirements document.
Requirements Engineering Processes: Feasibility studies; Requirements elicitation and analysis; Requirements validation; Requirements management.

UNIT – 4 7 Hours

System models, Project Management: System Models: Context models; Behavioral models; Data models; Object models; Structured methods.
Project Management: Management activities; Project planning; Project scheduling; Risk management

PART - B

UNIT – 5 7 Hours

Software Design: Architectural Design: Architectural design decisions; System organization; Modular decomposition styles; Control styles.

Object-Oriented design: Objects and Object Classes; An Object-Oriented design process; Design evolution.

UNIT – 6 6 Hours

Development: Rapid Software Development: Agile methods; Extreme programming; Rapid application development.
Software Evolution: Program evolution dynamics; Software maintenance; Evolution processes; Legacy system evolution.

UNIT – 7 7 Hours

Verification and Validation: Verification and Validation: Planning; Software inspections; Automated static analysis; Verification and formal methods.
Software testing: System testing; Component testing; Test case design; Test automation.

UNIT – 8 6 Hours

Management: Managing People: Selecting staff; Motivating people; Managing people; The People Capability Maturity Model.
Software Cost Estimation: Productivity; Estimation techniques; Algorithmic cost modeling, Project duration and staffing.

Text Books:

1. Ian Sommerville: Software Engineering, 8th Edition, Pearson Education, 2007.
   (Chapters-: 1, 2, 3, 4, 5, 6, 7, 8, 11, 14, 17, 21, 22, 23, 25, 26)

Reference Books:

1. Roger.S.Pressman: Software Engineering-A Practitioners approach, 7th Edition, Tata McGraw Hill, 2007.
2. Pankaj Jalote: An Integrated Approach to Software Engineering, Wiley India, 2009.

DATABASE MANAGEMENT SYSTEMS

Subject Code: 10CS54	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART - A

UNIT – 1 **6 Hours**

Introduction: Introduction; An example; Characteristics of Database approach; Actors on the screen; Workers behind the scene; Advantages of using DBMS approach; A brief history of database applications; when not to use a DBMS.

Data models, schemas and instances; Three-schema architecture and data independence; Database languages and interfaces; The database system environment; Centralized and client-server architectures; Classification of Database Management systems.

UNIT – 2 **6 Hours**

Entity-Relationship Model: Using High-Level Conceptual Data Models for Database Design; An Example Database Application; Entity Types, Entity Sets, Attributes and Keys; Relationship types, Relationship Sets, Roles and Structural Constraints; Weak Entity Types; Refining the ER Design; ER Diagrams, Naming Conventions and Design Issues; Relationship types of degree higher than two.

UNIT – 3 **8 Hours**

Relational Model and Relational Algebra : Relational Model Concepts; Relational Model Constraints and Relational Database Schemas; Update Operations, Transactions and dealing with constraint violations; Unary Relational Operations: SELECT and PROJECT; Relational Algebra Operations from Set Theory; Binary Relational Operations : JOIN and DIVISION; Additional Relational Operations; Examples of Queries in Relational Algebra; Relational Database Design Using ER- to-Relational Mapping.

UNIT – 4 **6 Hours**

SQL – 1: SQL Data Definition and Data Types; Specifying basic constraints in SQL; Schema change statements in SQL; Basic queries in SQL; More complex SQL Queries.

PART - B

UNIT – 5 **6 Hours**

SQL – 2 : Insert, Delete and Update statements in SQL; Specifying constraints as Assertion and Trigger; Views (Virtual Tables) in SQL; Additional features of SQL; Database programming issues and techniques; Embedded SQL, Dynamic SQL; Database stored procedures and SQL / PSM.

UNIT – 6 **6 Hours**

Database Design – 1: Informal Design Guidelines for Relation Schemas; Functional Dependencies; Normal Forms Based on Primary Keys; General Definitions of Second and Third Normal Forms; Boyce-Codd Normal Form

UNIT – 7 **6 Hours**

Database Design -2: Properties of Relational Decompositions; Algorithms for Relational Database Schema Design; Multivalued Dependencies and Fourth Normal Form; Join Dependencies and Fifth Normal Form; Inclusion Dependencies; Other Dependencies and Normal Forms

UNIT – 8 **8 Hours**

Transaction Management: The ACID Properties; Transactions and Schedules; Concurrent Execution of Transactions; Lock- Based Concurrency Control; Performance of locking; Transaction support in SQL; Introduction to crash recovery; 2PL, Serializability and Recoverability; Lock Management; Introduction to ARIES; The log; Other recovery-related structures; The write-ahead log protocol; Checkpointing; Recovering from a System Crash; Media Recovery; Other approaches and interaction with concurrency control.

Text Books:

1. Elmasri and Navathe: Fundamentals of Database Systems, 5th Edition, Pearson Education, 2007.

   (Chapters 1, 2, 3 except 3.8, 5, 6.1 to 6.5, 7.1, 8, 9.1, 9.2 except SQLJ, 9.4, 10)
2. Raghu Ramakrishnan and Johannes Gehrke: Database Management Systems, 3rd Edition, McGraw-Hill, 2003. (Chapters 16, 17.1, 17.2, 18)

Reference Books:

1. Silberschatz, Korth and Sudharshan: Data base System Concepts, 6th Edition, Mc-GrawHill, 2010.
2. C.J. Date, A. Kannan, S. Swamynatham: An Introduction to Database Systems, 8th Edition, Pearson Education, 2006.

COMPUTER NETWORKS - I

Subject Code: 10CS55	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT - 1 **7 Hours**

Introduction: Data Communications, Networks, The Internet, Protocols & Standards, Layered Tasks,
The OSI model, Layers in OSI model, TCP/IP Protocol suite, Addressing

UNIT- 2 **7 Hours**

Physical Layer-1: Analog & Digital Signals, Transmission Impairment, Data Rate limits, Performance, Digital-digital conversion (Only Line coding: Polar, Bipolar and Manchester coding), Analog-to-digital conversion (only PCM), Transmission Modes, Digital-to-analog conversion

UNIT- 3 **6 Hours**

Physical Layer-2 and Switching: Multiplexing, Spread Spectrum, Introduction to switching, Circuit Switched Networks, Datagram Networks, Virtual Circuit Networks

UNIT- 4 **6 Hours**

Data Link Layer-1: Error Detection & Correction: Introduction, Block coding, Linear block codes, Cyclic codes, Checksum.

PART - B

UNIT- 5 **6 Hours**

Data Link Layer-2: Framing, Flow and Error Control, Protocols, Noiseless Channels, Noisy channels, HDLC, PPP (Framing, Transition phases only)

UNIT- 6 **7 Hours**

Multiple Access & Ethernet: Random access, Controlled Access, Channelization, Ethernet: IEEE standards, Standard
Ethernet, Changes in the standard, Fast Ethernet, Gigabit Ethernet

UNIT - 7 **6 Hours**

Wireless LANs and Cellular Networks: Introduction, IEEE 802.11, Bluetooth, Connecting devices, Cellular Telephony

UNIT - 8: **7 Hours**

Network Layer: Introduction, Logical addressing, IPv4 addresses, IPv6 addresses, Internetworking basics,
IPv4, IPv6, Comparison of IPv4 and IPv6 Headers.

Text Books:

1. Behrouz A. Forouzan,: Data Communication and Networking, 4th Edition Tata McGraw-Hill, 2006.
   (Chapters 1.1 to 1.4, 2.1 to 2.5, 3.1 To 3.6, 4.1 to 4.3, 5.1, 6.1, 6.2, 8.1 to 8.3, 10.1 to 10.5, 11.1 to 11.7, 12.1 to 12.3, 13.1 to 13.5, 14.1, 14.2, 15.1, 16.1, 19.1, 19.2, 20.1 to 20.3)

Reference Books:

1. Alberto Leon-Garcia and Indra Widjaja: Communication Networks - Fundamental Concepts and Key architectures, 2nd Edition Tata McGraw-Hill, 2004.
2. William Stallings: Data and Computer Communication, 8th Edition, Pearson Education, 2007.
3. Larry L. Peterson and Bruce S. Davie: Computer Networks – A Systems Approach, 4th Edition, Elsevier, 2007.
4. Nader F. Mir: Computer and Communication Networks, Pearson Education, 2007.

DATABASE APPLICATIONS LABORATORY

Subject Code: 10CSL57	**I.A. Marks : 25**
Hours/Week : 03	**Exam Hours: 03**
Total Hours : 42	**Exam Marks: 50**

1. Consider the following relations:
   Student (*snum:* integer, *sname:* string, *major:* string, *level:* string, *age:* integer)
   Class (*name:* string, *meets at:* string, *room:* string, *d:* integer)
   Enrolled (*snum:* integer, *cname:* string)
   Faculty (fi*d*: integer, *fname:* string, *deptid:* integer)
   The meaning of these relations is straightforward; for example, Enrolled has one record per student-class pair such that the student is enrolled in the class. Level is a two character code with 4 different values (example: Junior: JR etc)
   Write the following queries in SQL. No duplicates should be printed in any of the answers.

   i. Find the names of all Juniors (level = JR) who are enrolled in a class taught by Prof. Harshith
   ii. Find the names of all classes that either meet in room R128 or have five or more Students enrolled.
   iii. Find the names of all students who are enrolled in two classes that meet at the same time.
   iv. Find the names of faculty members who teach in every room in which some class is taught.
   v. Find the names of faculty members for whom the combined enrollment of the courses that they teach is less than five.

2. The following relations keep track of airline flight information:
   Flights (*no:* integer, *from:* string, *to:* string, *distance:* integer, *Departs:* time, *arrives:* time, *price:* real)
   Aircraft (*aid:* integer, *aname:* string, *cruisingrange:* integer)
   Certified (*eid:* integer, *aid:* integer)
   Employees (*eid:* integer, *ename:* string, *salary:* integer)
   Note that the Employees relation describes pilots and other kinds of employees as well; Every pilot is certified for some aircraft,

and only pilots are certified to fly.
Write each of the following queries in SQL.

i. Find the names of aircraft such that all pilots certified to operate them have salaries more than Rs.80, 000.
ii. For each pilot who is certified for more than three aircrafts, find the *eid* and the maximum *cruisingrange* of the aircraft for which she or he is certified.
iii. Find the names of pilots whose *salary* is less than the price of the cheapest route from Bengaluru to Frankfurt.
iv. For all aircraft with *cruisingrange* over 1000 Kms, .find the name of the aircraft and the average salary of all pilots certified for this aircraft.
v. Find the names of pilots certified for some Boeing aircraft.
vi. Find the *aid*s of all aircraft that can be used on routes from Bengaluru to New Delhi.

3. Consider the following database of student enrollment in courses & books adopted for each course.
STUDENT (<u>regno</u>: string, name: string, major: string, bdate:date)
COURSE (<u>course #</u>:int, cname:string, dept:string)
ENROLL (<u>regno</u>:string, <u>course#</u>:int, <u>sem</u>:int, marks:int)
BOOK _ ADOPTION (<u>course# </u>:int, <u>sem</u>:int, book-ISBN:int)
TEXT (<u>book-ISBN</u>:int, book-title:string, publisher:string, author:string)

i. Create the above tables by properly specifying the primary keys and the foreign keys.
ii. Enter at least five tuples for each relation.
iii. Demonstrate how you add a new text book to the database and make this book be adopted by some department.
iv. Produce a list of text books (include Course #, Book-ISBN, Book-title) in the alphabetical order for courses offered by the 'CS' department that use more than two books.
v. List any department that has *all* its adopted books published by a specific publisher.
vi. Generate suitable reports.
vii. Create suitable front end for querying and displaying the results.

4. The following tables are maintained by a book dealer.
AUTHOR (<u>author-id</u>:int, name:string, city:string, country:string)
PUBLISHER (<u>publisher-id</u>:int, name:string, city:string, country:string)
CATALOG (<u>book-id</u>:int, title:string, author-id:int, publisher-id:int, category-id:int, year:int, price:int)
CATEGORY (<u>category-id</u>:int, description:string)
ORDER-DETAILS (<u>order-no</u>:int, <u>book-id</u>:int, quantity:int)
i. Create the above tables by properly specifying the primary keys and the foreign keys.
ii. Enter at least five tuples for each relation.
iii. Give the details of the authors who have 2 or more books in the catalog and the price of the books is greater than the average price of the books in the catalog and the year of publication is after 2000.
iv. Find the author of the book which has maximum sales.
v. Demonstrate how you increase the price of books published by a specific publisher by 10%.
vi. Generate suitable reports.
vii. Create suitable front end for querying and displaying the results.

5. Consider the following database for a banking enterprise
BRANCH(<u>branch-name</u>:string, branch-city:string, assets:real)
ACCOUNT(<u>accno</u>:int, branch-name:string, balance:real)
DEPOSITOR(<u>customer-name</u>:string, <u>accno</u>:int)
CUSTOMER(<u>customer-name</u>:string, customer-street:string, customer-city:string)
LOAN(<u>loan-number</u>:int, branch-name:string, amount:real)

BORROWER(<u>customer-name</u>:string, <u>loan-number</u>:int)

i. Create the above tables by properly specifying the primary keys and the foreign keys
ii. Enter at least five tuples for each relation
iii. Find all the customers who have at least two accounts at the *Main* branch.
iv. Find all the customers who have an account at *all* the branches located in a specific city.
v. Demonstrate how you delete all account tuples at every branch located in a specific city.
vi. Generate suitable reports.
vii. Create suitable front end for querying and displaying the results.

Instructions:

1. The exercises are to be solved in an RDBMS environment like Oracle or DB2.
2. Suitable tuples have to be entered so that queries are executed correctly.
3. Front end may be created using either VB or VAJ or any other similar tool.
4. The student need not create the front end in the examination. The results of the queries may be displayed directly.
5. Relevant queries other than the ones listed along with the exercises may also be asked in the examination.
6. Questions must be asked based on lots.

COMPUTER NETWORKS - II

Subject Code: 10CS64	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART - A

UNIT - 1 **6 Hours**

Packet Switching Networks - 1: Network services and internal network operation, Packet network topology, Routing in Packet networks, Shortest path routing: Bellman-Ford algorithm.

UNIT – 2 **6 Hours**

Packet Switching Networks – 2: Shortest path routing (continued), Traffic management at the Packet level, Traffic management at Flow level, Traffic management at flow aggregate level.

UNIT – 3 **6 Hours**

TCP/IP-1: TCP/IP architecture, The Internet Protocol, IPv6, UDP.

UNIT – 4 **8 Hours**

TCP/IP-2: TCP, Internet Routing Protocols, Multicast Routing, DHCP, NAT and Mobile IP.

PART – B

UNIT - 5 **7 Hours**

Applications, Network Management, Network Security: Application layer overview, Domain Name System (DNS), Remote Login Protocols, E-mail, File Transfer and FTP, World Wide Web and HTTP, Network management, Overview of network security, Overview of security methods, Secret-key encryption protocols, Public-key encryption protocols, Authentication, Authentication and digital signature, Firewalls.

UNIT – 6 **6 Hours**

QoS, VPNs, Tunneling, Overlay Networks: Overview of QoS, Integrated Services QoS, Differentiated services QoS, Virtual Private Networks, MPLS, Overlay networks.

UNIT - 7 **7 Hours**

Multimedia Networking: Overview of data compression, Digital voice and compression, JPEG, MPEG, Limits of compression with loss, Compression methods without loss, Overview of IP Telephony, VoIP signaling protocols, Real-Time Media Transport Protocols, Stream control Transmission Protocol (SCTP)

UNIT – 8 **6 Hours**

Mobile AdHoc Networks and Wireless Sensor Neworks: Overview of Wireless Ad-Hoc networks, Routing in AdHOc Networks, Routing protocols for and Security of AdHoc networks, Sensor Networks and protocol structures, Communication Energy model, Clustering protocols, Routing protocols, ZigBee technology and 802.15.4.

Text Books:

1. Communication Networks – Fundamental Concepts & key architectures, Alberto Leon Garcia & Indra Widjaja, 2nd Edition, Tata McGraw-Hill, India
   (7 - excluding 7.6, 8)
2. Computer & Communication Networks, Nadir F Mir, Pearson Education, India
   (9, 10 excluding 10.7, 12.1 to 12.3, 16, 17.1 to 17.6, 18.1 to18.3, 18.5, 19, 20)

Reference Books:

1. Behrouz A. Forouzan: Data Communications and Networking, 4th Edition, Tata McGraw-Hill, 2006.
2. William Stallings: Data and Computer Communication, 8th Edition, Pearson Education, 2007.
3. Larry L. Peterson and Bruce S. Davie: Computer Networks – A Systems Approach, 4th Edition, Elsevier, 2007.
4. Wayne Tomasi: Introduction to Data Communications and Networking, Pearson Education, 2005.

OBJECT-ORIENTED MODELING AND DESIGN

Subject Code: 10CS71	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT – 1 **7 Hours**

Introduction, Modeling Concepts, class Modeling: What is Object Orientation? What is OO development? OO themes; Evidence for usefulness of OO development; OO modeling history

Modeling as Design Technique: Modeling; abstraction; The three models.

Class Modeling: Object and class concepts; Link and associations concepts; Generalization and inheritance; A sample class model; Navigation of class models; Practical tips.

UNIT – 2 **6 Hours**

Advanced Class Modeling, State Modeling: Advanced object and class concepts; Association ends; N-ary associations; Aggregation; Abstract classes; Multiple inheritance; Metadata; Reification; Constraints; Derived data; Packages; Practical tips.

State Modeling: Events, States, Transitions and Conditions; State diagrams; State diagram behavior; Practical tips.

UNIT – 3 **6 Hours**

Advanced State Modeling, Interaction Modeling: Advanced State Modeling: Nested state diagrams; Nested states; Signal generalization; Concurrency; A sample state model; Relation of class and state models; Practical tips.

Interaction Modeling: Use case models; Sequence models; Activity models.
Use case relationships; Procedural sequence models; Special constructs for activity models.

UNIT – 4 **7 Hours**

Process Overview, System Conception, Domain Analysis: Process Overview: Development stages; Development life cycle.

System Conception: Devising a system concept; Elaborating a concept; Preparing a problem statement.

Domain Analysis: Overview of analysis; Domain class model; Domain state model; Domain interaction model; Iterating the analysis.

PART – B

UNIT – 5 **7 Hours**

Application Analysis, System Design: Application Analysis: Application interaction model; Application class model; Application state model; Adding operations.

Overview of system design; Estimating performance; Making a reuse plan; Breaking a system in to sub-systems; Identifying concurrency; Allocation of sub-systems; Management of data storage; Handling global resources; Choosing a software control strategy; Handling boundary conditions; Setting the trade-off priorities; Common architectural styles; Architecture of the ATM system as the example.

UNIT – 6 **7 Hours**

Class Design, Implementation Modeling, Legacy Systems: Class Design: Overview of class design; Bridging the gap; Realizing use cases; Designing algorithms; Recursing downwards, Refactoring; Design optimization; Reification of behavior; Adjustment of inheritance; Organizing a class design; ATM example.

Implementation Modeling: Overview of implementation; Fine-tuning classes; Fine-tuning generalizations; Realizing associations; Testing.

Legacy Systems: Reverse engineering; Building the class models; Building the interaction model; Building the state model; Reverse engineering tips; Wrapping; Maintenance.

UNIT – 7 **6 Hours**

Design Patterns – 1: What is a pattern and what makes a pattern? Pattern categories; Relationships between patterns; Pattern description
Communication Patterns: Forwarder-Receiver; Client-Dispatcher-Server; Publisher-Subscriber.

UNIT – 8 **6 Hours**

Design Patterns – 2, Idioms: Management Patterns: Command processor; View handler.

Idioms: Introduction; what can idioms provide? Idioms and style; Where to find idioms; Counted Pointer example

Text Books:

1. Michael Blaha, James Rumbaugh: Object-Oriented Modeling and Design with UML, 2nd Edition, Pearson Education, 2005. (Chapters 1 to 17, 23)
2. Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michael Stal: Pattern-Oriented Software Architecture, A System of Patterns, Volume 1, John Wiley and Sons, 2007. (Chapters 1, 3.5, 3.6, 4)

Reference Books:

1. Grady Booch et al: Object-Oriented Analysis and Design with Applications, 3rd Edition, Pearson Education, 2007.
2. Brahma Dathan, Sarnath Ramnath: Object-Oriented Analysis, Design, and Implementation, Universities Press, 2009.

3. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado: UML 2 Toolkit, Wiley- Dreamtech India, 2004.
4. Simon Bennett, Steve McRobb and Ray Farmer: Object-Oriented Systems Analysis and Design Using UML, 2nd Edition, Tata McGraw-Hill, 2002.

EMBEDDED COMPUTING SYSTEMS

Sub Code: 10CS72	**IA Marks :25**
Hrs/Week: 04	**Exam Hours :03**
Total Hrs: 52	**Exam Marks :100**

PART- A

UNIT – 1 **6 Hours**

Embedded Computing: Introduction, Complex Systems and Microprocessors, Embedded Systems Design Process, Formalism for System design

Design Example: Model Train Controller.

UNIT – 2 **7 Hours**

Instruction Sets, CPUs: Preliminaries, ARM Processor, Programming Input and Output, Supervisor mode, Exceptions, Traps, Coprocessors, Memory Systems Mechanisms, CPU Performance, CPU Power Consumption. Design Example: Data Compressor.

UNIT – 3 **6 Hours**

Bus-Based Computer Systems: CPU Bus, Memory Devices, I/O devices, Component Interfacing, Designing with Microprocessor, Development and Debugging, System-Level Performance Analysis

Design Example: Alarm Clock.

UNIT – 4 **7 Hours**

Program Design and Analysis: Components for embedded programs, Models of programs, Assembly, Linking and Loading, Basic Compilation Techniques, Program optimization, Program-Level performance analysis, Software performance optimization, Program-Level energy and power analysis, Analysis and optimization of program size, Program validation and testing. Design Example: Software modem.

PART- B

UNIT – 5 **6 Hours**

Real Time Operating System (RTOS) Based Design – 1: Basics of OS, Kernel, types of OSs, tasks, processes, Threads, Multitasking and Multiprocessing, Context switching, Scheduling Policies, Task Communication, Task Synchronization.

UNIT – 6 **6 Hours**

RTOS-Based Design - 2: Inter process Communication mechanisms, Evaluating OS performance, Choice of RTOS, Power Optimization. Design Example: Telephone Answering machine

UNIT – 7 **7 Hours**

Distributed Embedded Systems: Distributed Network Architectures, Networks for Embedded Systems: I2C Bus, CAN Bus, SHARC Link Ports, Ethernet, Myrinet, Internet, Network Based Design. Design Example: Elevator Controller.

UNIT – 8 **7 Hours**

Embedded Systems Development Environment: The Integrated Development Environment, Types of File generated on Cross Compilation, Dis-assembler /Decompiler, Simulators, Emulators, and Debugging, Target Hardware Debugging.

Text Books:

1. Wayne Wolf: Computers as Components, Principles of Embedded

Computing Systems Design, 2nd Edition, Elsevier, 2008.
2. Shibu K V: Introduction to Embedded Systems, Tata McGraw Hill, 2009
(Chapters 10, 13)

Reference Books:

1. James K. Peckol: Embedded Systems, A contemporary Design Tool, Wiley India, 2008
2. Tammy Neorgaard: Embedded Systems Architecture, Elsevier, 2005.

PROGRAMMING THE WEB

Subject Code: 10CS73	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

UNIT – 1 **6 Hours**

Fundamentals of Web, XHTML – 1: Internet, WWW, Web Browsers and Web Servers, URLs, MIME, HTTP, Security, The Web Programmers Toolbox.
XHTML: Basic syntax, Standard structure, Basic text markup, Images, Hypertext Links.

UNIT – 2 **7 Hours**

XHTML – 2, CSS: XHTML (continued): Lists, Tables, Forms, Frames
CSS: Introduction, Levels of style sheets, Style specification formats, Selector forms, Property value forms, Font properties, List properties, Color, Alignment of text, The box model, Background images, The <span> and <div> tags, Conflict resolution.

UNIT – 3 **6 Hours**

Javascript: Overview of Javascript, Object orientation and Javascript, Syntactic characteristics, Primitives, operations, and expressions, Screen output and keyboard input, Control statements, Object creation and modification, Arrays, Functions, Constructors, Pattern matching using regular expressions, Errors in scripts, Examples.

UNIT – 4 **7 Hours**

Javascript and HTML Documents, Dynamic Documents with Javascript: The Javascript execution environment, The Document Object Model, Element access in Javascript, Events and event handling, Handling events from the Body elements, Button elements, Text box and Password elements, The DOM 2 event model, The navigator object, DOM tree traversal and modification.
Introduction to dynamic documents, Positioning elements, Moving elements, Element visibility, Changing colors and fonts, Dynamic content, Stacking elements, Locating the mouse cursor, Reacting to a mouse click, Slow movement of elements, Dragging and dropping elements.

PART - B

UNIT – 5 **6 Hours**

XML: Introduction, Syntax, Document structure, Document type definitions, Namespaces, XML schemas, Displaying raw XML documents, Displaying XML documents with CSS, XSLT style sheets, XML processors, Web services.

UNIT – 6 **7 Hours**

Perl, CGI Programming: Origins and uses of Perl, Scalars and their operations, Assignment statements and simple input and output, Control statements, Fundamentals of arrays, Hashes, References, Functions, Pattern matching, File input and output; Examples.
The Common Gateway Interface; CGI linkage; Query string format; CGI.pm module; A survey example; Cookies.
Database access with Perl and MySQL

UNIT – 7 **6 Hours**

PHP: Origins and uses of PHP, Overview of PHP, General syntactic characteristics, Primitives, operations and expressions, Output, Control statements, Arrays, Functions, Pattern matching, Form handling, Files, Cookies, Session tracking, Database access with PHP and MySQL.

UNIT – 8 **7 Hours**

Ruby, Rails: Origins and uses of Ruby, Scalar types and their operations, Simple input and output, Control statements, Arrays, Hashes, Methods, Classes, Code blocks and iterators, Pattern matching.
Overview of Rails, Document requests, Processing forms, Rails applications with Databases, Layouts.

Text Books:

1. Robert W. Sebesta: Programming the World Wide Web, 4th Edition, Pearson Education, 2008.
   (Listed topics only from Chapters 1 to 9, 11 to 15)

Reference Books:

1. M. Deitel, P.J. Deitel, A. B. Goldberg: Internet & World Wide Web How to Program, 4th Edition, Pearson Education, 2004.
2. Chris Bates: Web Programming Building Internet Applications, 3rd Edition, Wiley India, 2007.
3. Xue Bai et al: The web Warrior Guide to Web Programming, Cengage Learning, 2003.

Web Programming Laboratory

Subject Code: 10CSL78	**I.A. Marks : 25**
Hours/Week : 03	**Exam Hours: 03**
Total Hours : 42	**Exam Marks: 50**

1. Develop and demonstrate a XHTML file that includes Javascript script for the following problems:
   a) Input: A number n obtained using prompt
   Output: The first n Fibonacci numbers
   b) Input: A number n obtained using prompt
   Output: A table of numbers from 1 to n and their squares using **alert**
2. a) Develop and demonstrate, using Javascript script, a XHTML document that collects the USN (the valid format is: A digit from 1 to 4 followed by two upper-case characters followed by two digits followed by two upper-case characters followed by three digits; no embedded spaces allowed) of the user. Event handler must be included for the form element that collects this information to validate the input. Messages in the alert windows must be produced when errors are detected.
   b) Modify the above program to get the current semester also (restricted to be a number from 1 to 8)
3. a) Develop and demonstrate, using Javascript script, a XHTML document that contains three short paragraphs of text, stacked on top of each other, with only enough of each showing so that the mouse cursor can be placed over some part of them. When the cursor is placed over the exposed part of any paragraph, it should rise to the top to become completely visible.
   b) Modify the above document so that when a paragraph is moved from the top stacking position, it returns to its original position rather than to the bottom.
4. a) Design an XML document to store information about a student in an engineering college affiliated to VTU. The information must include USN, Name, Name of the College, Brach, Year of Joining, and e-mail id. Make up sample data for 3 students. Create a CSS style sheet and use it to display the document.
   b) Create an XSLT style sheet for one student element of the above document and use it to create a display of that element.
5. a) Write a Perl program to display various Server Information like Server Name, Server Software, Server protocol, CGI Revision etc.
   b) Write a Perl program to accept UNIX command from a HTML form and to display the output of the command executed.

6. a) Write a Perl program to accept the User Name and display a greeting message randomly chosen from a list of 4 greeting messages.
   b) Write a Perl program to keep track of the number of visitors visiting the web page and to display this count of visitors, with proper headings.
7. Write a Perl program to display a digital clock which displays the current time of the server.
8. Write a Perl program to insert name and age information entered by the user into a table created using MySQL and to display the current contents of this table.
9. Write a PHP program to store current date-time in a COOKIE and display the 'Last visited on' date-time on the web page upon reopening of the same page.
10. Write a PHP program to store page views count in SESSION, to increment the count on each refresh, and to show the count on web page.
11. Create a XHTML form with Name, Address Line 1, Address Line 2, and E-mail text fields. On submitting, store the values in MySQL table. Retrieve and display the data based on Name.
12. Build a Rails application to accept book information viz. Accession number, title, authors, edition and publisher from a web page and store the information in a database and to search for a book with the title specified by the user and to display the search results with proper headings.

Note: In the examination *each* student picks one question from the lot of *all* 12 questions.

DATA WAREHOUSING AND DATA MINING

Subject Code: 10CS755	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT – 1 **6 Hours**

Data Warehousing:
Introduction, Operational Data Stores (ODS), Extraction Transformation Loading (ETL), Data Warehouses. Design Issues, Guidelines for Data Warehouse Implementation, Data Warehouse Metadata

UNIT – 2

6 Hours

Online Analytical Processing (OLAP): Introduction, Characteristics of OLAP systems, Multidimensional view and Data cube, Data Cube Implementations, Data Cube operations, Implementation of OLAP and overview on OLAP Softwares.

UNIT – 3 **6 Hours**

Data Mining: Introduction, Challenges, Data Mining Tasks, Types of Data, Data Preprocessing, Measures of Similarity and Dissimilarity, Data Mining Applications

UNIT – 4 **8 Hours**

Association Analysis: Basic Concepts and Algorithms: Frequent Itemset Generation, Rule Generation, Compact Representation of Frequent Itemsets, Alternative methods for generating Frequent Itemsets, FP Growth Algorithm, Evaluation of Association Patterns

PART - B

UNIT – 5 **6 Hours**

Classification -1 : Basics, General approach to solve classification problem, Decision Trees, Rule Based Classifiers, Nearest Neighbor Classifiers.

UNIT – 6 **6 Hours**

Classification - 2 : Bayesian Classifiers, Estimating Predictive accuracy of classification methods, Improving accuracy of clarification methods, Evaluation criteria for classification methods, Multiclass Problem.

UNIT – 7 **8 Hours**

Clustering Techniques: Overview, Features of cluster analysis, Types of Data and Computing Distance, Types of Cluster Analysis Methods, Partitional Methods, Hierarchical Methods, Density Based Methods, Quality and Validity of Cluster Analysis

UNIT – 8 **6 Hours**

Web Mining: Introduction, Web content mining, Text Mining, Unstructured Text, Text clustering, Mining Spatial and Temporal Databases.

Text Books:

1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar: Introduction to Data Mining, Pearson Education, 2005.
2. G. K. Gupta: Introduction to Data Mining with Case Studies, 3rd Edition, PHI, New Delhi, 2009.

Reference Books:

1. Arun K Pujari: Data Mining Techniques 2nd Edition, Universities Press, 2009.
2. Jiawei Han and Micheline Kamber: Data Mining - Concepts and Techniques, 2nd Edition, Morgan Kaufmann Publisher, 2006.
3. Alex Berson and Stephen J. Smith: Data Warehousing, Data Mining, and OLAP Computing, Mc GrawHill Publisher, 1997.

C# PROGRAMMING AND .NET

Subject Code: 10CS761	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT – 1 **6 Hours**

Interfaces and Collections: Defining Interfaces Using C# Invoking Interface Members at the object Level, Exercising the Shapes Hierarchy, Understanding Explicit Interface Implementation, Interfaces As Polymorphic Agents, Building Interface Hierarchies, Implementing, Implementation, Interfaces Using VS .NET, understanding the IConvertible Interface, Building a Custom Enumerator (IEnumerable and Enumerator), Building Cloneable objects (ICloneable), Building Comparable Objects (I Comparable), Exploring the system. Collections Namespace, Building a Custom Container (Retrofitting the Cars Type).

UNIT – 2 **8 Hours**

Callback Interfaces, Delegates, and Events, Advanced Techniques: Understanding Callback Interfaces, Understanding the .NET Delegate Type, Members of System. Multicast Delegate, The Simplest Possible Delegate Example, , Building More a Elaborate Delegate Example, Understanding Asynchronous Delegates, Understanding (and Using)Events.

The Advances Keywords of C#, A Catalog of C# Keywords Building a Custom Indexer, A Variation of the Cars Indexer Internal Representation of Type Indexer . Using C# Indexer from VB .NET. Overloading operators, The Internal Representation of Overloading Operators, interacting with Overload Operator from Overloaded- Operator- Challenged Languages, Creating Custom Conversion Routines, Defining Implicit Conversion Routines, The Internal Representations of Customs Conversion Routines

UNIT – 3 **6 Hours**

Understanding .NET Assembles: Problems with Classic COM Binaries, An Overview of .NET Assembly, Building a Simple File Test Assembly, A C#. Client Application, A Visual Basic .NET Client Application, Cross Language Inheritance, Exploring the CarLibrary's, Manifest, Exploring the CarLibrary's Types, Building the Multifile Assembly ,Using Assembly, Understanding Private Assemblies, Probing for Private Assemblies (The Basics), Private A Assemblies XML Configurations Files, Probing for Private Assemblies (The Details), Understanding Shared Assembly, Understanding Shared Names,

Building a Shared Assembly, Understanding Delay Signing, Installing/Removing Shared Assembly, Using a Shared Assembly

UNIT – 4 **6 Hours**

Object- Oriented Programming with C#: Forms Defining of the C# Class, Definition the “Default Public Interface” of a Type, Recapping the Pillars of OOP, The First Pillars: C#’s Encapsulation Services, Pseudo- Encapsulation: Creating Read-Only Fields, The Second Pillar: C#’s Inheritance Supports, keeping Family Secrets: The “ Protected” Keyword, Nested Type Definitions, The Third Pillar: C #’s Polymorphic Support, Casting Between .

PART – B

UNIT – 5 **6 Hours**

Exceptions and Object Lifetime: Ode to Errors, Bugs, and Exceptions, The Role of .NET Exception Handing, the System. Exception Base Class, Throwing a Generic Exception, Catching Exception, CLR System – Level Exception(System. System Exception), Custom Application-Level Exception(System. System Exception), Handling Multiple Exception, The Family Block, the Last Chance Exception Dynamically Identifying Application – and System Level Exception Debugging System Exception Using VS. NET, Understanding Object Lifetime, the CIT of “new’, The Basics of Garbage Collection,, Finalization a Type, The Finalization Process, Building an Ad Hoc Destruction Method, Garbage Collection Optimizations, The System. GC Type.

UNIT – 6 **6 Hours**

Interfaces and Collections: Defining Interfaces Using C# Invoking Interface Members at the object Level, Exercising the Shapes Hierarchy, Understanding Explicit Interface Implementation, Interfaces As Polymorphic Agents, Building Interface Hierarchies, Implementing, Implementation, Interfaces Using VS .NET, understanding the IConvertible Interface, Building a Custom Enumerator (IEnumerable and Enumerator), Building Cloneable objects (ICloneable), Building Comparable Objects (I Comparable), Exploring the system. Collections Namespace, Building a Custom Container (Retrofitting the Cars Type).

UNIT – 7 **8 Hours**

Callback Interfaces, Delegates, and Events, Advanced Techniques: Understanding Callback Interfaces, Understanding the .NET Delegate Type, Members of System. Multicast Delegate, The Simplest Possible Delegate Example, Building More a Elaborate Delegate Example, Understanding Asynchronous Delegates, Understanding (and Using)Events.

The Advances Keywords of C#, A Catalog of C# Keywords Building a Custom Indexer, A Variation of the Cars Indexer Internal Representation of Type Indexer . Using C# Indexer from VB .NET. Overloading operators, The Internal Representation of Overloading Operators, interacting with Overload Operator from Overloaded- Operator- Challenged Languages, Creating Custom Conversion Routines, Defining Implicit Conversion Routines, The Internal Representations of Customs Conversion Routines

UNIT – 8 **6 Hours**

Understanding .NET Assembles: Problems with Classic COM Binaries, An Overview of .NET Assembly, Building a Simple File Test Assembly, A C#. Client Application, A Visual Basic .NET Client Application, Cross Language Inheritance, Exploring the CarLibrary’s, Manifest, Exploring the CarLibrary’s Types, Building the Multifile Assembly, Using Assembly, Understanding Private Assemblies, Probing for Private Assemblies (The Basics), Private A Assemblies XML Configurations Files, Probing for Private Assemblies (The Details), Understanding Shared Assembly, Understanding Shared Names, Building a Shared Assembly, Understanding Delay Signing, Installing/Removing Shared Assembly, Using a Shared Assembly

Text Books:

1. Andrew Troelsen: Pro C# with .NET 3.0, 4th Edition, Wiley India, 2009.
   Chapters: 1 to 11 (up to pp.369)
2. E. Balagurusamy: Programming in C#, 2nd Edition, Tata McGraw

Hill, 2008.

(Programming Examples 3.7, 3.10, 5.5, 6.1, 7.2, 7.4, 7.5, 7.6, 8.1, 8.2, 8.3, 8.5, 8.7, 8.8, 9.1, 9.2, 9.3, 9.4, 10.2, 10.4, 11.2, 11.4, 12.1, 12.4, 12.5, 12.6, 13.1, 13.2, 13.3, 13.6, 14.1, 14.2, 14.4, 15.2, 15.3, 16.1, 16.2, 16.3, 18.3, 18.5.18.6)

Reference Books:

1. Tom Archer: Inside C#, WP Publishers, 2001.
2. Herbert Schildt: C# The Complete Reference, Tata McGraw Hill, 2004.

JAVA AND J2EE

Subject Code:10CS753	**IA Marks: 25**
Hours/Week: 4	**Exam Marks: 100**
Total Hours: 52	**Exam Hours: 3**

PART - A

UNIT – 1 **6 Hours**

Introduction to Java: Java and Java applications; Java Development Kit (JDK); Java is interpreted, Byte Code, JVM; Object-oriented programming; Simple Java programs.

Data types and other tokens: Boolean variables, int, long, char, operators, arrays, white spaces, literals, assigning values; Creating and destroying objects; Access specifiers.

Operators and Expressions: Arithmetic Operators, Bitwise operators, Relational operators, The Assignment Operator, The ? Operator; Operator Precedence; Logical expression; Type casting; Strings

Control Statements: Selection statements, iteration statements, Jump Statements.

UNIT – 2 **6 Hours**

Classes, Inheritance, Exceptions, Applets : Classes: Classes in Java; Declaring a class; Class name; Super classes; Constructors; Creating instances of class; Inner classes.

Inheritance: Simple, multiple, and multilevel inheritance; Overriding, overloading.

Exception handling**:** Exception handling in Java.

The Applet Class: Two types of Applets; Applet basics; Applet Architecture; An Applet skeleton; Simple Applet display methods; Requesting repainting; Using the Status Window; The HTML APPLET tag; Passing parameters to Applets; getDocumentbase() and getCodebase(); ApletContext and showDocument(); The AudioClip Interface; The AppletStub Interface; Output to the Console.

UNIT – 3 **7 Hours**

Multi Threaded Programming, Event Handling: Multi Threaded Programming: What are threads? How to make the classes threadable; Extending threads; Implementing runnable; Synchronization; Changing state of the thread; Bounded buffer problems, read-write problem, producer-consumer problems.

Event Handling: Two event handling mechanisms; The delegation event model; Event classes; Sources of events; Event listener interfaces; Using the delegation event model; Adapter classes; Inner classes.

UNIT – 4 **7 Hours**

Swings: Swings: The origins of Swing; Two key Swing features; Components and Containers; The Swing Packages; A simple Swing Application; Create a Swing Applet; Jlabel and ImageIcon; JTextField;The Swing Buttons; JTabbedpane; JScrollPane; JList; JComboBox; JTable.

PART – B

UNIT – 5 **6 Hours**

Java 2 Enterprise Edition Overview, Database Access: Overview of J2EE and J2SE
The Concept of JDBC; JDBC Driver Types; JDBC Packages; A Brief Overview of the JDBC process; Database Connection; Associating the JDBC/ODBC Bridge with the Database; Statement Objects; ResultSet; Transaction Processing; Metadata, Data types; Exceptions.

UNIT – 6 **7 Hours**
Servlets: Background; The Life Cycle of a Servlet; Using Tomcat for Servlet Development; A simple Servlet; The Servlet API; The Javax.servlet Package; Reading Servlet Parameter; The Javax.servlet.http package; Handling HTTP Requests and Responses; Using Cookies; Session Tracking.

UNIT – 7 **6 Hours**
JSP, RMI: Java Server Pages (JSP): JSP, JSP Tags, Tomcat, Request String, User Sessions, Cookies, Session Objects.
Java Remote Method Invocation: Remote Method Invocation concept; Server side, Client side.

UNIT – 8 **7 Hours**
Enterprise Java Beans: Enterprise java Beans; Deployment Descriptors; Session Java Bean, Entity Java Bean; Message-Driven Bean; The JAR File.

Text Books:
1. Herbert Schildt: Java The Complete Reference, 7th Edition, Tata McGraw Hill, 2007.
   (Chapters 1, 2, 3, 4, 5, 6, 8, 10, 11, 21, 22, 29, 30, 31)
2. Jim Keogh: J2EE - The Complete Reference, Tata McGraw Hill, 2007.
   (Chapters 5, 6, 11, 12, 15)

Reference Books:
1. Y. Daniel Liang: Introduction to JAVA Programming, 7th Edition, Pearson Education, 2007.
2. Stephanie Bodoff et al: The J2EE Tutorial, 2nd Edition, Pearson Education, 2004.

SOFTWARE TESTING

Subject Code: 10CS842	**I.A. Marks: 25**
Hours/Week: 4	**Exam Marks: 100**
Total Hours: 52	**Exam Hours: 3**

PART – A

UNIT 1 **6 Hours**
A Perspective on Testing, Examples: Basic definitions, Test cases, Insights from a Venn diagram, Identifying test cases, Error and fault taxonomies, Levels of testing. Examples: Generalized pseudocode, The triangle problem, The NextDate function, The commission problem, The SATM (Simple Automatic Teller Machine) problem, The currency converter, Saturn windshield wiper.

UNIT 2 **7 Hours**
Boundary Value Testing, Equivalence Class Testing, Decision Table-Based Testing: Boundary value analysis, Robustness testing, Worst-case testing, Special value testing, Examples, Random testing, Equivalence classes, Equivalence test cases for the triangle problem, NextDate function, and the commission problem, Guidelines and observations. Decision tables, Test cases for the triangle problem, NextDate function, and the commission problem, Guidelines and observations.

UNIT 3 **7 Hours**
Path Testing, Data Flow Testing: DD paths, Test coverage metrics, Basis path testing, guidelines and observations. Definition-Use testing, Slice-based testing, Guidelines and observations.

UNIT 4 **6 Hours**

Levels of Testing, Integration Testing: Traditional view of testing levels, Alternative life-cycle models, The SATM system, Separating integration and system testing. A closer look at the SATM system, Decomposition-based, call graph-based, Path-based integrations.

PART – B

UNIT 5 **7 Hours**

System Testing, Interaction Testing: Threads, Basic concepts for requirements specification, Finding threads, Structural strategies and functional strategies for thread testing, SATM test threads, System testing guidelines, ASF (Atomic System Functions) testing example. Context of interaction, A taxonomy of interactions, Interaction, composition, and determinism, Client/Server Testing,.

UNIT 6 **7 Hours**

Process Framework: Validation and verification, Degrees of freedom, Varieties of software. Basic principles: Sensitivity, redundancy, restriction, partition, visibility, Feedback. The quality process, Planning and monitoring, Quality goals, Dependability properties, Analysis, Testing, Improving the process, Organizational factors.

UNIT 7 **6 Hours**

Fault-Based Testing, Test Execution: Overview, Assumptions in fault-based testing, Mutation analysis, Fault-based adequacy criteria, Variations on mutation analysis. Test Execution: Overview, from test case specifications to test cases, Scaffolding, Generic versus specific scaffolding, Test oracles, Self-checks as oracles, Capture and replay.

UNIT 8 **6 Hours**

Planning and Monitoring the Process, Documenting Analysis and Test: Quality and process, Test and analysis strategies and plans, Risk planning, Monitoring the process, Improving the process, The quality team, Organizing documents, Test strategy document, Analysis and test plan, Test design specifications documents, Test and analysis reports.

TEXT BOOKS:

1. Paul C. Jorgensen: Software Testing, A Craftsman's Approach, 3rd Edition, Auerbach Publications, 2008.
   (Listed topics only from Chapters 1, 2, 5, 6, 7, 9, 10, 12, 1314, 15)
2. Mauro Pezze, Michal Young: Software Testing and Analysis – Process, Principles and Techniques, Wiley India, 2009.
   (Listed topics only from Chapters 2, 3, 4, 16, 17, 20, 24)

REFERENCE BOOKS:

1. Aditya P Mathur**:** Foundations of Software Testing, Pearson Education, 2008.
2. Srinivasan Desikan, Gopalaswamy Ramesh: Software Testing Principles and Practices, 2nd Edition, Pearson Education, 2007.
3. Brian Marrick: The Craft of Software Testing, Pearson Education, 1995.

INFORMATION AND NETWORK SECURITY

Subject Code: 10CS835	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT 1 **6 Hours**

Planning for Security: Introduction; Information Security Policy, Standards, and Practices; The Information Security Blue Print; Contingency plan and a model for contingency plan

UNIT 2 **6 Hours**
Security Technology-1: Introduction; Physical design; Firewalls; Protecting Remote Connections

UNIT 3 **6 Hours**
Security Technology – 2: Introduction; Intrusion Detection Systems (IDS); Honey Pots, Honey Nets, and Padded cell systems; Scanning and Analysis Tools

UNIT 4 **8 Hours**
Cryptography: Introduction; A short History of Cryptography; Principles of Cryptography; Cryptography Tools; Attacks on Cryptosystems.

PART - B

UNIT 5 **8 Hours**
Introduction to Network Security, Authentication Applications: Attacks, services, and Mechanisms; Security Attacks; Security Services; A model for Internetwork Security; Internet Standards and RFCs Kerberos, X.509 Directory Authentication Service.

UNIT 6 **6 Hours**
Electronic Mail Security: Pretty Good Privacy (PGP); S/MIME

UNIT 7 **6 Hours**
IP Security: IP Security Overview; IP Security Architecture; Authentication Header; Encapsulating Security Payload; Combining Security Associations; Key Management.

UNIT 8 **6 Hours**
Web Security: Web security requirements; Secure Socket layer (SSL) and Transport layer Security (TLS); Secure Electronic Transaction (SET)

Text Books:

1. Michael E. Whitman and Herbert J. Mattord: Principles of Information Security, 2nd Edition, Cengage Learning, 2005. (Chapters 5, 6, 7, 8; Exclude the topics not mentioned in the syllabus)
2. William Stallings: Network Security Essentials: Applications and Standards, 3rd Edition, Pearson Education, 2007. (Chapters: 1, 4, 5, 6, 7, 8)

Reference Book:

1. Behrouz A. Forouzan: Cryptography and Network Security, Special Indian Edition, Tata McGraw-Hill, 2007.

DIGITAL IMAGE PROCESSING

Subject Code: 10CS762	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT – 1 **6 Hours**
Digitized Image and its properties: Basic concepts, Image digitization, Digital image properties

UNIT – 2 **7 Hours**
Image Preprocessing: Image pre-processing: Brightness and geometric transformations, local preprocessing.

UNIT – 3 **7 Hours**
Segmentation – 1: Thresholding, Edge-based segmentation.

UNIT – 4 **7 Hours**
Segmentation – 2: Region based segmentation, Matching.

PART – B

UNIT – 5 **7 Hours**

Image Enhancement: Image enhancement in the spatial domain: Background, Some basic gray level transformations, Histogram processing, Enhancement using arithmetic/ logic operations, Basics of spatial filtering, Smoothing spatial filters, Sharpening spatial filters. Image enhancement in the frequency domain: Background, Introduction to the Fourier transform and the frequency domain, Smoothing Frequency-Domain filters, Sharpening Frequency Domain filters, Homomorphic filtering.

UNIT – 6 **6 Hours**

Image Compression: Image compression: Fundamentals, Image compression models, Elements of information theory, Error-Free Compression, Lossy compression.

UNIT – 7 **7 Hours**

Shape representation: Region identification, Contour-based shape representation and description, Region based shape representation and description, Shape classes.

UNIT – 8 **6 Hours**

Morphology: Basic morphological concepts, Morphology principles, Binary dilation and erosion, Gray-scale dilation and erosion, Morphological segmentation and watersheds

Text Books:

1. Milan Sonka, Vaclav Hlavac and Roger Boyle: Image Processing, Analysis and Machine Vision, 2nd Edition, Thomoson Learning, 2001.
   (Chapters 2, 4.1 to 4.3, 5.1 to 5.4, 6, 11.1 to 11.4, 11.7)
2. Rafel C Gonzalez and Richard E Woods: Digital Image Processing, 3rd Edition, Pearson Education, 2003.
   (Chapters 3.1 to 3.7, 4.1 to 4.5, 8.1 to 8.5)

Reference Books:

1. Anil K Jain, "Fundamentals of Digital Image Processing", PHI, 1997, Indian Reprint 2009.
2. B.Chanda, D Dutta Majumder, "Digital Image Processing and Analysis", PHI, 2002.

MULTI-CORE ARCHITECTURE AND PROGRAMMING

Subject Code: 10CS846	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART - A

UNIT 1 **7 Hours**

Introduction

The power and potential of parallelism, Examining sequential and parallel programs, Parallelism using multiple instruction streams, The Goals: Scalability and performance portability, Balancing machine specifics with portability, A look at six parallel computers: Chip multiprocessors, Symmetric multiprocessor architectures, Heterogeneous chip designs, Clusters, Supercomputers, Observations from the six parallel computers.

UNIT 2 **6 Hours**

Reasoning about Performance

Motivation and basic concepts, Sources of performance loss, Parallel structure, Performance trade-offs, Measuring performance, Scalable performance.

UNIT 3 **6 Hours**

Examples of Multi-Core Architectures

Introduction to Intel Architecture, How an Intel Architecture System works, Basic Components of the Intel Core 2 Duo Processor: The CPU, Memory Controller, I/O Controller; Intel Core i7: Architecture, The Intel Core i7

Processor, Intel QuickPath Interconnect, The SCH; Intel Atom Architecture.

Introduction to Texas Instruments' Multi-Core Multilayer SoC architecture for communications, infrastructure equipment

UNIT 4 **7 Hours**

Parallel Algorithm Design

Introduction, The Task / Channel model, Foster's design methodology, Examples: Boundary value problem, Finding the maximum, The n-Body problem, Adding data input.

PART – B

UNIT 5 **7 Hours**

Parallel Programming – 1 (Using OpenMP)

Designing for threads: Task decomposition, Data decomposition, Data flow decomposition, Implications of different decompositions; Challenges in decomposition, Parallel programming patters, A motivating problem: Error diffusion.

Threading and Parallel Programming Constructs: Synchronization, Critical sections, Deadlocks, Synchronization primitives: Semaphores, Locks, Condition variables; Messages, Flow Control-Based concepts: Fence, Barrier; Implementation-Dependent threading issues.

UNIT 6 **6 Hours**

Parallel Programming – 2 (Using OpenMP)

Introduction, The shared-memory model, Parallel *for* loops, Declaring private variables, Critical sections, Reductions, Performance improvements, More general data parallelism, Functional parallelism.

UNIT 7 **7 Hours**

Solutions to Common Parallel Programming Problems

Too many threads, Data races, deadlocks, and live locks, Heavily contended locks, Non-blocking algorithms, Thread-safe functions and libraries, Memory issues, Cache-related issues, Avoiding pipeline stalls, Data organization for high performance.

UNIT 8 **6 Hours**

Threading in the Processor

Single-Core Processors: Processor architecture fundamentals, Comparing Superscalar and EPIC architectures.

Multi-Core Processors: Hardware-based threading, Hyper-threading technology, Multi-Core processors, Multiple processor interactions, Power consumption, Beyond multi-core architecture.

NOTE: In order to acquire a sound understanding of the subject, it is desirable for the students to work in the laboratory using OpenMP. The hands-on experience would reinforce the concepts learnt in theory. Problems similar to the ones solved in the Algorithms Laboratory can be solved and issues like speed-up achieved can be analyzed in depth. Several free tools are available from companies like INTEL to facilitate such a study.

Text Books:

1. Calvin Lin, Lawrence Snyder: Principles of Parallel Programming, Pearson Education, 2009.
   (Listed topics only from Chapters 1, 2, 3)
2. Michael J. Quinn: Parallel Programming in C with MPI and OpenMP, Tata McGraw Hill, 2004.
   (Listed topics only from Chapters 3, 17)
3. Shameem Akhter, Jason Roberts: Multi-Core Programming, Increasing Performance through Software Multithreading, Intel Press, 2006.
   (Listed topics only from Chapters 3, 4, 7, 9, 10)
4. Web resources for Example Architectures of INTEL and Texas Instruments:
   http://download.intel.com/design/intarch/papers/321087.pdf ;
   http://focus.ti.com/lit/wp/spry133/spry133.pdf

Reference Books:

1. Introduction to Parallel Computing – Ananth Grama et. al., Pearson Education, 2009.
2. Reinders : Intel Threading Building Blocks, O'reilly – 2005
3. David Culler et. al.: Parallel Computer Architecture: A Hardware/Software Approach, Elsevier, 2006.
4. Richard Gerber, Aart J.C. Bik, Kevin B. Smith, Xinmin Tian: Software Optimization Cookbook, High-Performance Recipes for IA-32 Platforms, 2^{nd} Edition, Intel Press, 2006.

WIRELESS NETWORKS AND MOBILE COMPUTING

Sub Code: 10CS831	**IA Marks**	**: 25**
Hrs/Week: 04	**Exam Hours**	**: 03**
Total Hrs: 52	**Exam Marks**	**: 100**

PART-A

UNIT – 1 **6 Hours**

Mobile Computing Architecture: Types of Networks, Architecture for Mobile Computing, 3-tier Architecture, Design Considerations for Mobile Computing.

UNIT – 2 **7 Hours**

Wireless Networks – 1: GSM and SMS: Global Systems for Mobile Communication (GSM and Short Service Messages (SMS): GSM Architecture, Entities, Call routing in GSM, PLMN Interface, GSM Addresses and Identities, Network Aspects in GSM, Mobility Management, GSM Frequency allocation. Introduction to SMS, SMS Architecture, SM MT, SM MO, SMS as Information bearer, applications

UNIT – 3 **6 Hours**

Wireless Networks – 2: GPRS : GPRS and Packet Data Network, GPRS Network Architecture, GPRS Network Operations, Data Services in GPRS, Applications for GPRS, Billing and Charging in GPRS

UNIT – 4 **7 Hours**

Wireless Networks – 3: CDMA, 3G and WiMAX: Spread Spectrum technology, IS-95, CDMA versus GSM, Wireless Data, Third Generation Networks, Applications on 3G, Introduction to WiMAX.

PART - B

UNIT – 5 **6 Hours**

Mobile Client: Moving beyond desktop, Mobile handset overview, Mobile phones and their features, PDA, Design Constraints in applications for handheld devices.Mobile IP: Introduction, discovery, Registration, Tunneling, Cellular IP, Mobile IP with IPv6

UNIT – 6 **7 Hours**

Mobile OS and Computing Environment: Smart Client Architecture, The Client: User Interface, Data Storage, Performance, Data Synchronization, Messaging. The Server: Data Synchronization, Enterprise Data Source, Messaging. Mobile Operating Systems: WinCE, Palm OS, Symbian OS, Linux, Proprietary OS Client Development : The development process, Need analysis phase, Design phase, Implementation and Testing phase, Deployment phase, Development Tools, Device Emulators.

UNIT – 7 **6 Hours**

Building, Mobile Internet Applications: Thin client: Architecture, the client, Middleware, messaging Servers, Processing a Wireless request, Wireless Applications Protocol (WAP) Overview, Wireless Languages: Markup Languages, HDML, WML, HTML, cHTML, XHTML, VoiceXML.

UNIT – 8 **7 Hours**

J2ME: Introduction, CDC, CLDC, MIDP; Programming for CLDC, MIDlet model, Provisioning, MIDlet life-cycle, Creating new application, MIDlet

event handling, GUI in MIDP, Low level GUI Components, Multimedia APIs; Communication in MIDP, Security Considerations in MIDP.

Text Books:

1. Dr. Ashok Talukder, Ms Roopa Yavagal, Mr. Hasan Ahmed: Mobile Computing, Technology, Applications and Service Creation, 2d Edition, Tata McGraw Hill, 2010
2. Martyn Mallik: Mobile and Wireless Design Essentials, Wiley, 2003

Reference Books:

1. Raj kamal: Mobile Computing, Oxford University Press, 2007.
2. Iti Saha Misra: Wireless Communications and Networks, 3G and Beyond, Tata McGraw Hill, 2009.

DIGITAL SIGNAL PROCESSING

Subject Code: 10CS752	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART - A

UNIT – 1 **7 Hours**

The Discrete Fourier Transform: Its Properties and Applications : Frequency Domain Sampling: The Discrete Fourier Transform: Frequency Domain Sampling and Reconstruction of Discrete-Time Signals, The Discrete Fourier Transform (DFT), The DFT as a Linear Transformation, Relationship of the DFT to other Transforms. Properties of the DFT: Periodicity, Linearity and Symmetry Properties, Multiplication of Two DFT's and Circular Convolution, Additional DFT Properties; Linear FilteringMethods Based on the DFT: Use of the DFT in Linear Filtering, Filtering of Long Data Sequences; Frequency Analysis of Signals using the DFT.

UNIT – 2 **7 Hours**

Efficient Computation of the DFT: Fast Fourier Transform Algorithms: Efficient Computation of the DFT: FFT Algorithms : Direct Computation of the DFT, Divide-and-Conquer Approach to Computation of the DFT, Radix-2 FFT Algorithms, Radix-4 FFT Algorithms, Split-Radix FFT Algorithms, Implementation of FFT Algorithms.

Applications of FFT Algorithms: Efficient computation of the DFT of Two Real Sequences, Efficient computation of the DFT of a 2N-Point Real Sequence, Use of the FFT Algorithm in Linear filtering and Correlation.

A Linear filtering approach to Computation of the DFT: The Goertzel Algorithm, The Chirp-Z Transform Algorithm.

Quantization Effects in the Computation of the DFT: Quantization Errors in the Direct Computation of the DFT, Quantization Errors in FFT Algorithms.

UNIT – 3 **6 Hours**

Implementation of Discrete-Time Systems – 1: Structures for the Realization of Discrete-Time Systems

Structures for FIR Systems: Direct-Form Structures, Cascade-Form Structures, Frequency-Sampling Structures, Lattice Structure.

Structures for IIR Systems: Direct-Form Structures, Signal Flow Graphs and Transposed Structures, Cascade-Form Structures, Parallel-Form Structures, Lattice and Lattice-Ladder Structures for IIR Systems.

UNIT – 4 **6 Hours**

Implementation of Discrete-Time Systems – 2: State-Space System Analysis and Structures: State-Space Descriptions of Systems Characterized by Difference Equations, Solution of the State-Space Equations, Relationships between Input-Output and State-Space Descriptions, State-Space Analysis in the Z-Domain, Additional State-Space Structures.

Representation of Numbers: Fixed-Point Representation of Numbers, Binary Floating-Point Representation of Numbers, Errors Resulting from Rounding and Truncation.

PART – B

UNIT – 5 **6 Hours**

Implementation of Discrete-Time Systems – 3: Quantization of Filter Coefficients: Analysis of Sensitivity to Quantizatior of Filter Coefficients, Quantization of Coefficients in FIR Filters

Round-Off Effects in Digital Filters: Limit-Cycle Oscillations in Recursive Systems, Scaling to Prevent Overflow, Statistical Characterization of Quantization effects in Fixed-Point Realizations of Digital Filters.

UNIT – 6 **7 Hours**

Design of Digital Filters – 1: General Considerations: Causality and its Implications, Characteristics of Practical Frequency-Selective Filters.
Design of FIR Filters: Symmetric And Antisymetric FIR Filters, Design of Linear-Phase FIR Filters Using Windows, Design of Linear-Phase FIR Filters by the Frequency-Sampling Method, Design of Optimum Equiripple Linear-Phase FIR Filters, Design of FIR Differentiators, Design of Hilbert Transformers, Comparison of Design Methods for Linear-Phase FIR filters.

UNIT – 7 **6 Hours**

Design of Digital Filters – 2: Design of IIR Filters from Analog Filters: IIR Filter Design by Approximation of Derivatives, IIR Filter Design by Impulse Invariance, IIR Filter Design by the Bilinear Transformation, The Matched-Z Transformation, Characteristics of commonly used Analog Filters, Some examples of Digital Filters Designs based on the Bilinear Transformation.

UNIT – 8 **7 Hours**

Design of Digital Filters – 3: Frequency Transformations: Frequency Transformations in the Analog Domain, Frequency Transformations in the Digital Domain.
Design of Digital Filters based on Least-Squares method: Padé Approximations method, Least-Square design methods, FIR least-Squares Inverse (Wiener) Filters, Design of IIR Filters in the Frequency domain.

Text Books:

1. John G. Proakis and Dimitris G. Manolakis: Digital Signal Processing, 3rd Edition, Pearson Education, 2003. (Chapters 5, 6, 7 and 8)

Reference Books:

1. Paulo S. R. Diniz, Eduardo A. B. da Silva And Sergio L. Netto: Digital Signal Processing: System Analysis and Design, Cambridge University Press, 2002.
2. Sanjit K. Mitra: Digital Signal Processing: A Computer Based Approach, Tata Mcgraw-Hill, 2001.
3. Alan V Oppenheim and Ronald W Schafer: Digital Signal Processing, PHI, Indian Reprint, 2008.

DIGITAL SIGNAL PROCESSING

Subject Code: 10CS752	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART - A

UNIT – 1 **7 Hours**

The Discrete Fourier Transform: Its Properties and Applications : Frequency Domain Sampling: The Discrete Fourier Transform: Frequency Domain Sampling and Reconstruction of Discrete-Time Signals, The Discrete Fourier Transform (DFT), The DFT as a Linear Transformation, Relationship of the DFT to other Transforms. Properties of the DFT: Periodicity, Linearity and Symmetry Properties, Multiplication of Two DFT's and Circular Convolution, Additional DFT Properties; Linear Filtering

Methods Based on the DFT: Use of the DFT in Linear Filtering, Filtering of Long Data Sequences; Frequency Analysis of Signals using the DFT.

UNIT – 2 **7 Hours**

Efficient Computation of the DFT: Fast Fourier Transform Algorithms: Efficient Computation of the DFT: FFT Algorithms : Direct Computation of the DFT, Divide-and-Conquer Approach to Computation of the DFT, Radix- 2 FFT Algorithms, Radix-4 FFT Algorithms, Split-Radix FFT Algorithms, Implementation of FFT Algorithms.

Applications of FFT Algorithms: Efficient computation of the DFT of Two Real Sequences, Efficient computation of the DFT of a 2N-Point Real Sequence, Use of the FFT Algorithm in Linear filtering and Correlation.

A Linear filtering approach to Computation of the DFT: The Goertzel Algorithm, The Chirp-Z Transform Algorithm.

Quantization Effects in the Computation of the DFT: Quantization Errors in the Direct Computation of the DFT, Quantization Errors in FFT Algorithms.

UNIT – 3 **6 Hours**

Implementation of Discrete-Time Systems – 1: Structures for the Realization of Discrete-Time Systems

Structures for FIR Systems: Direct-Form Structures, Cascade-Form Structures, Frequency-Sampling Structures, Lattice Structure.

Structures for IIR Systems: Direct-Form Structures, Signal Flow Graphs and Transposed Structures, Cascade-Form Structures, Parallel-Form Structures, Lattice and Lattice-Ladder Structures for IIR Systems.

UNIT – 4 **6 Hours**

Implementation of Discrete-Time Systems – 2: State-Space System Analysis and Structures: State-Space Descriptions of Systems Characterized by Difference Equations, Solution of the State-Space Equations, Relationships between Input-Output and State-Space Descriptions, State-Space Analysis in the Z-Domain, Additional State-Space Structures.

Representation of Numbers: Fixed-Point Representation of Numbers, Binary Floating-Point Representation of Numbers, Errors Resulting from Rounding and Truncation.

PART – B

UNIT – 5 **6 Hours**

Implementation of Discrete-Time Systems – 3: Quantization of Filter Coefficients: Analysis of Sensitivity to Quantizatior of Filter Coefficients, Quantization of Coefficients in FIR Filters

Round-Off Effects in Digital Filters: Limit-Cycle Oscillations in Recursive Systems, Scaling to Prevent Overflow, Statistical Characterization of Quantization effects in Fixed-Point Realizations of Digital Filters.

UNIT – 6 **7 Hours**

Design of Digital Filters – 1: General Considerations: Causality and its Implications, Characteristics of Practical Frequency-Selective Filters.

Design of FIR Filters: Symmetric And Antisymetric FIR Filters, Design of Linear-Phase FIR Filters Using Windows, Design of Linear-Phase FIR Filters by the Frequency-Sampling Method, Design of Optimum Equiripple Linear- Phase FIR Filters, Design of FIR Differentiators, Design of Hilbert Transformers, Comparison of Design Methods for Linear-Phase FIR filters.

UNIT – 7 **6 Hours**

Design of Digital Filters – 2: Design of IIR Filters from Analog Filters: IIR Filter Design by Approximation of Derivatives, IIR Filter Design by Impulse Invariance, IIR Filter Design by the Bilinear Transformation, The Matched-Z Transformation, Characteristics of commonly used Analog Filters, Some examples of Digital Filters

Designs based on the Bilinear Transformation.

UNIT – 8 **7 Hours**

Design of Digital Filters – 3: Frequency Transformations: Frequency Transformations in the Analog Domain, Frequency Transformations in the Digital Domain.

Design of Digital Filters based on Least-Squares method: Padé Approximations method, Least-Square design methods, FIR least-Squares Inverse (Wiener) Filters, Design of IIR Filters in the Frequency domain.

Text Books:

2. John G. Proakis and Dimitris G. Manolakis: Digital Signal Processing, 3^{rd} Edition, Pearson Education, 2003.
   (Chapters 5, 6, 7 and 8)

Reference Books:

4. Paulo S. R. Diniz, Eduardo A. B. da Silva And Sergio L. Netto: Digital Signal Processing: System Analysis and Design, Cambridge University Press, 2002.
5. Sanjit K. Mitra: Digital Signal Processing: A Computer Based Approach, Tata Mcgraw-Hill, 2001.
6. Alan V Oppenheim and Ronald W Schafer: Digital Signal Processing, PHI, Indian Reprint, 2008.

ADVANCED DESIGN OF RCC STRUCTURES

Subject Code	**: 14CSE12**	IA Marks	: 50
No. of Lecture Hrs./ Week	: 04	Exam Hrs	: 03
Total No. of Lecture Hrs.	: 50	Exam Marks	: 100

Objectives:

The objectives of this course is to make students to learn principles of Structural Design, To design different types of structures and to detail the structures. To evaluate performance of the structures.

Course Outcomes: On completion of this course, students are able to

- **Achieve Knowledge of design and development of problem solving skills.**
- **Understand the principles of Structural Design**
- **Design and develop analytical skills.**
- **Summarize the principles of Structural Design and detailing**
- **Understands the structural performance.**

1. Yield line method of design of slabs. Design of flat slabs.
2. Design of grid floors.
3. Design of continuous beams with redistribution of moments
4. Design of Chimneys, Design of silos and bunkers.
5. Art of detailing earthquake resistant structures. Expansion and contraction joints

REFERENCE BOOKS:

1. A Park and Paulay, **"Reinforced Reinforced and Prestressed Concrete**"
2. Lin TY and Burns N H, "**Reinforced Concrete Design**".
3. Kong KF and Evans T H "**Design of Prestressed Concrete Structures**
4. P.C.Varghese, "**Advanced Reinforced Concrete Design**", Prentice-Hall of India, New Delhi, 2005.
5. Dr.B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, **"Comprehensive RCC Design"**

STRUCTURAL DYNAMICS

Subject Code	**: 14CSE14**	IA Marks	: 50
No. of Lecture Hrs./ Week	: 04	Exam Hrs	: 03
Total No. of Lecture Hrs.	: 50	Exam Marks	: 100

Objectives:

The objectives of this course is to make students to learn principles of Structural Dynamics, To implement these principles through different methods and to apply the same for free and forced vibration of structures. To evaluate the dynamic characteristics of the structures.

Course Outcomes: On completion of this course, students are able to

- **Achieve Knowledge of design and development of problem solving skills.**
- **Understand the principles of Structural Dynamics**
- **Design and develop analytical skills.**
- **Summarize the Solution techniques for dynamics of Multi-degree freedom systems**
- **Understand the concepts of damping in structures.**

1. Introduction: Introduction to Dynamic problems in Civil Engineering, Concept of degrees of freedom, D'Alembert's principle, principle of virtual displacement and energy principles Dynamics of Single-degree-of-freedom systems: Mathematical models of Single-degree-of-freedom systems system, Free vibration response of damped and undamped systems. Methods of evaluation of damping.

2. Response of Single-degree-of-freedom systems to harmonic loading (rotation unbalance, reciprocating unbalance) including support motion, vibration isolation, transmissibility, Numerical methods applied to Single-degree-of-freedom systems - Duhamel integral, principle of vibration-measuring instruments – seismometer and accelerometer.

3. Dynamics of Multi-degree freedom systems: Mathematical models of multi-degree-of-freedom systems, Shear building concept, free vibration of undamped multi-degree-of-freedom systems - Natural frequencies and mode shapes – orthogonality property of modes.

4. Response of Shear buildings for harmonic loading without damping using normal mode approach. Response of Shear buildings for forced vibration for harmonic loading with damping using normal mode approach, condition of damping uncoupling.

5. Approximate methods: Rayleigh's method Dunkarley's method, Stodola's method. Dynamics of Continuous systems: Free longitudinal vibration of bars, flexural vibration of beams with different end conditions,. Stiffness matrix, mass matrix (lumped and consistent); equations of motion for the discretised beam in matrix form.

Books for Reference:

1. **Dynamics of Structures – Theory and Application to Earthquake Engineering"- 2nd ed., Anil K. Chopra, Pearson Education.**
2. **Earthquake Resistant Design of Building Structures, Vinod Hosur, WILEY (india)**
3. **Vibrations, structural dynamics- M. Mukhopadhaya : Oxford IBH**
4. **Structural Dynamics- Mario Paz : CBS publishers.**
5. **Structural Dynamics- Clough & Penzien : TMH**
6. **Vibration Problems in Engineering Timoshenko, S, Van-Nostrand Co.**

ELECTIVE - I

SPECIAL CONCRETE

Subject Code	**: 14CSE152**	IA Marks	: 50
No. of Lecture Hrs./ Week	: 04	Exam Hrs	: 03
Total No. of Lecture Hrs.	: 50	Exam Marks	: 100

The objectives of this course is to make students to learn principles of Concrete mix design, To differentiate between different types of concrrete . To characterize the high Performance concrete.

Course Outcomes: On completion of this course, students are able to

- **Achieve Knowledge of design and development of problem solving skills.**
- **Understand the principles of Concrete mix design**
- **Design and develop analytical skills.**
- **Summerize the Light Weight concrete, Fibre reinforced concrete and High Performance concrete:**
- **Understand the concepts of high Performance concrete.**

1. Components of modern concrete and developments in the process and constituent materials : Role of constituents, Development in cements and cement replacement materials, pozzolona, fly ash, silica fume, rice husk ash, recycled aggregates, chemical admixtures. Mix proportioning of Concrete: Principles and methods.

2. Light Weight concrete: Introduction, classification, properties, strength and durability, mix proportioning and problems. High density concrete: Radiation shielding ability of concrete, materials for high density concrete, mix proportioning, properties in fresh and hardened state, placement methods.

3. Ferro cement: Ferrocement materials, mechanical properties, cracking of ferrocement, strength and behaviour in tension, compression and flexure, Design of ferrocement in tension, ferrocement constructions, durability, and applications.

4. ***Fibre reinforced concrete:*** Fibre materials, mix proportioning, distribution and orientation, interfacial bond, properties in fresh state, strength and behavior in tension, compression and flexure of steel fibre reinforced concrete, mechanical properties, crack arrest and toughening mechanism, applications.

5. High Performance concrete: constituents, mix proportioning, properties in fresh and hardened states, applications and limitations. Ready Mixed Concrete, Self Compacting Concrete, Reactive powder concrete, bacterial concrete.

REFERENCE BOOKS:

1. Neville A.M, "**Properties of Concrete"** Pearson Education Asis, 2000
2. P. Kumar Mehta, Paul J.N.Monterio, CONCRETE, "**Microstructure, Properties and Materials"-** Tata McGraw Hill
3. A.R.Santhakumar, (2007) "**Concrete Technology**"-Oxford University Press, New Delhi, 2007
4. Gambhir "Concrete Technology" TMH.
5. Short A and Kinniburgh.W, "**Light Weight Concrete"**- Asia Publishing House, 1963
6. Aitcin P.C**. "High performance concrete"**-E and FN, Spon London 1998
7. Rixom.R. and Mailvaganam.N., "**Chemical admixtures in concrete"-** E and FN, Spon London 1999
8. Rudnai.G., "**Light Wiehgt concrete"**- Akademiaikiado, Budapest, 1963.

STRUCTURAL ENGINEERING LAB-1

Subject Code	**: 14CSE16**	IA Marks	: 25
No. of Lab Hrs./ Week	: 03	Exam Hrs	: 03
Total No. of Lab Hrs.	**: 48**	Exam Marks	:50

The objectives of this course is to make students to learn principles of design of experiments, To investigate the performance of structural elements . To evaluate the different testing methods and equipments. .

Course Outcomes: On completion of this course, students are able to

- **Achieve Knowledge of design and development of experimenting skills.**
- **Understand the principles of design of experiments**
- **Design and develop analytical skills.**
- **Summerize the testing methods and equipments.**

1. Testing of beams for deflection, flexure and shear 12 Hrs
2. Experiments on Concrete, including Mix design 12 Hrs
3. Experiments on vibration of multi storey frame models for Natural frequency and modes. 12Hrs
4. Use of Non destructive testing (NDT) equipments – Rebound hammer, Ultra sonic pulse velocity meter and Profometer 12 Hrs

EARTHQUAKE RESISTANT STRUCTURES

Subject Code	: **14CSE22**	IA Marks	: 50
No. of Lecture Hrs./ Week	: 04	Exam Hrs	: 03
Total No. of Lecture Hrs.	: 50	Exam Marks	: 100

The objectives of this course is to make students to learn principles of engineering seismology, To design the reinforced concrete buildings for earthquake resistance. To evaluate the seismic response of the structures.

Course Outcomes: On completion of this course, students are able to

- **Achieve Knowledge of design and development of problem solving skills.**
- **Understand the principles of engineering seismology**
- **Design and develop analytical skills.**
- **Summarize the Seismic evaluation and retrofitting of structures.**
- **Understand the concepts of earthquake resistance of reinforced concrete buildings.**

1. Introduction to engineering seismology, Geological and tectonic features of India, Origin and propagation of seismic waves, characteristics of earthquake and its quantification – Magnitude and Intensity scales, seismic instruments. Earthquake Hazards in India, Earthquake Risk Evaluation and Mitigation. Structural behavior under gravity and seismic loads, Lateral load resisting structural systems, Requirements of efficient earthquake resistant structural system, damping devises, base isolation systems.
2. The Response history and strong motion characteristics. Response Spectrum – elastic and inelastic response spectra, tripartite (D-V-A) response spectrum, use of response spectrum in earthquake resistant design.Computation of seismic forces in multi-storeyed buildings – using procedures (Equivalent lateral force and dynamic analysis) as per IS-1893.
3. Structural Configuration for earthquake resistant design, Concept of plan irregularities and vertical irregularities, Soft storey, Torsion in buildings. Design provisions for these in IS-1893. Effect of infill masonry walls on frames, modeling concepts of infill masonry walls. Behaviour of masonry buildings during earthquakes, failure patterns, strength of masonry in shear and flexure, Slenderness concept of masonry walls, concepts for earthquake resistant masonry buildings – codal provisions.
4. Design of Reinforced concrete buildings for earthquake resistance-Load combinations, Ductility and energy absorption in buildings. confinement of concrete for ductility, design of columns and beams for ductility, ductile detailing provisions as per IS-1893. Structural behavior, design and ductile detailing of shear walls.
5. Seismic response control concepts – Seismic demand, seismic capacity, Overview of linear and nonlinear procedures of seismic analysis. Performance Based Seismic Engineering methodology, Seismic evaluation and retrofitting of structures.

Books for Reference:

1. **Dynamics of Structures – Theory and Application to Earthquake Engineering- 2nd ed. – Anil K. Chopra, Pearson Education.**
2. **Earthquake Resistant Design of Building Structures, Vinod Hosur, WILEY (india)**
3. **Earthquake Resistant Design of Structures, Duggal, Oxford University Press**
4. **Earthquake resistant design of structures - Pankaj Agarwal, Manish Shrikande - PHI India**
5. **IS – 1893 (Part I): 2002, IS – 13920: 1993, IS – 4326: 1993, IS-13828: 1993**
6. **Design of Earthquake Resistant Buildings, Minoru Wakabayashi, McGraw Hill Pub.**
7. **Seismic Design of Reinforced Concrete and Masonry Buildings, T Paulay and M J N Priestley, John Wiley and Sons**

FINITE ELEMENT METHOD OF ANALYSIS

Subject Code	**: 14CSE23**	IA Marks	: 50
No. of Lecture Hrs./ Week	: 04	Exam Hrs	: 03
Total No. of Lecture Hrs.	: 50	Exam Marks	: 100

The objectives of this course is to make students to learn principles of Analysis of Stress and Strain, To apply the Finite Element Method for the analysis of one and two dimensional problems. To evaluate the stress and strain parameters and their inter relations of the continuum.

Course Outcomes: On completion of this course, students are able to

- **Achieve Knowledge of design and development of problem solving skills.**
- **Understand the principles of stress-strain behaviour of continuum**
- **Design and develop analytical skills.**
- **Describe the state of stress in a continuum**
- **Understand the concepts of elasticity and plasticity.**

1. Basic concepts of elasticity – Kinematic and Static variables for various types of structural problems – approximate method of structural analysis – Rayleigh – Ritz method – Finite difference method – Finite element method. Variation method and minimization of Energy approach of element formulation.Principles of finite element method – advantages & disadvantages – Finite element procedure. Finite elements used for one, two & three dimensional problems – Element aspect ratio – mesh refinement vs. higher order elements – Numbering of nodes to minimize band width.

2. Nodal displacement parameters – Convergence criterion – Compatibility requirements – Geometric invariance – Shape function – Polynomial form of displacement function. Generalized and Natural coordinates – Lagrangian interpolation function – shape functions for one, two & three dimensional elements.

3. Isoparametric elements - Internal nodes and higher order elements – Serendipity and Lagrangian family of Finite Elements – Sub parametric and Super parametric elements – Condensation of internal nodes – Jacobian transformation Matrix. Development of strain – displacement matrix and stiffness matrix, consistent load vector, numerical integration.

4. Application of Finite Element Method for the analysis of one & two dimensional problems - Analysis of simple beams and plane trusses – Application to plane stress / strain / axisymmetric problems using CST & Quadrilateral Elements.

5. Application to Plates & Shells- Choice of displacement function (C^0, C^1 and C^2 type) – Techniques for Non – linear Analysis.

REFERENCE BOOKS:

1. Krishnamoorthy C S, “**Finite Element Analysis”-** Tata McGraw Hill
2. Desai C and Abel J F, “**Introduction to the Finite Element Method**”- East West Press Pvt. Ltd., 1972
3. Bathe K J, “**Finite Element Procedures in Engineering Analysis**”- Prentice Hall
4. Rajasekaran. S, “**Finite Element Analysis in Engineering Design”-**Wheeler Publishing
5. Cook R D, Malkan D S & Plesta M.E, “**Concepts and Application of Finite Element Analysis” -** 3rd Edition, John Wiley and Sons Inc., 1989
6. Shames I H and Dym C J, “**Energy and Finite Element Methods in Structural Mechanics**”- McGraw Hill, New York, 1985

DESIGN CONCEPTS OF SUBSTRUCTURES

Subject Code	**: 14CSE24**	IA Marks	: 50
No. of Lecture Hrs./ Week	: 04	Exam Hrs	: 03
Total No. of Lecture Hrs.	: 50	Exam Marks	: 100

The objectives of this course is to make students to learn principles of subsoil exploration, To design the sub structures. To evaluate the soil shear strength parameters.

Course Outcomes: On completion of this course, students are able to

- **Achieve Knowledge of design and development of problem solving skills.**
- **Understand the principles of subsoil exploration**
- **Design and develop analytical skills.**
- **Identify and evaluate the soil shear strength parameters .**
- **Understand the concepts of Settlement analysis.**

1. Introduction, Site investigation, In-situ testing of soils, Subsoil exploration, Classification of foundations systems.General requirement of foundations, Selection of foundations, Computations of Loads, Design concepts.
2. Concept of soil shear strength parameters, Settlement analysis of footings, Shallow foundations in clay, Shallow foundation in sand & C-Φ soils, Footings on layered soils and sloping ground, Design for Eccentric or Moment Loads.
3. Types of rafts, bearing capacity & settlements of raft foundation, Rigid methods, Flexible methods, soil-structure interaction, different methods of modeling the soil. Combined footings (rectangular & trapezoidal), strap footings & wall footings, Raft – super structure interaction effects & general concepts of structural design, Basement slabs.
4. Deep Foundations: Load Transfer in Deep Foundations, Types of Deep Foundations, Ultimate bearing capacity of different types of piles in different soil conditions, Laterally loaded piles, tension piles & batter piles, Pile groups: Bearing capacity, settlement, uplift capacity, load distribution between piles, Proportioning and design concepts of piles.
5. Types of caissons, Analysis of well foundations, Design principles, Well construction and sinking. Foundations for tower structures: Introduction, Forces on tower foundations, Selection of foundation type, Stability and design considerations, Ring foundations – general concepts.

IMPORTANT NOTE:

Only design principles of all type footings as per relevant BIS codes are to be covered, design of RC elements need not be covered

REFERENCE BOOKS:

1. Swami Saran – "**Analysis & Design of Substructures**"- Oxford & IBH Pub. Co. Pvt. Ltd., 1998.
2. Nainan P Kurian – "**Design of Foundation Systems**"- Narosa Publishing House, 1992.
3. R.B. Peck, W.E. Hanson & T.H. Thornburn – "**Foundation Engineering"-** Wiley Eastern Ltd.,Second Edition, 1984.
4. J.E. Bowles – "**Foundation Analysis and Design**"- McGraw-Hill Int. Editions, Fifth Ed., 1996.
5. W.C. Teng – "**Foundation Design"-** Prentice Hall of India Pvt. Ltd., 1983.
6. Bureau of Indian Standards:IS-1498, IS-1892, IS-1904, IS-6403, IS-8009, IS-2950, IS-11089, IS-11233, IS-2911 and all other relevant codes.

DESIGN OF TALL STRUCTURES

Subject Code	**: 14CSE252**	IA Marks	: 50
No. of Lecture Hrs./ Week	: 04	Exam Hrs	: 03
Total No. of Lecture Hrs.	: 50	Exam Marks	: 100

The objectives of this course is to make students to learn principles of stability of tall buildings, To design the tall buildings for earthquake and wind resistance. To evaluate the performance of tall structures for strength and stability.

Course Outcomes: On completion of this course, students are able to
- **Achieve Knowledge of design and development of problem solving skills.**
- **Understand the principles of strength and stability**
- **Design and develop analytical skills.**
- **Summarize the behavior of various structural systems.**
- **Understand the concepts of P-Delta analysis.**

1. **Design Criteria:** Design philosophy, loading, sequential loading, and materials – high performance concrete, fiber reinforced concrete, lightweight concrete, design mixes. Loading and Movement: Gravity loading: Dead and live load, methods of live load reduction, Impact, Gravity loading, Construction loads
2. **Wind loading**: static and dynamic approach, Analytical and wind tunnel experimentation method. Earthquake loading: Equivalent lateral force, modal analysis, combinations of loading, working stress design, Limit state design, Plastic design.
3. **Behavior of Various Structural Systems:** Factors affecting growth, Height and structural form; High rise behavior, Rigid frames, braced frames, in-filled frames, shear walls, coupled shear walls, wall-frames, tubular, cores, Futigger – braced and hybrid mega system.
4. **Analysis and Design:** Modeling for approximate analysis, accurate analysis and reduction techniques, analysis of building as total structural system considering overall integrity and major subsystem interaction, analysis for member forces; drift and twist, computerized general three dimensional analyses. .
5. **Stability of Tall Buildings:** Overall buckling analysis of frames, wall frames, approximate methods, second order effects of gravity of loading, P-Delta analysis, simultaneous first order and P-Delta analysis, Transnational, Torsional instability, out of plum effects, stiffness of member in stability, effect of foundation rotation. Structural elements: sectional shapes, properties and resisting capacities, design, deflection, cracking, pre-stressing, shear flow. Design for differential movement, creep and shrinkage effects, temperature effects and fire

REFERENCE BOOKS:

1. Taranath B.S, "**Structural Analysis and Design of Tall Buildings**"- McGraw Hill
2. Wilf gang Schuller, "**High rise building structures**"- John Wiley
3. Bryan Stafford Smith & Alexcoull, "**Tall building structures Analysis and Design**"- John Wiley
4. T.Y Lin & D.Stotes Burry, "**Structural concepts and system for Architects and Engineers"-** John Wiley
5. Lynn S.Beedle, "**Advances in Tall Buildings**"- CBS Publishers and Distributors.
6. Dr. Y.P. Gupta – Editor, "**Proceedings National Seminar on High Rise Structures- Design and Construction practices for middle level cities"-** New Age International Limited.
7.

STRUCTURAL ENGINEERING LAB-2

Subject Code	**: 14CSE26**	IA Marks	: 25
No. of Lab Hrs./ Week	: 03	Exam Hrs	: 03
Total No. of Lab Hrs.	**: 48**	Exam Marks	:50

The objectives of this course is to make students to learn the soft wares for structural analysis and design, To investigate the performance of structures for static and dynamic forces.

Course Outcomes: On completion of this course, students are able to

- **Achieve Knowledge of design and development of programming skills.**
- **Understand the principles of structural analysis and design**
- **Design and develop analytical skills.**
- **Summerize the performance of structures for static and dynamic forces..**

1. Static and Dynamic analysis of Building structure using software (ETABS / STAADPRO)	12 Hrs
2. Design of RCC and Steel structure using software (ETABS / STAADPRO)	12 Hrs
3. Analysis of folded plates and shells using software.	12 Hrs
4. Preparation of EXCEL sheets for structural design.	12 Hrs

ANALOG ELECTRONIC CIRCUITS
(Common to EC/TC/EE/IT/BM/ML)

Sub Code	**:**	**10ES32**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:
Diode Circuits: Diode Resistance, Diode equivalent circuits, Transition and diffusion capacitance, Reverse recovery time, Load line analysis, Rectifiers, Clippers and clampers. **6 Hours**

UNIT 2:
Transistor Biasing: Operating point, Fixed bias circuits, Emitter stabilized biased circuits, Voltage divider biased, DC bias with voltage feedback, Miscellaneous bias configurations, Design operations, Transistor switching networks, PNP transistors, Bias stabilization. **6 Hours**

UNIT 3:
Transistor at Low Frequencies: BJT transistor modeling, CE Fixed bias configuration, Voltage divider bias, Emitter follower, CB configuration, Collector feedback configuration, Analysis of circuits r_e model; analysis of CE configuration using h- parameter model; Relationship between h-parameter model of CE,CC and CE configuration. **7 Hours**

UNIT 4:
Transistor Frequency Response: General frequency considerations, low frequency response, Miller effect capacitance, High frequency response, multistage frequency effects. **7 Hours**

PART – B

UNIT 5:
(a) General Amplifiers: Cascade connections, Cascode connections, Darlington connections. **3 Hours**
(b) Feedback Amplifier: Feedback concept, Feedback connections type, Practical feedback circuits. Design procedures for the feedback amplifiers. **4 Hours**

UNIT 6:

Power Amplifiers: Definitions and amplifier types, series fed class A amplifier, Transformer coupled Class A amplifiers, Class B amplifier operations, Class B amplifier circuits, Amplifier distortions. Designing of Power amplifiers. **7 Hours**

UNIT 7:

Oscillators: Oscillator operation, Phase shift Oscillator, Wienbridge Oscillator, Tuned Oscillator circuits, Crystal Oscillator. (BJT Version Only) Simple design methods of Oscillators. **6 Hours**

UNIT 8:

FET Amplifiers: FET small signal model, Biasing of FET, Common drain common gate configurations, MOSFETs, FET amplifier networks.

6 Hours

TEXT BOOK:

1. **"Electronic Devices and Circuit Theory",** Robert L. Boylestad and Louis Nashelsky, PHI/Pearson Eduication. 9^{TH} Edition.

REFERENCE BOOKS:

1. **'Integrated Electronics',** Jacob Millman & Christos C. Halkias, Tata - McGraw Hill, 2^{nd} Edition, 2010
2. **"Electronic Devices and Circuits",** David A. Bell, PHI, 4^{th} Edition, 2004
3. "**Analog Electronics Circuits: A Simplified Approach"**, U.B. Mahadevaswamy, Pearson/Saguine, 2007.

LOGIC DESIGN
(Common to EC/TC/EE/IT/BM/ML)

Sub Code	**:**	**10ES33**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:

Principles of combinational logic-1: Definition of combinational logic, Canonical forms, Generation of switching equations from truth tables,

UNIT 6:

Power Amplifiers: Definitions and amplifier types, series fed class A amplifier, Transformer coupled Class A amplifiers, Class B amplifier operations, Class B amplifier circuits, Amplifier distortions. Designing of Power amplifiers. **7 Hours**

UNIT 7:

Oscillators: Oscillator operation, Phase shift Oscillator, Wienbridge Oscillator, Tuned Oscillator circuits, Crystal Oscillator. (BJT Version Only) Simple design methods of Oscillators. **6 Hours**

UNIT 8:

FET Amplifiers: FET small signal model, Biasing of FET, Common drain common gate configurations, MOSFETs, FET amplifier networks.

6 Hours

TEXT BOOK:

1. **"Electronic Devices and Circuit Theory",** Robert L. Boylestad and Louis Nashelsky, PHI/Pearson Eduication. 9^{TH} Edition.

REFERENCE BOOKS:

1. **'Integrated Electronics',** Jacob Millman & Christos C. Halkias, Tata - McGraw Hill, 2^{nd} Edition, 2010
2. **"Electronic Devices and Circuits",** David A. Bell, PHI, 4^{th} Edition, 2004
3. "**Analog Electronics Circuits: A Simplified Approach"**, U.B. Mahadevaswamy, Pearson/Saguine, 2007.

LOGIC DESIGN
(Common to EC/TC/EE/IT/BM/ML)

Sub Code	**:**	**10ES33**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:

Principles of combinational logic-1: Definition of combinational logic, Canonical forms, Generation of switching equations from truth tables,

Karnaugh maps-3, 4 and 5 variables, Incompletely specified functions (Don't Care terms), Simplifying Max term equations. **6 Hours**

UNIT 2:

Principles of combinational Logic-2: Quine-McCluskey minimization technique- Quine-McCluskey using don't care terms, Reduced Prime Implicant Tables, Map entered variables. **7 Hours**

UNIT 3:

Analysis and design of combinational logic - I: General approach, Decoders-BCD decoders, Encoders. **6 Hours**

UNIT 4:

Analysis and design of combinational logic - II: Digital multiplexers- Using multiplexers as Boolean function generators. Adders and subtractors- Cascading full adders, Look ahead carry, Binary comparators. Design methods of building blocks of combinational logics.

7 Hours

PART – B

UNIT 5:

Sequential Circuits – 1: Basic Bistable Element, Latches, SR Latch, Application of SR Latch, A Switch Debouncer, The $\overline{S}\,\overline{R}$ Latch, The gated SR Latch, The gated D Latch, The Master-Slave Flip-Flops (Pulse-Triggered Flip-Flops): The Master-Slave SR Flip-Flops, The Master-Slave JK Flip-Flop, Edge Triggered Flip-Flop: The Positive Edge-Triggered D Flip-Flop, Negative-Edge Triggered D Flip-Flop. **7 Hours**

UNIT 6:

Sequential Circuits – 2: Characteristic Equations, Registers, Counters - Binary Ripple Counters, Synchronous Binary counters, Counters based on Shift Registers, Design of a Synchronous counters, Design of a Synchronous Mod-6 Counter using clocked JK Flip-Flops Design of a Synchronous Mod-6 Counter using clocked D, T, or SR Flip-Flops **7 Hours**

UNIT 7:

Sequential Design - I: Introduction, Mealy and Moore Models, State Machine Notation, Synchronous Sequential Circuit Analysis and Design.

6 Hours

UNIT 8:
Sequential Design - II: Construction of state Diagrams, Counter Design.
6 Hours

TEXT BOOKS:

1. **“Digital Logic Applications and Design”**, John M Yarbrough, Thomson Learning, 2001.
2. **“Digital Principles and Design “,** Donald D Givone, Tata McGraw Hill Edition, 2002.

REFERENCE BOOKS:

1. **“Fundamentals of logic design”,** Charles H Roth, Jr; Thomson Learning, 2004.
2. **“Logic and computer design Fundamentals”,** Mono and Kim, Pearson, Second edition, 2001.
3. **“Logic Design”,** Sudhakar Samuel, Pearson/Saguine, 2007

NETWORK ANALYSIS
(Common to EC/TC/EE/IT/BM/ML)

Sub Code	**:**	**10ES34**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:
Basic Concepts: Practical sources, Source transformations, Network reduction using Star – Delta transformation, Loop and node analysis With linearly dependent and independent sources for DC and AC networks, Concepts of super node and super mesh. **7 Hours**

UNIT 2:
Network Topology: Graph of a network, Concept of tree and co-tree, incidence matrix, tie-set, tie-set and cut-set schedules, Formulation of equilibrium equations in matrix form, Solution of resistive networks, Principle of duality**.** **7 Hours**

UNIT 3:
Network Theorems – 1: Superposition, Reciprocity and Millman’s theorems. **6 Hours**

transform representation of discrete time signals. Sampling theorm and Nyquist rate. **7 Hours**

UNIT 7:

Z-Transforms – 1: Introduction, Z – transform, properties of ROC, properties of Z – transforms, inversion of Z – transforms.

6 Hours

UNIT 8:

Z-transforms – 2: Transform analysis of LTI Systems, unilateral Z-Transform and its application to solve difference equations. **6 Hours**

TEXT BOOK

1. **Simon Haykin,** "Signals and Systems", John Wiley India Pvt. Ltd., 2^{nd} Edn, 2008.
2. **Michael Roberts,** "Fundamentals of Signals & Systems", 2^{nd} ed, Tata McGraw-Hill, 2010.

REFERENCE BOOKS:

1. **Alan V Oppenheim, Alan S, Willsky and A Hamid Nawab,** "Signals and Systems" Pearson Education Asia / PHI, 2^{nd} edition, 1997. Indian Reprint 2002.
2. **H. P Hsu, R. Ranjan**, "Signals and Systems", Scham's outlines, TMH, 2006.
3. **B. P. Lathi**, "Linear Systems and Signals", Oxford University Press, 2005.
4. **Ganesh Rao and Satish Tunga**, "Signals and Systems", Pearson/Sanguine Technical Publishers, 2004.

FUNDAMENTALS OF HDL
(Common to EC/TC/IT/BM/ML)

Sub Code	:	**10EC45**	**IA Marks**	:	**25**
Hrs/ Week	:	**04**	**Exam Hours**	:	**03**
Total Hrs.	:	**52**	**Exam Marks**	:	**100**

PART – A

UNIT 1:

Introduction: Why HDL? , A Brief History of HDL, Structure of HDL Module, Operators, Data types, Types of Descriptions, simulation and synthesis, Brief comparison of VHDL and Verilog

7 Hours

UNIT 2:
Data –Flow Descriptions: Highlights of Data-Flow Descriptions, Structure of Data-Flow Description, Data Type – Vectors. **6 Hours**

UNIT 3:
Behavioral Descriptions: Behavioral Description highlights, structure of HDL behavioral Description, The VHDL variable –Assignment Statement, sequential statements. **6 Hours**

UNIT 4:
Structural Descriptions: Highlights of structural Description, Organization of the structural Descriptions, Binding, state Machines, Generate, Generic, and Parameter statements.

7 Hours

PART – B

UNIT 5:
Procedures, Tasks, and Functions: Highlights of Procedures, tasks, and Functions, Procedures and tasks, Functions.
Advanced HDL Descriptions: File Processing, Examples of File Processing
7 Hours

UNIT 6:
Mixed –Type Descriptions: Why Mixed-Type Description? VHDL User-Defined Types, VHDL Packages, Mixed-Type Description examples
6 Hours

UNIT 7:
Mixed –Language Descriptions: Highlights of Mixed-Language Description, How to invoke One language from the Other, Mixed-language Description Examples, Limitations of Mixed-Language Description.
7 Hours

UNIT 8:
Synthesis Basics: Highlights of Synthesis, Synthesis information from Entity and Module, Mapping Process and Always in the Hardware Domain.
6 Hours

TEXT BOOKS:
1. **HDL Programming (VHDL and Verilog**)- Nazeih M.Botros- John Weily India Pvt. Ltd. 2008.

REFERENCE BOOKS:
1. **Fundamentals of HDL** – Cyril P.R. Pearson/Sanguin 2010.
2. **VHDL** -Douglas perry-Tata McGraw-Hill.
3. **A Verilog HDL Primer**- J.Bhaskar – BS Publications
4. **Circuit Design with VHDL**-Volnei A.Pedroni-PHI.

MICROCONTROLLERS LAB
(Common to EC/TC/EE/IT/BM/ML)

Sub Code	**:**	**10ESL47**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**03**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**42**	**Exam Marks**	**:**	**50**

I. PROGRAMMING

1. Data Transfer - Block move, Exchange, Sorting, Finding largest element in an array.
2. Arithmetic Instructions - Addition/subtraction, multiplication and division, square, Cube – (16 bits Arithmetic operations – bit addressable).
3. Counters.
4. Boolean & Logical Instructions (Bit manipulations).
5. Conditional CALL & RETURN.
6. Code conversion: BCD – ASCII; ASCII – Decimal; Decimal - ASCII; HEX - Decimal and Decimal - HEX .
7. Programs to generate delay, Programs using serial port and on-Chip timer / counter.

Note: Programming exercise is to be done on both 8051 & MSP430.

II. INTERFACING:

Write C programs to interface 8051 chip to Interfacing modules to develop single chip solutions.

8. Simple Calculator using 6 digit seven segment displays and Hex Keyboard interface to 8051.
9. Alphanumeric LCD panel and Hex keypad input interface to 8051.
10. External ADC and Temperature control interface to 8051.
11. Generate different waveforms Sine, Square, Triangular, Ramp etc. using DAC interface to 8051; change the frequency and amplitude.
12. Stepper and DC motor control interface to 8051.
13. Elevator interface to 8051.

HDL LAB
(Common to EC/TC/IT/BM/ML)

Sub Code	**:**	**10ECL48**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**03**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**42**	**Exam Marks**	**:**	**50**

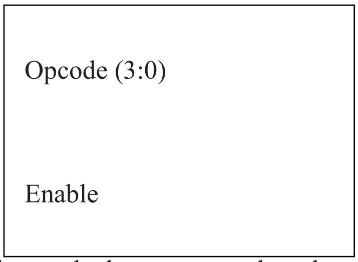
Note: Programming can be done using any compiler. Download the programs on a FPGA/CPLD boards such as Apex/Acex/Max/Spartan/Sinfi/TK Base or equivalent and performance testing may be done using 32 channel pattern generator and logic analyzer apart from verification by simulation with tools such as Altera/Modelsim or equivalent.

PROGRAMMING (using VHDL /Verilog)

1. Write HDL code to realize all the logic gates
2. Write a HDL program for the following combinational designs
   a. 2 to 4 decoder
   b. 8 to 3 (encoder without priority & with priority)
   c. 8 to 1 multiplexer
   d. 4 bit binary to gray converter
   e. Multiplexer, de-multiplexer, comparator.
2. Write a HDL code to describe the functions of a Full Adder Using three modeling styles.

3. Write a model for 32 bit ALU using the schematic diagram shown below

A (31:0) B (31:0)



- ALU should use combinational logic to calculate an output based on the four bit op-code input.
- ALU should pass the result to the out bus when enable line in high, and tri-state the out bus when the enable line is low.
- ALU should decode the 4 bit op-code according to the given in example below.

OPCODE	ALU OPERATION
1.	A + B
2.	A – B
3.	A Complement
4.	A * B
5.	A AND B
6.	A OR B
7.	A NAND B
8.	A XOR B

4. Develop the HDL code for the following flip-flops, SR, D, JK, T.
5. Design 4 bit binary, BCD counters (Synchronous reset and Asynchronous reset) and "any sequence" counters

<u>INTERFACING</u> (at least four of the following must be covered using VHDL/Verilog)

1. Write HDL code to display messages on the given seven segment display and LCD and accepting Hex key pad input data.

2. Write HDL code to control speed, direction of DC and Stepper motor.

3. Write HDL code to accept 8 channel Analog signal, Temperature sensors and display the data on LCD panel or Seven segment display.

4. Write HDL code to generate different waveforms (Sine, Square, Triangle, Ramp etc.,) using DAC change the frequency and amplitude.

5. Write HDL code to simulate Elevator operations
6. Write HDL code to control external lights using relays.

DIGITAL SIGNAL PROCESSING

Subject Code	: **10EC52**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

Discrete Fourier Transforms (DFT): Frequency domain sampling and reconstruction of discrete time signals. DFT as a linear transformation, its relationship with other transforms. **6 Hours**

UNIT - 2

Properties of DFT, multiplication of two DFTs- the circular convolution, additional DFT properties. **6 Hours**

UNIT - 3

Use of DFT in linear filtering, overlap-save and overlap-add method. Direct computation of DFT, need for efficient computation of the DFT (FFT algorithms). **7 Hours**

UNIT - 4

Radix-2 FFT algorithm for the computation of DFT and IDFT–decimation-in-time and decimation-in-frequency algorithms. Goertzel algorithm, and chirp-z transform. **7 Hours**

PART – B

UNIT - 5

IIR filter design: Characteristics of commonly used analog filters – Butterworth and Chebysheve filters, analog to analog frequency transformations. **6 Hours**

UNIT - 6

Implementation of discrete-time systems: Structures for IIR and FIR systems-direct form I and direct form II systems, cascade, lattice and parallel realization. **7 Hours**

UNIT - 7

FIR filter design: Introduction to FIR filters, design of FIR filters using - Rectangular, Hamming, Bartlet and Kaiser windows, FIR filter design using frequency sampling technique. **6 Hours**

UNIT - 8

Design of IIR filters from analog filters (Butterworth and Chebyshev) - impulse invariance method. Mapping of transfer functions: Approximation of derivative (backward difference and bilinear transformation) method, Matched z transforms, Verification for stability and linearity during mapping

7 Hours

TEXT BOOK:

1. **Digital signal processing – Principles Algorithms & Applications**, Proakis & Monalakis, Pearson education, 4^{th} Edition, New Delhi, 2007.

REFERENCE BOOKS:

1. **Discrete Time Signal Processing**, Oppenheim & Schaffer, PHI, 2003.
2. **Digital Signal Processing**, S. K. Mitra, Tata Mc-Graw Hill, 3^{rd} Edition, 2010.
3. **Digital Signal Processing**, Lee Tan: Elsivier publications, 2007

ANALOG COMMUNICATION

Subject Code	: **10EC53**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

RANDOM PROCESS: Random variables: Several random variables. Statistical averages: Function of Random variables, moments, Mean, Correlation and Covariance function: Principles of autocorrelation function, cross – correlation functions. Central limit theorem, Properties of Gaussian process. **7 Hours**

UNIT - 2

AMPLITUDE MODULATION: Introduction, AM: Time-Domain description, Frequency – Domain description. Generation of AM wave: square law modulator, switching modulator. Detection of AM waves: square law detector, envelop detector. Double side band suppressed carrier modulation (DSBSC): Time-Domain description, Frequency-Domain representation, Generation of DSBSC waves: balanced modulator, ring modulator. Coherent detection of DSBSC modulated waves. Costas loop.

7 Hours

TEXT BOOKS:

1. **Communication Systems**, Simon Haykins, 5th Edition, John Willey, India Pvt. Ltd, 2009.
2. **An Introduction to Analog and Digital Communication**, Simon Haykins, John Wiley India Pvt. Ltd., 2008

REFERENCE BOOKS:

1. **Modern digital and analog Communication systems** B. P. Lathi, Oxford University Press., 4th ed, 2010,
2. **Communication Systems**, Harold P.E, Stern Samy and A Mahmond, Pearson Edn, 2004.
3. **Communication Systems**: Singh and Sapre**:** Analog and digital TMH 2nd , Ed 2007.

MICROWAVES AND RADAR

Subject Code	: **10EC54**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

MICROWAVE TRANSMISSION LINES: Introduction, transmission lines equations and solutions, reflection and transmission coefficients, standing waves and SWR, line impedance and line admittance. Smith chart, impedance matching using single stubs, Microwave coaxial connectors.

7 Hours

UNIT - 2

MICROWAVE WAVEGUIDES AND COMPONENTS: Introduction, rectangular waveguides, circular waveguides, microwave cavities, microwave hybrid circuits, directional couplers, circulators and isolators.

6 Hours

UNIT - 3

MICROWAVE DIODES,

Transfer electron devices: Introduction, GUNN effect diodes – GaAs diode, RWH theory, Modes of operation, Avalanche transit time devices: READ diode, IMPATT diode, BARITT diode, Parametric amplifiers

Other diodes: PIN diodes, Schottky barrier diodes. **7 Hours**

UNIT - 4
Microwave network theory and passive devices. Symmetrical Z and Y parameters, for reciprocal Networks, S matrix representation of multi port networks. **6 Hours**

PART – B

UNIT - 5
Microwave passive devices, Coaxial connectors and adapters, Phase shifters, Attenuators, Waveguide Tees, Magic tees. **6 Hours**

UNIT - 6
STRIP LINES: Introduction, Microstrip lines, Parallèle strip lines, Coplanar strip lines, Shielded strip Lines. **6 Hours**

UNIT - 7
AN INTRODUCTION TO RADAR: Basic Radar, The simple form of the Radar equation, Radar block diagram, Radar frequencies, application of Radar, the origins of Radar. **7 Hours**

UNIT - 8
MTI AND PULSE DOPPLER RADAR: Introduction to Doppler and MTI Radar, delay line Cancellers, digital MTI processing, Moving target detector, pulse Doppler Radar. **7 Hours**

TEXT BOOKS:
1. **Microwave Devices and circuits**- Liao / Pearson Education.
2. **Introduction to Radar systems**-Merrill I Skolnik, 3rd Ed, TMH, 2001.
3. **Microwave Engineering** – Annapurna Das, Sisir K Das TMH Publication, 2nd , 2010.

REFERENCE BOOK:
1. **Microwave Engineering** – David M Pozar, John Wiley India Pvt. Ltd., 3rd Edn, 2008.

INFORMATION THEORY AND CODING

Subject Code	: **10EC55**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1
INFORMATION THEORY: Introduction, Measure of information, Average information content of symbols in long independent sequences, Average information content of symbols in long dependent sequences. Mark-off statistical model for information source, Entropy and information rate of mark-off source. **7 Hours**

UNIT - 2
SOURCE CODING: Encoding of the source output, Shannon's encoding algorithm. Communication Channels, Discrete communication channels, Continuous channels. **6 Hours**

UNIT - 3
FUNDAMENTAL LIMITS ON PERFORMANCE: Source coding theorem, Huffman coding, Discrete memory less Channels, Mutual information, Channel Capacity. **7 Hours**

UNIT - 4
Channel coding theorem, Differential entropy and mutual information for continuous ensembles, Channel capacity Theorem. **6 Hours**

PART – B

UNIT - 5
INTRODUCTION TO ERROR CONTROL CODING: Introduction, Types of errors, examples, Types of codes Linear Block Codes: Matrix description, Error detection and correction, Standard arrays and table look up for decoding. **7 Hours**

UNIT - 6
Binary Cycle Codes, Algebraic structures of cyclic codes, Encoding using an (n-k) bit shift register, Syndrome calculation. BCH codes. **6 Hours**

UNIT - 7
RS codes, Golay codes, Shortened cyclic codes, Burst error correcting codes. Burst and Random Error correcting codes. **7 Hours**

UNIT - 8
Convolution Codes, Time domain approach. Transform domain approach. **6 Hours**

TEXT BOOKS:
1. **Digital and analog communication systems**, K. Sam Shanmugam, John Wiley India Pvt. Ltd, 1996.
2. **Digital communication**, Simon Haykin, John Wiley India Pvt. Ltd, 2008.

REFERENCE BOOKS:
1. **ITC and Cryptography**, Ranjan Bose, TMH, II edition, 2007
2. **Digital Communications** - Glover and Grant**;** Pearson Ed. 2^{nd} Ed 2008.

FUNDAMENTALS OF CMOS VLSI

Subject Code	: **10EC56**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1
BASIC MOS TECHNOLOGY: Integrated circuit's era. Enhancement and depletion mode MOS transistors. nMOS fabrication. CMOS fabrication. Thermal aspects of processing. BiCMOS technology. Production of E-beam masks. **3 Hours**

MOS TRANSISTOR THEORY: Introduction, MOS Device Design Equations, The Complementary CMOS Inverter – DC Characteristics, Static Load MOS Inverters, The Differential Inverter, The Transmission Gate, Tristate Inverter**.** **4 Hours**

UNIT - 8

TESTABILITY: Performance parameters. Layout issues. I/O pads. Real estate. System delays. Ground rules for design. Test and testability.

7 Hours

TEXT BOOKS:

1. **CMOS VLSI Design – A Circuits and Systems Perspective. 3rd Edition. N.H. Weste and David Harris. Addison-Wesley, 2005. (Refer to** http://www.cmosvlsi.com**).**
2. **Principles of CMOS VLSI Design: A Systems Perspective**, Neil H. E. Weste, K. Eshragian, and ??? 3rd edition, Pearson Education (Asia) Pvt. Ltd., 200?. (Shift to the latest edition.).
3. **Basic VLSI Design** - Douglas A. Pucknell & Kamran Eshraghian, PHI 3rd Edition (original Edition – 1994), 2005.

REFERENCE BOOKS:

1. R. Jacob Baker. CMOS Circuit Design, Layout and Simulation. John Wiley India Pvt. Ltd, 2008.
2. **Fundamentals of Semiconductor Devices**, M. K. Achuthan and K. N. Bhat, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2007.
3. **CMOS Digital Integrated Circuits: Analysis and Design**, Sung-Mo Kang & Yusuf Leblebici, 3rd Edition, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2007.
4. **Analysis and Design of Digital Integrated Circuits** - D.A Hodges, H.G Jackson and R.A Saleh. 3rd Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2007.

DIGITAL SIGNAL PROCESSING LABORATORY

Subject Code	: **10ECL57**	IA Marks	: 25
No. of Practical Hrs/Week	: 03	Exam Hours	: 03
Total no. of Practical Hrs.	: 42	Exam Marks	: 50

A LIST OF EXPERIMENTS USING MATLAB / SCILAB / OCTAVE / WAB

3. Verification of Sampling theorem.
4. Impulse response of a given system
5. Linear convolution of two given sequences.
6. Circular convolution of two given sequences

7. Autocorrelation of a given sequence and verification of its properties.
8. Cross correlation of given sequences and verification of its properties.
9. Solving a given difference equation.
10. Computation of N point DFT of a given sequence and to plot magnitude and phase spectrum.
11. Linear convolution of two sequences using DFT and IDFT.
12. Circular convolution of two given sequences using DFT and IDFT
13. Design and implementation of FIR filter to meet given specifications.
14. Design and implementation of IIR filter to meet given specifications.

B. LIST OF EXPERIMENTS USING DSP PROCESSOR

1.Linear convolution of two given sequences.
2.Circular convolution of two given sequences.
3.Computation of N- Point DFT of a given sequence
4.Realization of an FIR filter (any type) to meet given specifications .The input can be a signal from function generator / speech signal.
5.Audio applications such as to plot time and frequency (Spectrum) display of Microphone output plus a cosine using DSP. Read a wav file and match with their respective spectrograms
6.Noise: Add noise above 3kHz and then remove; Interference suppression using 400 Hz tone.
7.Impulse response of first order and second order system

REFERENCE BOOKS:

1. **Digital signal processing using MATLAB -** Sanjeet Mitra, TMH, 2001
2. **Digital signal processing using MATLAB** - J. G. Proakis & Ingale, MGH, 2000
3. **Digital Signal Processors**, B. Venkataramani and Bhaskar, TMH,2002

ANALOG COMMUNICATION LAB + LIC LAB

Subject Code	: **10ECL58**	IA Marks	: 25
No. of Practical Hrs/Week	: 03	Exam Hours	: 03
Total no. of Practical Hrs.	: 42	Exam Marks	: 50

EXPERIMENTS USING DESCERTE COMPONENTS and LABVIEW - 2009 CAN BE USED FOR VERIFICATION AND TESTING.

1. Second order active LPF and HPF
2. Second order active BPF and BE
3. Schmitt Trigger Design and test a Schmitt trigger circuit for the given values of UTP and LTP

VI SEMESTER

DIGITAL COMMUNICATION

Subject Code	: **10EC61**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

Basic signal processing operations in digital communication. Sampling Principles: Sampling Theorem, Quadrature sampling of Band pass signal, Practical aspects of sampling and signal recovery. **7 Hours**

UNIT - 2

PAM, TDM. Waveform Coding Techniques, PCM, Quantization noise and SNR, robust quantization. **6 Hours**

UNIT - 3

DPCM, DM, applications. Base-Band Shaping for Data Transmission, Discrete PAM signals, power spectra of discrete PAM signals. **7 Hours**

UNIT - 4

ISI, Nyquist's criterion for distortion less base-band binary transmission, correlative coding, eye pattern, base-band M-ary PAM systems, adaptive equalization for data transmission. **6 Hours**

PART – B

UNIT - 5

DIGITAL MODULATION TECHNIQUES: Digital Modulation formats, Coherent binary modulation techniques, Coherent quadrature modulation techniques. Non-coherent binary modulation techniques. **6 Hours**

UNIT - 6

Detection and estimation, Model of DCS, Gram-Schmidt Orthogonalization procedure, geometric interpretation of signals, response of bank of correlators to noisy input. **6 Hours**

UNIT - 7

Detection of known signals in noise, correlation receiver, matched filter receiver, detection of signals with unknown phase in noise. **7 Hours**

UNIT - 8

Spread Spectrum Modulation: Pseudo noise sequences, notion of spread spectrum, direct sequence spread spectrum, coherent binary PSK, frequency hop spread spectrum, applications. **7 Hours**

TEXT BOOK:

1. **Digital communications**, Simon Haykin, John Wiley India Pvt. Ltd, 2008.

REFERENCE BOOKS:

1. **Digital and Analog communication systems,** Simon Haykin, John Wildy India Lts, 2008
2. **An introduction to Analog and Digital Communication**, K. Sam Shanmugam, John Wiley India Pvt. Ltd, 2008.
3. **Digital communications** - Bernard Sklar: Pearson education 2007

MICROPROCESSOR

Subject Code	: **10EC62**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

8086 PROCESSORS: Historical background, The microprocessor-based personal computer system, 8086 CPU Architecture, Machine language instructions, Instruction execution timing. **6 Hours**

UNIT - 2

INSTRUCTION SET OF 8086: Assembler instruction format, data transfer and arithmetic, branch type, loop, NOP & HALT, flag manipulation, logical and shift and rotate instructions. Illustration of these instructions with example programs, Directives and operators. **6 Hours**

UNIT - 3

BYTE AND STRING MANIPULATION: String instructions, REP Prefix, Table translation, Number format conversions, Procedures, Macros, Programming using keyboard and video display. **7 Hours**

UNIT - 4

8086 INTERRUPTS: 8086 Interrupts and interrupt responses, Hardware interrupt applications, Software interrupt applications, Interrupt examples.
7 Hours

Stability problem. Effect of feedback an amplifier poles. Stability study using Bode plots. Frequency compensation. SPICE examples. **7 Hours**

UNIT - 6

Operational Amplifiers: The two stage CMOS Op-amp, folded cascade CMOS op-amp, 741 op-amp circuit, DC analysis of the 741, small signal analysis of 741, gain, frequency response and slew rate of 741. Data Converters. A-D and D-A converters. **6 Hours**

UNIT – 7 & 8

Digital CMOS circuits. Overview. Design and performance analysis of CMOS inverter. Logic Gate Circuits. Pass-transistor logic. Dynamic Logic Circuits. SPICE examples. **12 Hours**

TEXT BOOK:

1. **"Microelectronic Circuits",** Adel Sedra and K.C. Smith, 5^{th} Edition, Oxford University Press, Interantional Version, 2009.

REFERENCE BOOK:

1. "**Fundamentals of Microelectronics**" , Behzad Razavi, John Wiley India Pvt. Ltd, 2008.
2. **"Microelectronics – Analysis and Design"**, Sundaram Natarajan,
3. Tata McGraw-Hill, 2007

ANTENNAS AND PROPAGATION

Subject Code	: **10EC64**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

ANTENNA BASICS: Introduction, basic Antenna parameters, patterns, beam area, radiation intensity, beam efficiency, diversity and gain, antenna apertures, effective height, bandwidth, radiation, efficiency, antenna temperature and antenna filed zones.

7 Hours

UNIT - 2

POINT SOURCES AND ARRAYS: Introduction, point sources, power patterns, power theorem, radiation intensity, filed patterns, phase patterns. Array of two isotropic point sources. Endfire array and Broadside array.

6 Hours

UNIT - 3

ELECTRIC DIPOLES AND THIN LINEAR ANTENNAS: Introduction, short electric dipole, fields of a short dipole(no derivation of field components), radiation resistance of short dipole, radiation resistances of lambda/2 Antenna, thin linear antenna, micro strip arrays, low side lobe arrays, long wire antenna, folded dipole antennas. **7 Hours**

UNIT - 4

LOOP, SLOT, PATCH AND HORN ANTENNA: Introduction, small loop, comparison of far fields of small loop and short dipole, loop antenna general case, far field patterns of circular loop, radiation resistance, directivity, slot antenna, Babinet's principle and complementary antennas, impedance of complementary and slot antennas, patch antennas.

8 Hours

PART – B

UNIT – 5 & 6

ANTENNA TYPES: Horn antennas, rectangular horn antennas, Helical Antenna, Yagi-Uda array, corner reflectors, parabolic reflectors, log periodic antenna, lens antenna, antenna for special applications – sleeve antenna, turnstile antenna, omni directional antennas, antennas for satellite antennas for ground penetrating radars, embedded antennas, ultra wide band antennas, plasma antenna, high-resolution data, intelligent antennas, antenna for remote sensing.

12 Hours

UNIT - 7 & 8

RADIO WAVE PROPAGATION: Introduction, Ground wave propagation, free space propagation, ground reflection, surface wave, diffraction.

TROPOSPHERE WAVE PROPAGATION: Troposcopic scatter, Ionosphere propagation, electrical properties of the ionosphere, effects of earth's magnetic field. **10 Hours**

TEXT BOOKS:

1. **Antennas and Wave Propagation**, John D. Krauss, 4th Edn,McGraw-Hill International edition, 2010.
2. **Antennas and Wave Propagation** - Harish and Sachidananda: Oxford Press 2007.

REFERENCE BOOKS:

1. **Antenna Theory Analysis and Design** - C A Balanis, 3rd Edn, John Wiley India Pvt. Ltd, 2008.
2. **Antennas and Propagation for Wireless Communication Systems** - Sineon R Saunders, John Wiley, 2003.
3. **Antennas and wave propagation -** G S N Raju: Pearson Education 2005.

OPERATING SYSTEMS

Subject Code	: **10EC65**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

INTRODUCTION AND OVERVIEW OF OPERATING SYSTEMS: Operating system, Goals of an O.S, Operation of an O.S, Resource allocation and related functions, User interface related functions, Classes of operating systems, O.S and the computer system, Batch processing system, Multi programming systems, Time sharing systems, Real time operating systems, distributed operating systems. **6 Hours**

UNIT - 2

STRUCTURE OF THE OPERATING SYSTEMS: Operation of an O.S, Structure of the supervisor, Configuring and installing of the supervisor, Operating system with monolithic structure, layered design, Virtual machine operating systems, Kernel based operating systems, and Microkernel based operating systems. **7 Hours**

TEXT BOOKS:

1. **Antennas and Wave Propagation**, John D. Krauss, 4th Edn,McGraw-Hill International edition, 2010.
2. **Antennas and Wave Propagation** - Harish and Sachidananda: Oxford Press 2007.

REFERENCE BOOKS:

1. **Antenna Theory Analysis and Design** - C A Balanis, 3rd Edn, John Wiley India Pvt. Ltd, 2008.
2. **Antennas and Propagation for Wireless Communication Systems** - Sineon R Saunders, John Wiley, 2003.
3. **Antennas and wave propagation -** G S N Raju: Pearson Education 2005.

OPERATING SYSTEMS

Subject Code	: **10EC65**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

INTRODUCTION AND OVERVIEW OF OPERATING SYSTEMS: Operating system, Goals of an O.S, Operation of an O.S, Resource allocation and related functions, User interface related functions, Classes of operating systems, O.S and the computer system, Batch processing system, Multi programming systems, Time sharing systems, Real time operating systems, distributed operating systems. **6 Hours**

UNIT - 2

STRUCTURE OF THE OPERATING SYSTEMS: Operation of an O.S, Structure of the supervisor, Configuring and installing of the supervisor, Operating system with monolithic structure, layered design, Virtual machine operating systems, Kernel based operating systems, and Microkernel based operating systems. **7 Hours**

UNIT - 3

PROCESS MANAGEMENT: Process concept, Programmer view of processes, OS view of processes, Interacting processes, Threads, Processes in UNIX, Threads in Solaris**.** **6 Hours**

UNIT - 4

MEMORY MANAGEMENT: Memory allocation to programs, Memory allocation preliminaries, Contiguous and noncontiguous allocation to programs, Memory allocation for program controlled data, kernel memory allocation. **7 Hours**

PART – B

UNIT - 5

VIRTUAL MEMORY: Virtual memory basics, Virtual memory using paging, Demand paging, Page replacement, Page replacement policies, Memory allocation to programs, Page sharing, UNIX virtual memory.

6 Hours

UNIT - 6

FILE SYSTEMS: File system and IOCS, Files and directories, Overview of I/O organization, Fundamental file organizations, Interface between file system and IOCS, Allocation of disk space, Implementing file access, UNIX file system. **7 Hours**

UNIT - 7

SCHEDULING: Fundamentals of scheduling, Long-term scheduling, Medium and short term scheduling, Real time scheduling, Process scheduling in UNIX. **6 Hours**

UNIT - 8

MESSAGE PASSING: Implementing message passing, Mailboxes, Inter process communication in UNIX. 7 Hours

TEXT BOOK:

1. **"Operating Systems - A Concept based Approach"**, D. M. Dhamdhare, TMH, 3rd Ed, 2010.

REFERENCE BOOK:

1. **Operating Systems Concepts**, Silberschatz and Galvin, John Wiley India Pvt. Ltd, 5th Edition, 2001.
2. **Operating System – Internals and Design Systems**, Willaim Stalling, Pearson Education, 4th Ed, 2006.
3. **Design of Operating Systems,** Tennambhaum, TMH, 2001.

POWER ELECTRONICS

Subject Code	: **10EC73**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1
Introduction, Applications of power electronics, Power semiconductor devices, Control characteristics, Types of power electronics circuits, Peripheral effects. **6 Hours**

UNIT - 2
POWER TRANSISTOR: Power BJT's, Switching characteristics, Switching limits, Base derive control, Power MOSFET's, Switching characteristics, Gate drive, IGBT's, Isolation of gate and base drives.
6 Hours

UNIT - 3
INTRODUCTION TO THYRISTORS: Principle of operation states anode-cathode characteristics, Two transistor model. Turn-on Methods, Dynamic Turn-on and turn-off characteristics, Gate characteristics, Gate trigger circuits, di / dt and dv / dt protection, Thyristor firing circuits.
7 Hours

UNIT - 4
CONTROLLED RECTIFIERS: Introduction, Principles of phase controlled converter operation, 1φ fully controlled converters, Duel converters, 1 φ semi converters (all converters with R & RL load).
7 Hours

PART – B

UNIT - 5
Thyristor turn off methods, natural and forced commutation, self commutation, class A and class B types, Complementary commutation, auxiliary commutation, external pulse commutation, AC line commutation, numerical problems. **7 Hours**

UNIT - 6
AC VOLTAGE CONTROLLERS: Introduction, Principles of on and off control, Principles of phase control, Single phase controllers with restive loads and Inductive loads, numerical problems.
6 Hours

UNIT - 7

DC CHOPPERS: Introduction, Principles of step down and step up choppers, Step down chopper with RL loads, Chopper classification, Switch mode regulators – buck, boost and buck – boost regulators. **6 Hours**

UNIT - 8

INVERTORS: Introduction, Principles of operation, Performance parameters, 1φ bridge inverter, voltage control of 1φ invertors, current source invertors, Variable DC link inverter.

7 Hours

TEXT BOOKS:

1. **"Power Electronics" -** M. H. Rashid 3rd edition, PHI / Pearson publisher 2004.
2. **"Power Electronics" -** M. D. Singh and Kanchandani K.B. TMH publisher, 2nd Ed. 2007.

REFERENCE BOOKS:

1. **"Power Electronics, Essentials and Applications", L Umanand,** John Wiley India Pvt. Ltd, 2009.
2. **"Power Electronics"** , Daniel W. Hart, McGraw Hill, 2010.
3. **"Power Electronics**", V Nattarasu and R.S. Anandamurhty, **Pearson/Sanguine Pub. 2006.**

EMBEDED SYSTEM DESIGN

Subject Code	: **10EC74**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT 1:

Introduction to Embedded System: Introducing Embedded Systems, Philosophy, Embedded Systems, Embedded Design and Development Process. **5 Hours**

UNIT 2:

The Hardware Side: An Introduction, The Core Level, Representing Information, Understanding Numbers, Addresses, Instructions, Registers-A

UNIT - 7

DC CHOPPERS: Introduction, Principles of step down and step up choppers, Step down chopper with RL loads, Chopper classification, Switch mode regulators – buck, boost and buck – boost regulators. **6 Hours**

UNIT - 8

INVERTORS: Introduction, Principles of operation, Performance parameters, 1φ bridge inverter, voltage control of 1φ invertors, current source invertors, Variable DC link inverter.

7 Hours

TEXT BOOKS:

1. **"Power Electronics" -** M. H. Rashid 3rd edition, PHI / Pearson publisher 2004.
2. **"Power Electronics" -** M. D. Singh and Kanchandani K.B. TMH publisher, 2nd Ed. 2007.

REFERENCE BOOKS:

1. **"Power Electronics, Essentials and Applications", L Umanand,** John Wiley India Pvt. Ltd, 2009.
2. **"Power Electronics"** , Daniel W. Hart, McGraw Hill, 2010.
3. **"Power Electronics**", V Nattarasu and R.S. Anandamurhty, **Pearson/Sanguine Pub. 2006.**

EMBEDED SYSTEM DESIGN

Subject Code	: **10EC74**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT 1:

Introduction to Embedded System: Introducing Embedded Systems, Philosophy, Embedded Systems, Embedded Design and Development Process. **5 Hours**

UNIT 2:

The Hardware Side: An Introduction, The Core Level, Representing Information, Understanding Numbers, Addresses, Instructions, Registers-A

First Look, Embedded Systems-An Instruction Set View, Embedded Systems-A Register View, Register View of a Microprocessor
The Hardware Side: Storage Elements and Finite-State Machines (2 hour)
The concepts of State and Time, The State Diagram, Finite State Machines-A Theoretical Model.

8 Hours

UNIT 3:

Memories and the Memory Subsystem: Classifying Memory, A General Memory Interface, ROM Overview, Static RAM Overview, Dynamic RAM Overview, Chip Organization, Terminology, A Memory Interface in Detail, SRAM Design, DRAM Design, DRAM Memory Interface, The Memory Map, Memory Subsystem Architecture, Basic Concepts of Caching, Designing a Cache System, Dynamic Memory Allocation.

7 Hours

UNIT 4:

Embedded Systems Design and Development : System Design and Development, Life-cycle Models, Problem Solving-Five Steps to Design, The Design Process, Identifying the Requirements, Formulating the Requirements Specification, The System Design Specification, System Specifications versus System Requirements, Partitioning and Decomposing a System, Functional Design, Architectural Design, Functional Model versus Architectural Model, Prototyping, Other Considerations, Archiving the Project. **6 Hours**

PART – B

UNIT 5 & 6:

Real-Time Kernels and Operating Systems: Tasks and Things, Programs and Processes, The CPU is a resource, Threads – Lightweight and heavyweight, Sharing Resources, Foreground/Background Systems, The operating System, The real time operating system (RTOS), OS architecture, Tasks and Task control blocks, memory management revisited.

12 Hours

UNIT 7 & 8:

Performance Analysis and Optimization: Performance or Efficiency Measures, Complexity Analysis, The methodology, Analyzing code, Instructions in Detail, Time, etc. – A more detailed look, Response Time, Time Loading, Memory Loading, Evaluating Performance, Thoughts on Performance Optimization, Performance Optimization, Tricks of the Trade, Hardware Accelerators, Caches and Performance.

12 Hours

TEXT BOOK:

1. **Embedded Systems – A contemporary Design Tool,** James K. Peckol**,** John Weily India Pvt. Ltd, 2008.

REFERENCE BOOKS:

1. **Embedded Systems: Architecture and Programming,** Raj Kamal, TMH. 2008.
2. **Embedded Systems Architecture – A Comprehensive Guide for Engineers and Programmers**, Tammy Noergaard, Elsevier Publication, 2005.
3. **Programming for Embedded Systems**, Dreamtech Software Team, John Wiley India Pvt. Ltd, 2008.

VLSI LAB

Subject Code	: **10ECL77**	IA Marks	: 25
No. of Practical Hrs/Week	: 03	Exam Hours	: 03
Total no. of Practical Hrs.	: 42	Exam Marks	: 50

(Wherever necessary Cadence/Synopsis/Menta Graphics tools <u>must be</u> used)

PART - A
DIGITAL DESIGN

ASIC-DIGITAL DESIGN FLOW

1. Write Verilog Code for the following circuits and their Test Bench for **verification**, observe the waveform and **synthesize** the code with technological library with given Constraints*. Do the initial timing verification with gate level simulation.

1. An inverter
2. A Buffer
3. Transmission Gate
4. Basic/universal gates
5. Flip flop -RS, D, JK, MS, T
6. Serial & Parallel adder
7. 4-bit counter [Synchronous and Asynchronous counter]
8. Successive approximation register [SAR]

** An appropriate constraint should be given*

VIII SEMESTER
WIRELESS COMMUNICATION

Subject Code	: **10EC81**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1
Introduction to wireless telecommunication systems and Networks, History and Evolution Different generations of wireless cellular networks 1G, 2g,3G and 4G networks. **6 Hours**

UNIT - 2
Common Cellular System components, Common cellular network components, Hardware and software, views of cellular networks, 3G cellular systems components, Cellular component identification Call establishment. **7 Hours**

UNIT - 3
Wireless network architecture and operation, Cellular concept Cell fundamentals, Capacity expansion techniques, Cellular backbone networks, Mobility management, Radio resources and power management Wireless network security. **7 Hours**

UNIT - 4
GSM and TDMA techniques, GSM system overview, GSM Network and system Architecture, GSM channel concepts, GSM identifiers **6 Hours**

PART – B

UNIT - 5
GSM system operation, Traffic cases, Cal handoff, Roaming, GSM protocol architecture. TDMA systems. **6 Hours**

UNIT - 6
CDMA technology, CDMA overview, CDMA channel concept CDMA operations. **6 Hours**

UNIT - 7
Wireless Modulation techniques and Hardware, Characteristics of air interface, Path loss models, wireless coding techniques, Digital modulation

techniques, OFDM, UWB radio techniques, Diversity techniques, Typical GSM Hardware. **7 Hours**

UNIT - 8

Introduction to wireless LAN 802.11X technologies, Evolution of Wireless LAN Introduction to 802.15X technologies in PAN Application and architecture Bluetooth Introduction to Broadband wireless MAN, 802.16X technologies. **7 Hours**

TEXT BOOK:

1. **Wireless Telecom Systems and networks**, Mullet: Thomson Learning 2006.

REFERENCE BOOKS:

1. **Mobile Cellular Telecommunication**, Lee W.C.Y, MGH, 2^{nd}, 2009.
2. **Wireless communication** - D P Agrawal: 2^{nd} Edition Thomson learning 2007.
3. **Fundamentals of Wireless Communication**, David Tse, Pramod Viswanath, Cambridge 2005.
4. S. S. Manvi, M. S. Kakkasageri, "**Wireles and Mobile Network concepts and protocols**", John Wiley India Pvt. Ltd, 1^{st} edition, 2010.
5. "**Wireless Communication – Principles & Practice**" , T.S. Rappaport, PHI 2001.

DIGITAL SWITCHING SYSTEMS

Subject Code	: **10EC82**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

Developments of telecommunications, Network structure, Network services, terminology, Regulation, Standards. Introduction to telecommunications transmission, Power levels, Four wire circuits, Digital transmission, FDM, TDM, PDH and SDH, Transmission performance.

7 Hours

UNIT - 7

DESIGN OF RTSS – GENERAL INTRODUCTION: Introduction, Specification documentation, Preliminary design, Single-program approach, Foreground/background, Multi-tasking approach, Mutual exclusion, Monitors. **6 Hours**

UNIT - 8

RTS DEVELOPMENT METHODOLOGIES: Introduction, Yourdon Methodology, Requirement definition for Drying Oven, Ward and Mellor Method, Hately and Pirbhai Method. **6 Hours**

TEXT BOOKS:

1. **Real - Time Computer Control- An Introduction**, Stuart Bennet, 2nd Edn. Pearson Education. 2005.

REFERENCE BOOKS:

1. **Real-Time Systems Design and Analysis**, Phillip. A. Laplante, second edition, PHI, 2005.
2. **Real-Time Systems Development**, Rob Williams, Elsevier. 2006.
3. **Embedded Systems**, Raj Kamal, Tata Mc Graw Hill, India, 2005.

IMAGE PROCESSING

Subject Code	: **10EC763**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

DIGITAL IMAGE FUNDAMENTALS: What is Digital Image Processing. fundamental Steps in Digital Image Processing, Components of an Image processing system, elements of Visual Perception. **6 Hours**

UNIT - 2

Image Sensing and Acquisition, Image Sampling and Quantization, Some Basic Relationships between Pixels, Linear and Nonlinear Operations. **6 Hours**

UNIT - 3
IMAGE TRANSFORMS: Two-dimensional orthogonal & unitary transforms, properties of unitary transforms, two dimensional discrete Fourier transform. **7 Hours**

UNIT - 4
Discrete cosine transform, sine transform, Hadamard transform, Haar transform, Slant transform, KL transform. **7 Hours**

PART – B

UNIT - 5
IMAGE ENHANCEMENT: Image Enhancement in Spatial domain, Some Basic Gray Level Trans -formations, Histogram Processing, Enhancement Using Arithmetic/Logic Operations. **7 Hours**

UNIT - 6
Basics of Spatial Filtering Image enhancement in the Frequency Domain filters, Smoothing Frequency Domain filters, Sharpening Frequency Domain filters, homomorphic filtering. **6 Hours**

UNIT - 7
Model of image degradation/restoration process, noise models, Restoration in the Presence of Noise, Only-Spatial Filtering Periodic Noise Reduction by Frequency Domain Filtering, Linear Position-Invariant Degradations, inverse filtering, minimum mean square error (Weiner) Filtering,
7 Hours

UNIT - 8
Color Fundamentals. Color Models, Pseudo color Image Processing., processing basics of full color image processing
6 Hours

TEXT BOOK:
1. **"Digital Image Processing"**, Rafael C.Gonzalez, Richard E. Woods, etl , TMH , 2nd Edition 2010.

REFERENCE BOOKS:
1. **"Fundamentals of Digital Image Processing"**, Anil K. Jain, Pearson Education, 2001.
2. **"Digital Image Processing and Analysis"**, B. Chanda and D. Dutta Majumdar, PHI, 2003.

UNIT - 7

PROTOCOL PERFORMANCE TESTING: SDL based performance testing of TCP, OSPF, Interoperability testing, SDL based interoperability testing of CSMA/CD and CSMA/CA protocol using bridge, Scalability testing.

7 Hours

UNIT - 8

PROTOCOL SYNTHESIS: Synthesis methods, interactive synthesis algorithms, automatic synthesis algorithm, automatic synthesis of SDL from MSC protocol re synthesis. **6 Hours**

TEXT BOOK:

1. **Communication Protocol Engineering**, P. Venkatarm and S. S. Manvi, PHI, 2004.

REFERENCES BOOKS:

1. **The Internet and its Protocols**, Adrian Farrel, Elsevier, 2006.
2. **TCP/IP Protocol Stack**, B A Forouzan, TMH, 2006.

ELECTIVE –V (GROUP E)
MULTIMEDIA COMMUNICATIONS

Subject Code	: **10EC841**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

MULTIMEDIA COMMUNICATIONS: Introduction, multimedia information representation, multimedia networks, multimedia applications, media types, communication modes, network types, multipoint conferencing, network QoS application QoS. **6 Hours**

UNIT - 2

MULTIMEDIA INFORMATION REPRESENTATION: Introduction, digital principles, text, images, audio, video. **7 Hours**

UNIT - 3

TEXT AND IMAGE COMPRESSION: Introduction, compression principles, text compression, image compression.

6 Hours

UNIT - 4

AUDIO AND VIDEO COMPRESSION: Introduction, audio compression, DPCM, ADPCM, APC, LPC, video compression, video compression principles, H.261, H.263, MPEG, MPEG-1, MPEG-2, and MPEG-4.

7 Hours

PART – B

UNIT - 5

MULTIMEDIA INFORMATION NETWORKS: Introduction, LANs, Ethernet, Token ring, Bridges, FDDI High-speed LANs, LAN protocol.

6 Hours

UNIT - 6

THE INTERNET: Introduction, IP Datagrams, Fragmentation, IP Address, ARP and RARP, QoS Support, IPv8. **7 Hours**

UNIT - 7

BROADBAND ATM NETWORKS: Introduction, Cell format, Switfh and Protocol Architecture ATM LANs. **6 Hours**

UNIT - 8

TRANSPORT PROTOCOL: Introduction, TCP/IP, TCP, UDP, RTP and RTCP. **7 Hours**

TEXT BOOK:

1. **Multimedia Communications: Applications, Networks, Protocols and Standards**, Fred Halsall, Pearson Education, Asia, Second Indian reprint 2002.

REFERENCE BOOKS:

1. **Multimedia Information Networking**, Nalin K. Sharda, PHI, 2003.
2. **"Multimedia Fundamentals: Vol 1 - Media Coding and Content Processing"**, Ralf Steinmetz, Klara Narstedt, Pearson Education, 2004.
3. **"Multimedia Systems Design"**, Prabhat K. Andleigh, Kiran Thakrar, PHI, 2004.

UNIT 6

Embedded System Components:

Firmware components, RTOS system software mechanisms, Software application components.

Debugging Components:

Execptions assert, Checking return codes, Single-step debugging, kernel scheduler traces, Test access ports, Trace ports, Power-On self test and diagnostics, External test equipment, Application-level debugging.

7 Hours

UNIT 7

Performance Tuning:

Basic concepts of drill-down tuning, hardware – supported profiling and tracing, Building performance monitoring into software, Path length, Efficiency, and Call frequency, Fundamental optimizations. **6 Hours**

UNIT 8

High availability and Reliability Design:

Reliability and Availability, Similarities and differences, Reliability, Reliable software, Available software, Design trade offs, Hierarchical applications for Fail-safe design.

Design of RTOS – PIC microcontroller. **(Chap 13 of book Myke Predko)**

7 Hours

REFERENCE BOOKS:

1. "**Real-Time Embedded Systems and Components"** Sam Siewert, Cengage Learning India Edition, 2007.
2. " **Programming and Customizing the PIC microcontroller"** , Myke Predko, 3rd Ed, TMH, 2008

GSM

Subject Code	: **10EC843**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

GSM ARCHITECTURE AND INTERFACES: Introduction, GSM frequency bands, GSM PLMN, Objectives of a GSM PLMN, GSM PLMN Services, GSM Subsystems, GSM Subsystems entities, GSM interfaces, The radio interface (MS to BSC), A_{bits} interface (BTS to BSC), A interface (BSC

to MSC), Interfaces between other GSM entities, Mapping of GSM layers onto OSI layers. **6 Hours**

UNIT - 2

RADIO LINK FEATURES IN GSM SYSTEMS: Introduction, Radio link measurements, Radio link features of GSM, Dynamic power control, Discontinuous transmission (DTX), SFH, Future techniques to reduce interface in GSM, Channel borrowing, Smart antenna. **7 Hours**

UNIT - 3

GSM LOGICAL CHANNELS AND FRAME STRUCTURE: Introduction, GSM logical channels, Allowed logical channel combinations, TCH multi frame for TCH/H, CCH multi frame, GSM frame structure, GSM bursts, Normal burst, Synchronization burst, Frequency correction channel burst, Access burst, Data encryption in GSM, Mobility management, Location registration, Mobile identification. **7 Hours**

UNIT - 4

SPEECH CODING IN GSM: Introduction, Speech coding methods, Speech code attributes, Transmission bit rate, Delay, Complexity, Quality, LPAS, ITU-T standards, Bit rate, Waveform coding, Time domain waveform coding, Frequency domain waveform coding, Vocoders, Full-rate vocoder, Half-rate vocoder. MESSAGES, SERVICES, AND CALL FLOWS IN GSM: Introduction, GSM PLMN services.

7 Hours

PART – B

UNIT - 5

GSM messages, MS-BS interface, BS to MSC messages on the A interface, MSC to VLR and HLR, GSM call setup by an MS, Mobile-Terminated call, Call release, Handover. Data services, Introduction, Data interworking, GSM data services, Interconnection for switched data, Group 3 fax, Packet data on the signaling channel, User-to-user signaling, SMS, GSM GPRS.

6 Hours

UNIT - 6

PRIVACY AND SECURITY IN GSM: Introduction, Wireless security requirements, Privacy of communications, Authentication requirements, System lifetime requirements, Physical requirements, SIM cards, Security algorithms for GSM, Token-based authentication, Token-based registration, Token-based challenge.

6 Hours

UNIT - 7

PLANNING AND DESIGN OF A GSM WIRELESS NETWORK: Introduction, Tele traffic models, Call model, Topology model, Mobility in

cellular / PCS networks, Application of a fluid flow model, Planning of a wireless network, Radio design for a cellular / PCS network, Radio link design, Coverage planning, Design of a wireless system, Service requirements, Constraints for hardware implementation, Propagation path loss, System requirements, Spectral efficiency of a wireless system, Receiver sensitivity and link budget, Selection of modulation scheme, Design of TDMA frame, Relationship between delay spread and symbol rate, Design example for a GSM system.

7 Hours

UNIT - 8

MANAGEMENT OF GSM NETWORKS: Introduction, Traditional approaches to NM, TMN, TMN layers, TMN nodes, TMN interface, TMN management services, Management requirements for wireless networks, Management of radio resources, Personal mobility management, Terminal mobility, Service mobility management, Platform-centered management, SNMP, OSI systems management, NM interface and functionality, NMS functionality, OMC functionality, Management of GSM network, TMN applications, GSM information model, GSM containment tree, Future work items.

7 Hours

TEXT BOOK:

1. **"Principles of Applications of GSM"**, Vijay K. Garg & Joseph E. Wilkes, Pearson education/ PHI, 1999.

REFERENCE BOOKS:

1. **GSM: Evolution towards 3rd Generation Systems**, (Editor), Z. Zvonar Peter Jung, Karl Kammerlander Springer; 1st edition 1998
2. **GSM & UMTS: The Creation of Global Mobile Communication,** Friedhelm Hillebrand, John Wiley & Sons; 2001.

ADHOC WIRELESS NETWORKS

Subject Code	: **10EC844**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

AD HOC NETWORKS: Introduction, Issues in Ad hoc wireless networks, Ad hoc wireless internet. **6 Hours**

10EE35 ELECTRICAL and ELECTRONIC MEASUREMENTS and INSTRUMENTATION

Subject Code	:	**10EE35**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART – A

UNIT 1:
1-(a) Units and Dimensions: Review of fundamental and derived units. S.I. units. Dimensional equations, problems. **3 Hours**
1-(b) Measurement of Resistance: Wheatstone's bridge, sensitivity, limitations. Kelvin's double bridge. Earth resistance, measurement by fall of potential method and by using Megger. **3 Hours**

UNIT 2:
Measurement of Inductance and Capacitance: Sources and detectors, Maxwell's inductance bridge, Maxwell's inductance &capacitance bridge,Hay's bridge, Anderson's bridge, Desauty's bridge, Schering bridge. Shielding of bridges. Problems. **07 Hours**

UNIT 3:
Extension of Instrument Ranges: Shunts and multipliers. Construction and theory of instrument transformers, Equations for ratio and phase angle errors of C.T. and P.T (derivations excluded). Turns compensation, illustrative examples (excluding problems on turns compensation),Silsbees's method of testing CT. **07 Hours**
UNIT 4:
Measurement of Power and Energy: Dynamometer wattmeter. UPF and LPF wattmeters, Measurement of real and reactive power in three-phase circuits. Induction type energy meter — construction, theory, errors, adjustments and calibration. Principle of working of electronic energy meter. 0**6 Hours**

PART – B

UNIT 5:
(a) Construction and operation of electro-dynamometer single-phase power factor meter. Weston frequency meter and phase sequence indicator. 0**4 Hours**
(b) Electronic Instruments: Introduction. True RMS responding voltmeter. Electronic multimeters. Digital voltmeters. Q meter. 0**4 Hours**
UNIT 6:
Dual trace oscilloscope — front panel details of a typical dual trace oscilloscope. Method of measuring voltage, current, phase, frequency and period. Use of Lissajous patterns. Working of a digital storage oscilloscope. Brief note on current probes. 0**6 Hours**

UNIT 7:
Transducers: Classification and selection of transducers. Strain gauges. LVDT. Measurement of temperature and pressure. Photo-conductive and photo-voltaic cells.
0**6 Hours**
UNIT 8:
(a) Interfacing resistive transducers to electronic circuits. Introduction to data acquisition systems.
2 Hours
(b) Display Devices and Signal Generators: X-Y recorders. Nixie tubes. LCD and LED display. Signal generators and function generators. 0**4 Hours**

Text Books

1. **Electrical and Electronic Measurements and Instrumentation,** A. K. Sawhney, Dhanpatrai and Sons, New Delhi.
2. **Modern Electronic Instrumentation and Measuring Techniques,** Cooper D. and A.D. Heifrick, PHI, 2009 Edition.

References

1. **Electronic Instrumentation and Measurement,** David A. Bell, oxford Publication ,2nd Edition, 2009.
2. **Electrical Measurements and Measuring Instruments,** Golding and Widdies, Pitman

10EE36 ELECTRIC POWER GENERATION

Subject Code	:	**10EE36**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART – A

UNIT 1:
Sources of Electrical Power: Wind, solar, fuel cell, tidal, geo-thermal, hydro-electric, thermal-steam, diesel, gas, nuclear power plants (block diagram approach only). Concept of co-generation. Combined heat and power distributed generation. 06 **Hours**

UNIT 2:
Diesel electric plants. Gas turbine plants. Mini, micro, and bio generation. Concept of distributed generation. 06 **Hours**

UNIT 3:
(a) Hydro Power Generation: Selection of site. Classification of hydro-electric plants. General arrangement and operation. Hydroelectric plant power station structure and control. 5 **Hours**
(b) Thermal Power Generation: Introduction. Main parts of a thermal power plant. Working. Plant layout. **3 Hours**

UNIT 4:
Nuclear Power Station: Introduction. Pros and cons of nuclear power generation. Selection of site, cost, components of reactors. Description of fuel sources. Safety of nuclear power reactor. **6 Hours**

PART – B

UNIT 5 and 6:
(a) Economics Aspects: Introduction. Terms commonly used in system operation. Diversity factor, load factor, plant capacity factor, plant use factor, plant utilization factor and loss factor, load duration curve. Cost of generating station, factors influencing the rate of tariff designing, tariff, types of tariff**.** Power factor improvement.
(b) Substations: Introduction, types, Bus bar arrangement schemes, Location of substation equipment. Reactors and capacitors. Interconnection of power stations. 1**4 Hours**

UNIT 7 and 8 :
Grounding Systems: Introduction, grounding systems. Neutral grounding. Ungrounded system.
Resonant grounding. Solid grounding, reactance grounding, resistance grounding. Earthing transformer. Neutral grounding transformer. **12 Hours**

Text Books
1. **Power System Engineering,** A. Chakrabarti, M. L. Soni, and P.V. Gupta, Dhanpat Rai and Co.,NewDelhi.
2. **Electric Power Generation, Transmission and Distribution,** S**.** N. Singh, PHI, 2^{nd} Edition,2009.

References
1. **Elements of Electrical Power System Design,** M. V. Deshpande, PHI,2010

10ES42 MICROCONTROLLERS
(Common to EC/TC/EE/IT/BM/ML)

Sub Code	**:**	**10ES42**	***IA Marks***	**:**	**25**
Hrs/ Week	**:**	**04**	Exam Hours	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

UNIT 1:
Microprocessors and microcontroller. Introduction, Microprocessors and Microcontrollers, RISC & CISC CPU Architectures, Harvard & Von-Neumann CPU architecture, Computer software.
The 8051 Architecture: Introduction, Architecture of 8051, Pin diagram of 8051, Memory organization, External Memory interfacing, Stacks.

6 Hours

UNIT 2:
Addressing Modes: Introduction, Instruction syntax, Data types, Subroutines, Addressing modes: Immediate addressing , Register addressing, Direct addressing, Indirect addressing, relative addressing, Absolute addressing, Long addressing, Indexed addressing, Bit inherent addressing, bit direct addressing.

Instruction set: Instruction timings, 8051 instructions: Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Subroutine instructions, Bit manipulation instruction.

6H**ours**

UNIT 3:
8051 programming: Assembler directives, Assembly language programs and Time delay calculations.

6 Hours

UNIT 4:
8051 Interfacing and Applications: Basics of I/O concepts, I/O Port Operation, Interfacing 8051 to LCD, Keyboard, parallel and serial ADC, DAC, Stepper motor interfacing and DC motor interfacing and programming

6 Hours

UNIT 5:

8051 Interrupts and Timers/counters: Basics of interrupts, 8051 interrupt structure, Timers and Counters, 8051 timers/counters, programming 8051 timers in assembly and C .

6 Hours

UNIT 6:

8051 Serial Communication: Data communication, Basics of Serial Data Communication, 8051 Serial Communication, connections to RS-232, Serial communication Programming in assembly and C.8255A Programmable Peripheral Interface:, Architecture of 8255A, I/O addressing,, I/O devices interfacing with 8051 using 8255A. **6 Hours**

Course Aim – The MSP430 microcontroller is ideally suited for development of low-power embedded systems that must run on batteries for many years. There are also applications where MSP430 microcontroller must operate on energy harvested from the environment. This is possible due to the ultra- low power operation of MSP430 and the fact that it provides a complete system solution including a RISC CPU, flash memory, on-chip data converters and on-chip peripherals.

UNIT 7:
Motivation for MSP430microcontrollers – Low Power embedded systems, On-chip peripherals (analog and digital), low-power RF capabilities. Target applications (Single-chip, low cost, low power, high performance system design).

2 Hours

MSP430 RISC CPU architecture, Compiler-friendly features, Instruction set, Clock system, Memory subsystem. Key differentiating factors between different MSP430 families.

2 Hours

Introduction to Code Composer Studio (CCS v4). Understanding how to use CCS for Assembly, C, Assembly+C projects for MSP430 microcontrollers. Interrupt programming.

2 **Digital I/O – I/O ports** programming using C and assembly, Understanding the muxing scheme of the MSP430 pins. **2 Hours**

UNIT 8:

On-chip peripherals. Watchdog Timer, Comparator, Op-Amp, Basic Timer, Real Time Clock (RTC), ADC, DAC, SD16, LCD, DMA.

2 Hours

Using the Low-power features of MSP430. Clock system, low-power modes, Clock request feature, Low-power programming and Interrupt.

2 Hours

Interfacing LED, LCD, External memory. Seven segment LED modules interfacing. Example – Real-time clock.

2 Hours

Case Studies of applications of MSP430 - Data acquisition system, Wired Sensor network, Wireless sensor network with Chipcon RF interfaces.

3 Hours

TEXT BOOKS:

1. "The 8051 Microcontroller and Embedded Systems – using assembly and C "-, **Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; PHI, 2006 / Pearson, 2006**
2. "MSP430 Microcontroller Basics", **John Davies, Elsevier, 2010**

REFERENCE BOOKS:

1. "The 8051 Microcontroller Architecture, Programming & Applications", **2e Kenneth J. Ayala ;, Penram International, 1996 / Thomson Learning 2005.**
2. **"**The 8051 Microcontroller", **V.Udayashankar and MalikarjunaSwamy, TMH, 2009**
3. MSP430 Teaching CD-ROM, **Texas Instruments, 2008 (can be requested** http://www.uniti.in **)**
4. Microcontrollers: Architecture, Programming, Interfacing and System Design",**Raj Kamal, "Pearson Education, 2005**

10EE45 POWER ELECTRONICS

Subject Code	:	10EE45	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART – A

UNIT 1:

Power Semiconductor Devices:

Introduction to semiconductors, Power Electronics, Power semiconductor devices, Control Characteristics. Types of power electronic converters and industrial applications-Drives, Electrolysis, Heating, Welding, Static Compensators, SMPS, HVDC power transmission, Thyristorized tap changers and Circuit breakers.

7 hours

UNIT 2:

Power Transistors: Power BJT's – switching characteristics, switching limits, base drive control. Power MOSFET's and IGBT's –characteristics, gate drive , di/dt and dv/dt limitations. Isolation of gate and base drives. Simple design of gate and base drives. **6 Hours**

UNIT 3:

Thyristors

Introduction, Two Transistor Model, characteristics-static and dynamic. di/dt and dv/dt protection. Ratings of thyristors. Thyristor types. Series and parallel operation of Thyristors. Thyristor firing circuits. Design of firing circuits using UJT, R, R-C circuits. Analysis of firing circuits using operational amplifiers and digital IC's. **7 Hours**

UNIT 4:

Commutation Techniques: Introduction. Natural Commutation. Forced commutation- self-commutation, impulse commutation, resonant pulse commutation and complementary commutation. **6 Hours**

PART – B

UNIT 5:

Controlled Rectifiers: Introduction. Principle of phase controlled converter operation. Single- phase semi-converters. Full converters. Three-phase half-wave converters. Three-phase full-wave converters. **7 Hours**

UNIT 6:

Choppers: Introduction. Principle of step-down and step-up chopper with R-L load. Performance parameters. Chopper classification. Analysis of impulse commutated thyristor chopper (only qualitative analysis) **6 Hours**

UNIT 7:

Inverters: Introduction. Principle of operation. Performance parameters. Single-phase bridge inverters. Threephase inverters. Voltage control of single-phase inverters – single pulse width, multiple pulse width, and sinusoidal pulse width modulation. Current source inverters. **7 Hours**

1

UNIT 8:

(a) AC Voltage Controllers: Introduction. Principle of ON-OFF and phase control. Single-phase, bi-directional controllers with resistive and R-L loads.

(b) Electromagnetic Compatibility: Introduction, effect of power electronic converters and remedial measures.

6 Hours

Text Book:

1. **Power Electronics,** M.H.Rashid, , Pearson, 3rd Edition, 2006.
2. **Power Electronics,** M.D. Singh and Khanchandani K.B., T.M.H., 2nd Edition,2001

References

1. **Power Electronics Essentials and Applications**,L.Umanand, Wiley India Pvt Ltd,Reprint,2010
2. **Thyristorised Power Controllers,** G.K. Dubey, S.R. Doradla, A. Joshi and R.M.K. Sinha, New Age International Publishers.
3. **Power Electronics – Converters, Applications and Design,** Ned Mohan, Tore M. Undeland, and William P. Robins, Third Edition, John Wiley and Sons,2008.
4. **Power Electronics: A Simplified Approach,** R.S. Ananda Murthy and V. Nattarasu, pearson/Sanguine Technical Publishers.

MICROCONTROLLERS LAB

(Common to EC/TC/EE/IT/BM/ML)

Sub Code	**:**	**10ESL47**	***IA Marks***	**:**	**25**
Hrs/ Week	**:**	**03**	Exam Hours	**:**	**03**
Total Hrs.	**:**	**42**	**Exam Marks**	**:**	**50**

I. PROGRAMMING

1. Data Transfer - Block move, Exchange, Sorting, Finding largest element in an array.
2. Arithmetic Instructions - Addition/subtraction, multiplication and division, square, Cube – (16 bits Arithmetic operations – bit addressable).
3. Counters.
4. Boolean & Logical Instructions (Bit manipulations).
5. Conditional CALL & RETURN.
6. Code conversion: BCD – ASCII; ASCII – Decimal; Decimal - ASCII; HEX - Decimal and Decimal - HEX .
7. Programs to generate delay, Programs using serial port and on-Chip timer / counter.

Note: Programming exercise is to be done on both 8051 & MSP430.

II. INTERFACING:

Write C programs to interface 8051 chip to Interfacing modules to develop single chip solutions.

8. Simple Calculator using 6 digit seven segment displays and Hex Keyboard interface to 8051.
9. Alphanumeric LCD panel and Hex keypad input interface to 8051.
10. External ADC and Temperature control interface to 8051.
11. Generate different waveforms Sine, Square, Triangular, Ramp etc. using DAC interface to 8051; change the frequency and amplitude.
12. Stepper and DC motor control interface to 8051.
13. Elevator interface to 8051.

10EEL48 POWER ELECTRONICS LAB

Subject Code	:	10EEL48	IA Marks	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

1. Static characteristics of SCR.
2. Static characteristics of MOSFET and IGBT.
3. SCR turn-on circuit using synchronized UJT relaxation oscillator.
4. SCR Digital triggering circuit for a single-phase controlled rectifier and A.C. voltage controller.
5. Single-phase controlled full-wave rectifier with *R* and *R-L* loads.
6. A.C. voltage controller using TRIAC and DIAC combination connected to *R* and *R-L* loads.
7. Speed control of a separately excited D.C. motor using an IGBT or MOSFET chopper.
8. Speed control of D.C. motor using single semi converter
9. Speed control of a stepper motor.
10. Speed control of universal motor using A.C. voltage controller.
11. MOSFET OR IGBT based single-phase full-bridge inverter connected to R load.
12. Study of commutation using LC circuits and auxiliary circuits.

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10EEL57 MEASUREMENTS AND CIRCUIT SIMULATION LABORATORY

Subject Code	:	**10EEL57**	**IA Marks**	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

1. Measurement of low resistance using Kelvin's double bridge.
2. Measurement of cable insulation and earth resistance using Meggar
3. Measurement of inductance using Maxwell Inductance-Capacitance bridge & determination of Q-factor
4. Measurement of capacitance using De-Sauty's bridge & determination of dissipation factor.
5. M easurement of active and reactive power in balanced 3-phase circuit using two-watt meter method.
6. Adjustment & calibration of 1-phase energy meter
7. Determination of ratio & phase angle error in CT.
8. a) Inverting, non-inverting & scale changing of signals using op -amps
   b) RC phase shift oscillator using op amps (Both using simulation package)
9. RC coupled amplifier-frequency response for variation of bias & coupling using simulation package
10. Rectifier circuits-Bridge rectifier, diode clipping & clamping circuits using simulation package.
11. Schmitt –trigger- inverting and non-inverting.
    12 Signal generator- triangular, saw tooth and rectangular wave generation
    Note: All experiments, except 5,6 and 7, are to be carried out by using components and verify the result by using a simulation package.

10EE61 POWER SYSTEM ANALYSIS AND STABILITY

Subject Code	:	**10EE61**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

REPRESENTATION OF POWER SYSTEM COMPONENTS: Circuit models of Transmission line, Synchronous machines, Transformers and load. Single line diagram, impedance and reactance diagrams. Per unit system, per unit impedance diagram of power system. **8 Hours**

UNIT - 2

SYMMETRICAL 3 - PHASE FAULTS: Analysis of Synchronous machines and Power system. Transients on a transmission line, Short-Circuit currents and the reactance of synchronous machines with and without load . **6 Hours**

UNIT - 3 & 4

SYMMETRICAL COMPONENTS: Introduction, analysis of unbalanced load against balanced Three-phase supply, neutral shift. Resolution of unbalanced phasors into their symmetrical components, Phase shift of symmetrical components in star-delta transformer bank, Power in terms of symmetrical components**,** Analysis of balanced and unbalanced loads against unbalanced 3 phase supply, Sequence impedances and networks of power system elements (alternator, transformer and transmission line) Sequence networks of power systems. Measurement of sequence impedance of synchronous generator.

12 Hours

Part - B

UNIT - 5 & 6

UNSYMMETRICAL FAULTS: L-G, L-L, L-L-G faults on an unbalanced alternator with and without fault impedance. Unsymmetrical faults on a power system with and without fault impedance. Open conductor faults in power system. **14 Hours**

UNIT - 7

STABILITY STUDIES: Introduction**,** Steady state and transient stability. Rotor dynamics and the swing equation. Equal area criterion for transient stability evaluation and its applications. **8 Hours**

UNIT – 8

UNBALANCED OPERATION OF THREE PHASE INDUCTION MOTRORS: Analysis of three phase induction motor with one line open., Analysis of three phase induction motor with unbalanced voltage. **4 Hours**

TEXT BOOKS:

1. **Elements of Power System Analysis**, W.D.Stevenson, TMH,4th Edition
2. **Modern Power System Analysis**,.I. J. Nagrath and D.P.Kothari- TMH, 3rd Edition,2003.
3. **Symmetrical Components and Short Circuit Studies,** Dr.P.N.Reddy, Khanna Publishers

REFERENCE BOOKS:

1. **Power System Analysis**, Hadi Sadat, TMH,2nd Edition.
2. **Power system Analysis**, R.Bergen, and Vijay Vittal, Pearson publications, 2nd edition, 2006.
3. **Computer Aided Power system analysis**, G.L., Kusic, PHI.Indian Edition, 2010 .
4. **Power System Analysis**,W.D.Stevenson & Grainger,TMH, First Edition, 2003.

10EE62 SWITCHGEAR & PROTECTION

Subject Code	:	**10EE62**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

SWITCHES AND FUSES: Introduction, energy management of power system, definition of switchgear, switches - isolating, load breaking and earthing. Introduction to fuse**,** fuse law, cut -off characteristics,: Time current characteristics, fuse material, HRC fuse, liquid fuse, Application of fuse

4 Hours

UNIT - 2

PRINCIPLES OF CIRCUIT BREAKERS: Introduction, requirement of a circuit breakers, difference between an isolator and circuit breaker, basic principle of operation of a circuit breaker, phenomena of arc, properties of arc, initiation and maintenance of arc, arc interruption theories - slepian's theory and energy balance theory**,** Restriking voltage, recovery voltage, Rate of rise of Restriking voltage, DC circuit breaking, AC circuit breaking, current chopping, capacitance switching, resistance switching, Rating of Circuit breakers.

10 Hours

UNIT - 3 & 4

CIRCUITS BREAKERS: Air Circuit breakers – Air break and Air blast Circuit breakers, oil Circuit breakers - Single break, double break, minimum OCB, SF_6 breaker - Preparation of SF_6 gas, Puffer and non Puffer type of SF_6 breakers. Vacuum circuit breakers - principle of operation and constructional details. Advantages and disadvantages of different types of Circuit breakers, Testing of Circuit breakers, Unit testing, synthetic testing, substitution test, compensation test and capacitance test.

LIGHTNING ARRESTERS: Causes of over voltages – internal and external, lightning, working principle of different types of lightning arresters. Shield wires.

12 Hours

PART - B

UNIT - 5

PROTECTIVE RELAYING: Requirement of Protective Relaying, Zones of protection, primary and backup protection, Essential qualities of Protective Relaying, Classification of Protective Relays

4 Hours

UNIT - 6

INDUCTION TYPE RELAY: Non-directional and directional over current relays, IDMT and Directional characteristics. Differential relay – Principle of operation, percentage differential relay, bias characteristics, distance relay – Three stepped distance protection, Impedance relay, Reactance relay, Mho relay, Buchholz relay, Negative Sequence relay, Microprocessor based over current relay – block diagram approach.

10 Hours

UNIT - 7 & 8

PROTECTION SCHEMES: Generator Protection - Merz price protection, prime mover faults, stator and rotor faults, protection against abnormal conditions – unbalanced loading, loss of excitation, over speeding. Transformer Protection - Differential protection, differential relay with harmonic restraint, Inter turn faults Induction motor protection - protection against electrical faults such as phase fault, ground fault, and abnormal operating conditions such as single phasing, phase reversal, over load. **12 Hours**

TEXT BOOKS:

1. **Switchgear & Protection** Sunil S.Rao,,Khanna Publishers,13th Edition,2008.
2. **Power System Protection & Switchgear,** Badriram & Viswa Kharma ,TMH,1st edition, 2001.
3. **Fundamentals of Power System protection,** Y G. Painthankar and S R Bhide,PHI, 2009.

REFERENCE BOOKS:

1. **A Course in Electrical Power,** Soni, Gupta & Bhatnagar, Dhanapatirai.
2. **Power System Protection & Switchgear,** Ravindarnath & Chandra -New age Publications.
3 **Electrical Power,** Dr S. L. Uppal, Khanna Publishers.
4. **Handbook of Switchgears**, BHEL,TMH, 5th reprint,2008.

10EE664 OBJECT ORIENTED PROGRAMMING USING C ++

Subject Code	:	**10EE664**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
PRINCIPLES OF OBJECT-ORIENTED PROGRAMMING: Review of Procedure Oriented Programming, Basic concepts of Object Oriented Programming – Object, Class, Encapsulation, Inheritance, Polymorphism; Benefits of OOPs, Applications of OOP's. **4 Hours**

UNIT - 2
THE BASIC LANGUAGE C++: A comparison of C and C++, Structure of C++ program with Class, Preprocessor directives, C++ Statements – Input/Output, Comments, Tokens, Keywords, Identifiers, Constants, Data types – string, pointer, reference, boole, enumeration, array, complex number; typedef names, type compatibility, type conversion, qualifier – const, volatile; Operators in C++, Operator Precedence and Operator Overloading; C++ expressions – New and Delete. **6 Hours**

UNIT - 3
FUNCTIONS IN C++: Introduction, The main() function, Function prototype, Call by reference, Return by reference, Inline functions, Default arguments, const Arguments, Function Overloading, Friend and Virtual functions, pointer to functions. **8 hours**

UNIT - 4
CLASSES AND OBJECTS: Introduction – declaration and definition of a Class, defining member functions, C++ program with a Class, Making an outside function Inline, Nesting of member functions, Arrays within a class, Static data members, static member functions, Objects – global & local objects, scope & lifetime, memory allocation for objects, dynamically allocated objects, pointers to objects, arrays of objects, function arguments with objects, returning objects; const member functions. **8 Hours**

PART - B

UNIT - 5
CONSTRUCTORS AND DESTRUCTORS: Introduction, Constructors, Parameterized Constructors, Multiple constructors in a class, Constructors with default arguments, Dynamic initialization of objects, Copy constructor, Constructing two-dimensional arrays, const Objects, Destructors. **4 Hours**

UNIT - 6
OPERATOR OVERLOADING AND TYPE CONVERSION: Introduction, Defining operator overloading, Overloading unary operators, Overloading binary operators, Overloading binary operators using Friends, Rules for overloading operators, overloading a comma operator, overloading the output operator , Type conversion. **7 Hours**

UNIT - 7
INHERITANCE: Introduction, Defining derived classes, Single inheritance, Making a private member Inheritable, Multilevel inheritance, Multiple inheritance, Hierarchical inheritance, Hybrid inheritance, Virtual base classes, Abstract classes, Constructors & Destructors in base & derived classes. **6 Hours**

UNIT - 8
POINTER, VIRTUAL FUNCTIONS AND POLYMORPHISM: Introduction, Pointers, Pointers to Objects, this pointer, Pointers to derived classes, type-checking pointers, pointers to members, Virtual functions, Pure virtual functions.

MANAGING CONSOLE I/O AND FILE I/O: C++ streams, C++ stream classes, examples of formatted and unformatted I/O operations, Classes for file stream operations, Methods of Opening and Closing a File, Examples of Opening file using constructor open(), file modes (simple programming exercises). **9 Hours**

TEXT BOOKS:

1. **Object Oriented Programming with C++-** Balagurusamy, E, TMH,4th edition, 2008.
2. **C++, The Complete Reference -**Herbert Schildt**,** , TMH, 4th edition
3. **Object Oriented Programming with C++**, Farrell,Cengage Learning,First Edition,2008.

REFERENCE BOOKS:

1. **The C++ programming language,**Bjarne Stroustrup, Pearson Education, 3rd edition,2006.
2. **Objected oriented programming with C++,**Bhave, Pearson Education, First Edition,2006.

10EE72 ELECTRICAL POWER UTILIZATION

Subject Code	:	**10EE72**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

HEATING AND WELDING: Advantages and methods of electric of heating, resistance ovens, induction heating, dielectric heating, the arc furnace, heating of building. Electric welding, resistance and arc welding, control devices and welding equipment. **10 Hours**

UNIT - 2

ELECTROLYTIC PROCESS: Fundamental principles, extraction, refining of metals and electroplating. Factors affecting electro deposition process, power supply for electrolytic process. **6 Hours**

UNIT - 3 & 4

ILLUMINATION: Laws of illumination, lighting calculation, factory lighting, flood lighting, street lighting, different types of lamps-incandescent, fluorescent, vapor, CFL and LED lamps and their working, comparision, Glare and its remedy. **10 Hours**

PART - B

UNIT - 5, 6 & 7

ELECTRIC TRACTION: Introduction, requirements of an ideal traction,systems of traction, speed time curve, tractive effort,co-efficient of adhesion, selection of traction motors, method of speed control, energy saving by series parallel control, ac traction equipment. AC series motor, characteristics, regenerative braking, linear induction motor and their use. AC traction, diesel electric equipment, trains lighting system, specific energy, factors affecting specific energy consumption. **20 Hours**

UNIT - 8

INTRODUCTION TO ELECTRIC AND HYBRID VEHICLES: Configuration and performance of electrical vehicles, traction motor characteristics, tractive effort, transmission requirement, vehicle performance and energy consumption. **6 Hours**

TEXT BOOKS:

1. **Utilization Of Electric Energy,**E Openshaw Taylor, 12th Impression,2009,Universities Press.
2. **Modern Electric, Hybrid Electric and Fuel Cell Vehicles**, Mehrdad, Ehsani, Yimin Gao, Sabastien. E. Gay, Ali Emadi- CRC Press.

REFERENCE BOOKS:

1. **A Course in Electrical Power**, Soni Gupta and Bhatnager-Dhanapat Rai & sons.
3. **Electrical Power,** Dr. S.L.Uppal, Khanna Publications

10EE73 HIGH VOLTAGE ENGINEERING

Subject Code	:	**10EE73**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
INTRODUCTION: Introduction to HV technology, need for generating high voltages in laboratory. Industrial applications of high voltage, Electrostatic precipitation, separation, painting and printing.
6Hours

UNIT - 2 & 3
BREAKDOWN PHENOMENA: Classification of HV insulating media. Properties of important HV insulating media under each category. Gaseous dielectrics,Ionization: primary and secondary ionization processes. Criteria for gaseous insulation breakdown based on Townsend's theory. Limitations of Townsend's theory. Streamer's theory breakdown in non uniform fields. Corona discharges. Breakdown in electro negative gases. Paschen's law and its significance. Time lags of Breakdown. Breakdown in solid dielectrics: Intrinsic Breakdown, avalanche breakdown, thermal breakdown, and electro mechanic breakdown. Breakdown of liquid dielectrics: Suspended particle theory, electronic Breakdown, cavity breakdown (bubble's theory), electro convection breakdown. **12 Hours**

UNIT - 4
GENERATION OF HV AC AND DC VOLTAGE: HV AC-HV transformer; Need for cascade connection and working of transformers units connected in cascade. Series resonant circuit- principle of operation and advantages. Tesla coil. HV DC- voltage doubler circuit, cock croft- Walton type high voltage DC set. Calculation of high voltage regulation, ripple and optimum number of stages for minimum voltage drop. **8 Hours**

Part - B

UNIT - 5
GENERATION OF IMPULSE VOLTAGE AND CURRENT: Introduction to standard lightning and switching impulse voltages. Analysis of single stage impulse generator-expression for Output impulse voltage. Multistage impulse generator working of Marx impulse. Rating of impulse generator. Components of multistage impulse generator. Triggering of impulse generator by three electrode gap arrangement. Trigatron gap and oscillograph time sweep circuits. Generation of switching impulse voltage. Generation of high impulse current. **6 Hours**

UNIT - 6
MEASUREMENT OF HIGH VOLTAGES: Electrostatic voltmeter-principle, construction and limitation. Chubb and Fortescue method for HV AC measurement. Generating voltmeter- Principle, construction. Series resistance micro ammeter for HV DC measurements. Standard sphere gap measurements of HV AC, HV DC, and impulse voltages; Factors affecting the measurements. Potential dividers-resistance dividers capacitance dividers mixed RC potential dividers. Measurement of high impulse currents-Rogogowsky coil and Magnetic Links. **10 Hours**

UNIT - 7

NON-DESTRUCTIVE INSULATION TESTING TECHNIQUES: Dielectric loss and loss angle measurements using Schering Bridge, Transformer ratio Arms Bridge. Need for discharge detection and PD measurements aspects. Factor affecting the discharge detection. Discharge detection methods-straight and balanced methods. **6 Hours**

UNIT - 8

HIGH VOLTAGE TESTS ON ELECTRICAL APPARATUS: Definitions of terminologies, tests on isolators, circuit breakers, cables insulators and transformers. **4 Hours**

TEXT BOOKS:

1. **High Voltage Engineering**, M.S.Naidu and Kamaraju- 4th Edition, THM, 2008.
2. **High Voltage Engineering Fundamentals**, E.Kuffel and W.S. Zaengl, 2nd Edition, Elsevier Press, 2005.
3. **High Voltage Engineering** ,C.L.Wadhwa, New Age International Private limited, 1995.

REFERENCE BOOKS:

1.**High Voltage Engineering Theory and Practice,** Mazen Abdel-Salam, Hussein Anis, Ahdab El-Morshedy, Roshdy Radwan, 2nd Edn(Revised & Expanded) Marcel-Dekker Publishers(Special Indian Edn.).

10EE752 PROGRAMMABLE LOGIC CONTROLLERS

Subject Code	:	**10EE752**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
INTRODUTION: Introduction to Programmable logic controller (PLC), role in automation (SCADA), advantages and disadvantages, hardware, internal architecture, sourcing and sinking, characteristics of I/O devices, list of input and output devices, examples of applications. I/O processing, input/output units, signal conditioning, remote connections, networks, processing inputs I/O addresses. **7 Hours**

UNIT - 2
ROGRAMMING: Ladder programming- ladder diagrams, logic functions, latching, multiple outputs, entering programs, functional blocks, programme examples like location of stop and emergency switches
8 Hours

UNIT - 3 & 4
PROGRAMMING LANGUAGES: Instruction list, sequential functions charts & structured text, jump and call subroutines**.** **10 Hours**

PART - B

UNIT - 5
INTERNAL RELAYS: ladder programmes, battery- backed relays, one - shot operation, set and reset, master control relay. **5 Hours**

UNIT - 6 & 7
Timers and counters: Types of timers, programming timers, ON and OFF- delay timers, pulse timers, forms of counter, programming, up and down counters, timers with counters, sequencer. **12 Hours**

UNIT - 8
Shift register and data handling: shift registers, ladder programs, registers and bits, data handling, arithmetic functions, temperature control and bottle packing applications. **10 Hours**

Note: Programming is to be with reference to only Mitsubhish PLC

TEXT BOOKS:

1. **Programmable Logic controllers-**W Bolton, 5th edition, Elsevier- newness, 2009.
2. **Programmable logic controllers - principles and applications"-**John W Webb, Ronald A Reis, Pearson education, 5th edition, 2nd impression, 2007.

REFERENCE BOOKS:

1. **Programmable Controller Theory and Applications**,L. A Bryan, E. A Bryan, An industrial text company publication, 2nd edition, 1997.
2. **Programmable Controllers, An Engineers Guide**-E. A Paar, newness, 3rd edition, 2003.

10EE836 RENEWABLE ENERGY SOURCES

Subject Code	:	**10EE836**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

UNIT - 1

ENERGY SOURCES: Introduction, Importance of Energy Consumption as Measure of Prosperity, Per Capita Energy Consumption, Classification of Energy Resources; Conventional Energy Resources - Availability and their limitations; Non-Conventional Energy Resources – Classification, Advantages, Limitations; Comparison of Conventional and Non-Conventional Energy Resources; World Energy Scenario; Indian Energy Scenario. **4 Hours**

UNIT - 2

SOLAR ENERGY BASICS: Introduction, Solar Constant, Basic Sun-Earth Angles – definitions and their representation, Solar Radiation Geometry (numerical problems), Estimation of Solar Radiation of Horizontal and Tilted Surfaces (numerical problems); Measurement of Solar Radiation Data – Pyranometer and Pyrheliometer. **6 Hours**

UNIT - 3

SOLAR THERMAL SYSTEMS: Principle of Conversion of Solar Radiation into Heat, Solar Water Heaters (Flat Plate Collectors), Solar Cookers – Box type, concentrating dish type, Solar driers, Solar Still, Solar Furnaces, Solar Green Houses. **6 Hours**

UNIT - 4

SOLAR ELECTRIC SYSTEMS: Solar Thermal Electric Power Generation – Solar Pond and Concentrating Solar Collector (parabolic trough, parabolic dish, Central Tower Collector). Advantages and Disadvantages; Solar Photovoltaic – Solar Cell fundamentals, characteristics, classification, construction of module, panel and array. Solar PV Systems – stand-alone and grid connected; Applications – Street lighting, Domestic lighting and Solar Water pumping systems. **7 Hours**

ENERGY STORAGE: Introduction, Necessity of Energy Storage, and Methods of Energy Storage (classification and brief description using block diagram representation only). **3 Hours**

PART - B

UNIT - 5

WIND ENERGY: Introduction, Wind and its Properties, History of Wind Energy, Wind Energy Scenario – World and India. Basic principles of Wind Energy Conversion Systems (WECS), Classification of WECS, Parts of WECS, Derivation for Power in the wind, Electrical Power Output and Capacity Factor of WECS, Wind site selection consideration, Advantages and Disadvantages of WECS. **8 Hours**

UNIT - 6

BIOMASS ENERGY: Introduction, Photosynthesis process, Biomass fuels, Biomass conversion technologies, Urban waste to Energy Conversion, Biomass Gasification, Biomass to Ethanol Production, Biogas production from waste biomass, factors affecting biogas generation, types of biogas plants – KVIC and Janata model; Biomass program in India. **6 Hours**

UNIT - 7

ENERGY FROM OCEAN: Tidal Energy – Principle of Tidal Power, Components of Tidal Power Plant (TPP), Classification of Tidal Power Plants, Estimation of Energy – Single basin and Double basin type TPP (no derivations. Simple numerical problems), Advantages and Limitations of TPP. Ocean Thermal Energy Conversion (OTEC): Principle of OTEC system, Methods of OTEC power generation – Open Cycle (Claude cycle), Closed Cycle (Anderson cycle) and Hybrid cycle (block diagram description of OTEC); Site-selection criteria, Biofouling, Advantages & Limitations of OTEC. **6 Hours**

UNIT - 8

EMERGING TECHNOLOGIES: Fuel Cell, Small Hydro Resources, Hydrogen Energy, and Wave Energy. (Principle of Energy generation using block diagrams, advantages and limitations). **6 Hours**

TEXT BOOKS:

1. **Non-Conventional Sources of Energy,**Rai, G. D, Khanna Publishers, 4th Edition, 2007
2. **Non-Conventional Energy Resources,** Khan, B. H., TMH, 2nd Edition.

REFERENCE BOOK:

1. **Fundamentals of Renewable Energy Systems,** Mukherjee, D and Chakrabarti, S., New Age International Publishers, 2005.

MATERIAL SCIENCE AND METALLURGY

Subject Code	**: 10ME32A /42A**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Crystal Structure: BCC, FCC and HCP Structures, coordination number and atomic packing factors, crystal imperfections -point line and surface imperfections. Atomic Diffusion: Phenomenon, Ficks laws of diffusion, factors affecting diffusion.

06 Hours

UNIT - 2

Mechanical Behaviour: Stress-strain diagram showing ductile and brittle behaviour of materials, linear and non linear elastic behaviour and properties, mechanical properties in plastic range, yield strength offset yield strength, ductility, ultimate tensile strength, toughness. Plastic deformation of single crystal by slip and twinning.

06 Hours

UNIT - 3

Fracture: Type I, Type II and Type III.

Creep: Description of the phenomenon with examples. three stages of creep, creep properties, stress relaxation.

Fatigue: Types of fatigue loading with examples, Mechanism of fatigue, fatigue properties, fatigue testing and S-N diagram.

07 Hours

UNIT - 4

Solidification: Mechanism of solidification, Homogenous and Heterogeneous nucleation, crystal growth, cast metal structures.

Phase Diagram I: Solid solutions Hume Rothary rule substitutional, and interstitial solid solutions, intermediate phases, Gibbs phase rule.

07 Hours

PART - B

UNIT - 5

Phase Diagram II: Construction of equilibrium diagrams involving complete and partial solubility, lever rule. Iron carbon equilibrium diagram description of phases, solidification of steels and cast irons, invariant reactions.

06 Hours

UNIT - 6

Heat treating of metals: TTT curves, continuous cooling curves, annealing and its types. normalizing, hardening, tempering, martempering, austempering, hardenability, surface hardening methods like carburizing, cyaniding, nitriding, flame hardening and induction hardening, age hardening of aluminium-copper alloys.

07 Hours

UNIT - 7

Ferrous and non ferrous materials: Properties, Composition and uses of

- Grey cast iron, malleable iron, SG iron and steel
- Copper alloys-brasses and bronzes.
  Aluminium alloys-Al-Cu,Al-Si,Al-Zn alloys.

06 Hours

UNIT - 8

Composite Materials: Definition, classification, types of matrix materials & reinforcements, fundamentals of production of FRP's and MMC's advantages and application of composites.

07 Hours

TEXT BOOKS:

1. **Foundations of Materials Science and Engineering,** Smith, 4th Edition McGraw Hill, 2009
2. **Materials Science, Shackleford., & M. K. Muralidhara,** Pearson Publication – 2007.

REFERENCE BOOKS:

1. **An Introduction to Metallurgy; Alan Cottrell**, Universities Press India Oriental Longman Pvt. Ltd., 1974.
2. **Engineering Materials Science**, W.C.Richards, PHI, 1965
3. **Physical Metallurgy**; Lakhtin, Mir Publications
4. **Materials Science and Engineering,** V.Raghavan , PHI, 2002
5. **Elements of Materials Science and Engineering,** H. VanVlack, Addison-Wesley Edn., 1998
6. **Materials Science and Engineering,**William D. Callister Jr., John Wiley & Sons. Inc, 5th Edition, 2001.
7. **The Science and Engineering of Materials,** Donald R. Askland and Pradeep.P. Phule, Cengage Learning, 4lh Ed., 2003.

MECHANICAL MEASUREMENTS AND METROLOGY

Subject Code	**: 10ME32B /42B**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART- A

UNIT-1

Standards of measurement: Definition and Objectives of metrology, Standards of length-International prototype meter, Imperial standard yard, Wave length standard, subdivision of standards, line and

end standard, calibration of end bars (Numerical), Slip gauges, Wringing phenomena, Indian Standards (M-81, M-12), Numerical problems on building of slip gauges.

06 Hours

UNIT-2

System of Limits, Fits, Tolerance and Gauging: Definition of tolerance, Specification in assembly, Principle of interchangeability and selective assembly limits of size, Indian standards, concept of limits of size and tolerances, compound tolerances, accumulation of tolerances, definition of fits, types of fits and their designation (IS 919-1963), geometrical tolerance, positional-tolerances, hole basis system, shaft basis system, classification of gauges, brief concept of design of gauges (Taylor's principles), Wear allowance on gauges, Types of gauges-plain plug gauge, ring gauge, snap gauge, limit gauge and gauge materials.

07 Hours

UNIT-3

Comparators and Angular measurement: Introduction to comparators, characteristics, classification of comparators, mechanical comparators-Johnson Mikrokator, sigma comparators, dial indicator, optical comparators-principles, Zeiss ultra optimeter, electric and electronic comparators-principles, LVDT, pneumatic comparators, back pressure gauges, solex comparators. Angular measurements, bevel protractor, sine principle and use of sine bars, sine centre, use of angle gauges (numericals on building of angles), clinometers.

07 Hours

UNIT-4:

Interferometer and screw thread, gear measurement: Interferometer, interferometry, autocollimator. Optical flats. Terminology of screw threads, measurement of major diameter, minor diameter, pitch, angle and effective diameter of screw threads by 2 - wire and 3 -wire methods, best size wire. Tool maker's microscope, gear tooth terminology, use of gear tooth vernier caliper and micrometer.

06 Hours

PART-B

UNIT-5:

Measurements and measurement systems: Definition, significance of measurement, generalized measurement system, definitions and concept of accuracy, precision, calibration, threshold, sensitivity, hysterisis, repeatability, linearity, loading effect, system response-times delay. Errors in measurement, classification of errors. Transducers, transfer efficiency, primary and secondary transducers, electrical, mechanical, electronic transducers, advantages of each type transducers.

07 Hours

UNIT-6

Intermediate modifying and terminating devices: Mechanical systems, inherent problems, electrical intermediate modifying devices, input circuitry, ballast circuit, electronic amplifiers and telemetry. Terminating devices, mechanical, cathode ray oscilloscope, oscillographs, X-Y plotters.

06 Hours

UNIT-7

Measurement of force, torque and pressure: Principle, analytical balance, platform balance, proving ring. Torque measurement, Prony brake, hydraulic dynamometer. Pressure measurements, principle, use of elastic members, Bridgeman gauge, McLeod gauge, Pirani gauge. **06 Hours**

UNIT-8

Temperature and strain measurement: Resistance thermometers, thermocouple, law of thermo couple, materials used for construction, pyrometer, optical pyrometer. Strain measurements, strain gauge, preparation and mounting of strain gauges, gauge factor, methods of strain measurement.

07 Hours

TEXT BOOKS:

1. **Mechanical Measurements,** Beckwith Marangoni and Lienhard, Pearson Education, 6th Ed., 2006.
2. **Engineering Metrology,** R.K. Jain, Khanna Publishers, 1994.

REFERENCE BOOKS:

1. **Engineering Metrology,** I.C. Gupta, Dhanpat Rai Publications, Delhi.
2. **Mechanical Measurements,** R.K. Jain Khanna Publishers, 1994
3. **Industrial Instrumentation,** Alsutko, Jerry. D. Faulk, Cengage Asia Pvt. Ltd. 2002.
4. **Measurement Systems Applications and Design,** Ernest O. Doebelin, 5th Ed., McGraw Hill Book Co.
5. **Metrology & Measurement,** Anand K. Bewoor & Vinay A. Kulkarni, Tata McGraw Hill Pvt. Ltd., New-Delhi

MANUFACTURING PROCESS – I
(FUNDAMENTALS OF FOUNDRY & WELDING)

Subject Code	**: 10ME35**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

CASTING PROCESS

UNIT - 1

Introduction: Concept of Manufacturing process, its importance. Classification of Manufacturing processes. Introduction to Casting process & steps involved. Varieties of components produced by casting process. Advantages & Limitations of casting process.

Patterns: Definition, functions, Materials used for pattern, various pattern allowances and their importance. Classification of patterns, BIS color coding of Patterns.

Binder: Definition, Types of binder used in moulding sand.

Additives: Need, Types of additives used and their properties..

06 Hours

UNIT - 2

Sand Moulding : Types of base sand, requirement of base sand. Moulding sand mixture ingredients for different sand mixtures. Method used for sand moulding, such as Green sand, dry sand and skin dried moulds.

Cores: Definition, Need, Types. Method of making cores, Binders used, core sand moulding.

Concept of Gating & Risers. Principle and types.

Fettling and cleaning of castings. Basic steps, Casting defects, Causes, features and remedies.

Moulding Machines : Jolt type, Squeeze type, Jolt & Squeeze type and Sand slinger.

07 Hours

UNIT - 3

Special moulding Process: Study of important moulding processes, No bake moulds, Flaskless moulds, Sweep mould, CO_2 mould, Shell mould, Investment mould.

Metal moulds: Gravity die-casting, Pressure die casting, Centrifugal casting, Squeeze Casting, Slush casting, Thixo-casting and Continuous Casting Processes.

07 Hours

UNIT - 4

Melting Furnaces: Classification of furnaces. Constructional features & working principle of coke fired, oil fired and Gas fired pit furnace, Resistance furnace, Coreless Induction furnace, Electric Arc Furnace, Cupola furnace.

06 Hours

PART – B

WELDING

UNIT - 5

Welding process: Definition, Principles, Classification, Application, Advantages & limitations of welding.

Arc Welding: Principle, Metal Arc welding **(MAW)**, Flux Shielded Metal Arc Welding **(FSMAW)**, Inert Gas Welding **(TIG & MIG)** Submerged Arc Welding **(SAW)** and Atomic Hydrogen Welding processes. **(AHW)**

Gas Welding: Principle, Oxy – Acetylene welding, Chemical Reaction in Gas welding, Flame characteristics. Gas torch construction & working. Forward and backward welding.

07 Hours

UNIT - 6

Special types of welding: Resistance welding **-** principles, Seam welding, Butt welding, Spot welding and projection welding.

Friction welding, Explosive welding, Thermit welding, Laser welding and Electron beam welding.

07 Hours

UNIT - 7

Metallurgical aspect, in welding : Structure of welds, Formation of different zones during welding. Heat affected zone **(HAZ).** Parameters affecting **HAZ**. Effect of carbon content on structure and properties of steel. Shrinkage in welds & Residual stresses.

Concept of electrodes, Filler rod and fluxes. Welding defects – Detection causes & remedy.

06 Hours

UNIT - 8

Principles of soldering & brazing: Parameters involved & Mechanism. Different Types of Soldering & Brazing Methods.

Inspection Methods – Methods used for Inspection of casting and welding. Visual, Magnetic particle, Fluorescent particle, Ultrasonic, Radiography, Eddy current, Holography methods of Inspection.

06 Hours

TEXT BOOKS:

1. **"Manufacturing Process-I",** Dr.K.Radhakrishna, Sapna Book House, 5th Revised Edition 2009.
2. **"Manufacturing & Technology**: Foundry Forming and Welding", P.N.Rao, 3rd Ed., Tata McGraw Hill, 2003.

REFERENCE BOOKS:

1. **"Process and Materials of Manufacturing**", Roy A Lindberg, 4th Ed. Pearson Edu. 2006.
2. **"Manufacturing Technology**", Serope Kalpakjian, Steuen. R. Sechmid, Pearson Education Asia, 5th Ed. 2006.

COMPUTER AIDED MACHINE DRAWING

Subject Code	**:10ME36A/10ME46A**	**IA Marks**	**25**
Hours/Week	**: 04(1 Hrs. Theory & 3 Hrs Practical)**	**Exam Hours**	**03**
Total Hours	**: 52**	**Exam Marks**	**100**

Introduction:
Review of graphic interface of the software. Review of basic sketching commands and navigational commands. Starting a new drawing sheet. Sheet sizes. Naming a drawing, Drawing units, grid and snap.

02 Hours

PART-A

UNIT - 1
Sections of Solids: Sections of Pyramids, Prisms, Cubes, Tetrahedrons, Cones and Cylinders resting only on their bases (No problems on axis inclinations, spheres and hollow solids). True shape of sections.
Orthographic Views: Conversion of pictorial views into orthographic projections. of **simple machine parts** with or without section. (Bureau of Indian Standards conventions are to be followed for the drawings) Hidden line conventions. Precedence of lines.

08 Hours

UNIT - 2
Thread Forms: Thread terminology, sectional views of threads. ISO Metric (Internal & External) BSW (Internal & External) square and Acme. Sellers thread, American Standard thread.
Fasteners: Hexagonal headed bolt and nut with washer (assembly), square headed bolt and nut with washer (assembly) simple assembly using stud bolts with nut and lock nut. Flanged nut, slotted nut, taper and split pin for locking, counter sunk head screw, grub screw, Allen screw.

08 Hours

PART-B

UNIT - 3

Keys & Joints :

Parallel key, Taper key, Feather key, Gibhead key and Woodruff key

Riveted Joints: Single and double riveted lap joints, butt joints with single/double cover straps (Chain and Zigzag, using snap head rivets). cotter joint (socket and spigot), knuckle joint (pin joint) for two rods.

08 Hours

UNIT - 4

Couplings:

Split Muff coupling, Protected type flanged coupling, pin (bush) type flexible coupling, Oldham's coupling and universal coupling (Hooks' Joint)

08 Hours

PART - C
Assembly Drawings
(Part drawings should be given)

1. Plummer block (Pedestal Bearing)
2. Rams Bottom Safety Valve
3. I.C. Engine connecting rod
4. Screw jack (Bottle type)
5. Tailstock of lathe
6. Machine vice
7. Tool Head of a shaper

18 Hours

TEXT BOOKS:

1. **'A Primer on Computer Aided Machine Drawing-2007'**, Published by VTU, Belgaum.
2. **'Machine Drawing'**, N.D.Bhat & V.M.Panchal

REFERENCE BOOKS:

1. **'A Text Book of Computer Aided Machine Drawing'**, S. Trymbaka Murthy, CBS Publishers, New Delhi, 2007
2. **'Machine Drawing'**, K.R. Gopala Krishna, Subhash Publication.

3. **'Machine Drawing with Auto CAD'**, Goutam Pohit & Goutham Ghosh, 1st Indian print Pearson Education, 2005
4. **'Auto CAD 2006, for engineers and designers'**, Sham Tickoo. Dream tech 2005
5. **'Machine Drawing'**, N. Siddeshwar, P. Kanniah, V.V.S. Sastri, published by Tata McGraw Hill,2006

NOTE:

Internal assessment: 25 Marks

All the sheets should be drawn in the class using software. Sheet sizes should be A3/A4. All sheets must be submitted at the end of the class by taking printouts.

Scheme of Examination:

Two questions to be set from each Part-A, Part-B and Part-C
Student has to answer one question each from Part-A and Part-B for 20 marks each. And one question from Part-C for 60 marks.

i.e. PART-A 1 x 20 = 20 Marks
PART-B 1 x 20 = 20 Marks
PART-C 1 x 60 = 60 Marks

Total = 100 Marks

FLUID MECHANICS

Subject Code	**: 10ME36B / 46B**	**IA Marks**	**25**
Hours/Week	**: 04**	**Exam Hours**	**03**
Total Hours	**: 52**	**Exam Marks**	**100**

PART – A

UNIT-1

Properties of Fluids: Introduction, Types of fluid, Properties of fluids, viscosity, thermodynamic properties, surface tension, capillarity, vapour pressure and cavitation

06 Hours

UNIT-2

Fluid Statistics: Fluid pressure at a point, Pascal's law, pressure variation in a static fluid, absolute, gauge, atmospheric and vacuum pressures, simple manometers and differential manometers. Total pressure and center of pressure on submerged plane surfaces; horizontal, vertical and inclined plane surfaces, curved surface submerged in liquid.

07 Hours

UNIT-3

Buoyancy and Fluid Kinematics:

Buoyancy, center of buoyancy, metacentre and metacentric height, conditions of equilibrium of floating and submerged bodies, determination of Metacentric height experimentally and theoretically.

<u>Kinematics</u>: Types of fluid flow, continuity equation in 2D and 3D (Cartesian Co-ordinates only), velocity and acceleration, velocity potential function and stream function.

07 Hours

UNIT-4

Fluid Dynamics: Introduction equation of motion, Euler's equation of motion, Bernoulli's equation from first principles and also from Euler's equation, limitations of Bernoulli's equation.

06 Hours

PART-B

UNIT-5

Fluid Flow Measurements : Venturimeter, orificemeter, pitot-tube, vertical orifice, V-Notch and rectangular notches.

<u>Dimensional Analysis</u> : Introduction, derived quantities, dimensions of physical quantities, dimensional homogeneity, Rayleigh's method, Buckingham π theorem, dimensionless numbers, similitude, types of similitudes.

07 Hours

UNIT-6

Flow through pipes : Minor losses through pipes. Darey's and Chezy's equation for loss of head due to friction in pipes. HGL and TEL.

06 Hours

UNIT-7

Laminar flow and viscous effects : Reyonold's number, critical Reynold's number, laminar flow through circular pipe-Hagen Poiseille's equation, laminar flow between parallel and stationary plates.

06 Hours

UNIT-8

Flow past immersed bodies : Drag, Lift, expression for lift and drag, boundary layer concept, displacement, momentum and energy thickness. Introduction to compressible flow : Velocity of sound in a fluid, Mach number, Mach cone, propagation of pressure waves in a compressible fluid.

07 Hours

TEXT BOOKS:

1. **Fluid Mechanics,** Oijush.K.Kundu, IRAM COCHEN, ELSEVIER, 3rd Ed. 2005.
2. **Fluid Mechanics**, Dr. Bansal, R.K.Lakshmi Publications, 2004.

REFERENCE BOOKS:

1. **Fluid Mechanics and hydraulics,** Dr.Jagadishlal: Metropolitan Book Co-Ltd., 1997.
2. **Fluid Mechanics (SI Units),** Yunus A. Cengel John M.Oimbala, 2nd Ed., Tata McGraw Hill, 2006.
3. **Fluid Mechanics,** John F.Douglas, Janul and M.Gasiosek and john A.Swaffield, Pearson Education Asia, 5th ed., 2006
4. **Fluid Mechanics and Fluid Power Engineering**, Kumar.D.S, Kataria and Sons., 2004
5. **Fluid Mechanics** -. Merle C. Potter, Elaine P.Scott. Cengage learning

METALLOGRAPHY AND MATERIAL TESTING LABORATORY

Subject Code	**: 10MEL37A / 47A**	**IA Marks**	**: 25**
Hours/Week	**: 03**	**Exam Hours**	**: 03**
Total Hours	**: 48**	**Exam Marks**	**: 50**

PART – A

1. Preparation of specimen for Metallograpic examination of different engineering materials. Identification of microstructures of plain carbon steel, tool steel, gray C.I, SG iron, Brass, Bronze & composites.
2. Heat treatment: Annealing, normalizing, hardening and tempering of steel. Hardness studies of heat-treated samples.
3. To study the wear characteristics of ferrous, non-ferrous and composite materials for different parameters.
4. Non-destructive test experiments like,
   (a). Ultrasonic flaw detection
   (b). Magnetic crack detection
   (c). Dye penetration testing. To study the defects of Cast and Welded specimens

PART – B

1. Tensile, shear and compression tests of metallic and non metallic specimens using Universal Testing Machine
2. Torsion Test
3. Bending Test on metallic and nonmetallic specimens.
4. Izod and Charpy Tests on M.S, C.I Specimen.
5. Brinell, Rockwell and Vickers's Hardness test.
6. Fatigue Test.

<u>Scheme of Examination:</u>

ONE question from part -A: **20** Marks
ONE question from part -B: 20 Marks
Viva -Voice: **10** Marks

Total : 50 Marks

MECHANICAL MEASUREMENTS AND METROLOGY LABORATORY

Subject Code	**: 10MEL37B / 47B**	**IA Marks**	**: 25**
Hours/Week	**: 03**	**Exam Hours**	**: 03**
Total Hours	**: 48**	**Exam Marks**	**: 50**

PART-A: MECHANICAL MEASUREMENTS

1. Calibration of Pressure Gauge
2. Calibration of Thermocouple
3. Calibration of LVDT
4. Calibration of Load cell
5. Determination of modulus of elasticity of a mild steel specimen using strain gauges.

PART-B: METROLOGY

1. Measurements using Optical Projector / Toolmaker Microscope.
2. Measurement of angle using Sine Center / Sine bar / bevel protractor
3. Measurement of alignment using Autocollimator / Roller set
4. Measurement of cutting tool forces using
   a) Lathe tool Dynamometer
   b) Drill tool Dynamometer.
5. Measurement of Screw thread Parameters using Two wire or Three-wire method.
6. Measurements of Surface roughness, Using Tally Surf/Mechanical Comparator
7. Measurement of gear tooth profile using gear tooth vernier /Gear tooth micrometer
8. Calibration of Micrometer using slip gauges
9. Measurement using Optical Flats

Scheme of Examination:

ONE question from part -A:	**20** Marks
ONE question from part -B:	**20** Marks
Viva -Voice:	**10** Marks
Total :	**50** Marks

FOUNDRY AND FORGING LABORATORY

Subject Code	**: 10MEL38A / 48A**	**IA Marks**	**: 25**
Hours/Week	**: 03**	**Exam Hours**	**: 03**
Total Hours	**: 48**	**Exam Marks**	**: 50**

PART – A

1. Testing of Moulding sand and Core sand

Preparation of sand specimens and conduction of the following tests:

1 Compression, Shear and Tensile tests on Universal Sand Testing Machine.

2 Permeability test

3 Core hardness & Mould hardness tests.

4 Sieve Analysis to find Grain Fineness number of Base Sand

5 Clay content determination in Base Sand

PART – B

2. Foundry Practice

Use of foundry tools and other equipments.

Preparation of moulds using two moulding boxes using patterns or without patterns. (Split pattern, Match plate pattern and Core boxes).

Preparation of one casting (Aluminum or cast iron-Demonstration only)

PART – C

3. Forging Operations :

- Calculation of length of the raw material required to do the model.
- Preparing minimum three forged models involving upsetting, drawing and bending operations.
- Out of these three models, at least one model is to be prepared by using Power Hammer.

<u>Scheme of Examination:</u>

One question is to be set from Part-A: 10 marks
One question is to be set from either
Part-B or Part-C: 30 marks
Calculation part in case of forging is made compulsory

Calculation (Forging)	+ Foundry Model = 05 +25 = 30 Marks
Calculation (Forging)	+ Forging Model = 05 +25 = 30 Marks

Viva-Voce	:	**10** marks.
Total	:	**50** Marks**.**

MACHINE SHOP

Subject Code	**: 10MEL38B / 48B**	**IA Marks**	**: 25**
Hours/Week	**: 03**	**Exam Hours**	**: 03**
Total Hours	**: 48**	**Exam Marks**	**: 50**

PART – A

Preparation of three models on lathe involving Plain turning, Taper turning, Step turning, Thread cutting, Facing, Knurling, Drilling, Boring, Internal Thread cutting and Eccentric turning.

PART – B

Cutting of V Groove/ dovetail / Rectangular groove using a shaper.
Cutting of Gear Teeth using Milling Machine.

Scheme of Examination:

ONE question from part -A:	**30**	Marks
ONE question from part -B:	**10**	Marks
Viva -Voice:	**10**	Marks
Total :	**50**	Marks

APPLIED THERMODYNAMICS

Subject Code	**: 10ME43**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART-A

UNIT - 1

Combustion thermodynamics: Theoretical (Stoichiometric) air and excess air for combustion of fuels. Mass balance, actual combustion. Exhaust gas analysis. A./ F ratio, Energy balance for a chemical reaction, enthalpy of formation, enthalpy and internal energy of combustion, Combustion efficiency, adiabatic flow temperature.

07 Hours

UNIT- 2

Gas power cycle: Air Standard cycles: Carnot, Otto, Diesel, Dual and Stirling cycles, P-V and T-S diagrams, description, efficiencies and mean effective pressures, Comparison of Otto, Diesel and dual cycles.

06 Hours

UNIT - 3

I.C. Engine: Testing of two stroke and four stroke SI and CI engines for performance Related numerical problems, heat balance, Motoring Method, Willian's line method, swinging field dynamometer, Morse test.

06 Hours

UNIT - 4

Vapour Power Cycles: Carnot vapour power cycles, drawbacks as a reference cycle, Simple Rankine cycle, description, T- S diagram, analysis for performance , comparison of Carnot and Rankine cycles. Effects of pressure and temperature on Rankine cycle performance. Actual vapour power cycles. Ideal and practical regenerative Rankine cycle, open and closed feed water heaters, Reheat Rankine cycle.

07 Hours

PART-B

UNIT - 5

Reciprocating Compressors: Operation of a single stage reciprocating compressors, work input through P-V diagram and steady state steady flow analysis. Effect of clearance and volumetric efficiency. Adiabatic, isothermal and mechanical efficiencies. Multistage compressor, saving in work, optimum intermediate pressure, inter- cooling, minimum work for compression.

06 Hours

UNIT - 6

Gas turbine and Jet propulsion: Classification of Gas turbines, Analysis of open cycle gas turbine cycle. Advantages and disadvantages of closed cycle. Methods to improve thermal efficiency, Jet propulsion and Rocket propulsion.

07 Hours

UNIT - 7

Refrigeration: Vapour compression refrigeration system ; description, analysis, refrigerating effect, capacity , power required, units of refrigeration, COP , Refrigerants and their desirable properties. Air cycle refrigeration;

reversed Carnot cycle, reversed Brayton cycle, Vapour absorption refrigeration system, steam jet refrigeration.

06 Hours

UNIT - 8

Psychometry: Atmospheric air and psychometric properties; Dry bulb temperature, wet bulb temperature, dew point temperature; partial pressures, specific and relative humidities and the relation between the two enthalpy and adiabatic saturation temperature. Construction and use of psychometric chart . Analysis of various processes; heating, cooling , dehumidifying and humidifying. Adiabatic mixing of moist air. Summer and winter air conditioning.

07 Hours

Data Hand Book :

1. **Thermodynamic data hand book,** B.T. Nijaguna.
2. **Properties of Refrigerant & Psychometric** (tables & Charts in SI Units), Dr. S.S. Banwait, Dr. S.C. Laroiya, Birla Pub. Pvt. Ltd., Delhi, 2008

TEXT BOOKS:

1. **Basic and applied Thermodynamics**, P.K. Nag, 2nd Ed., Tata McGraw Hill Pub.Co,2002
2. **Applied Thermodynamics**, Rajput, Laxmi Publication
3. **Applied Thermodynamics**, B.K. Venkanna, Swati B. Wadavadagi, PHI, New Delhi, 2010

REFERENCE BOOKS:

1. **Thermodynamics , An engineering approach**, Yunus, A. Cengel and Michael A.Boies, 6th Ed., Tata McGraw Hill pub. Co., 2002,
2. **Fundamental of Classical Thermodynamics,** G.J. Van Wylen and R.E. Sontang Wiley eastern.

KINEMATICS OF MACHINES

Subject Code	**: 10ME44**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Introduction: Definitions Link or element, kinematic pairs, Degrees of freedom, Grubler's criterion (without derivation), Kinematic chain, Mechanism, Structure, Mobility of Mechanism, Inversion, Machine.

Kinematic Chains and Inversions: Inversions of Four bar chain; Single slider crank chain and Double slider crank chain.

07 Hours

UNIT - 2

Mechanisms: Quick return motion mechanisms-Drag link mechanism, Whitworth mechanism and Crank and slotted lever Mechanism.

Straight line motion mechanisms Peaucellier's mechanism and Robert's mechanism. Intermittent Motion mechanisms -Geneva wheel mechanism and Ratchet and Pawl mechanism. Toggle mechanism, Pantograph, Ackerman steering gear mechanism.

06 Hours

UNIT - 3

Velocity and Acceleration Analysis of Mechanisms (Graphical Methods)
Velocity and acceleration analysis of Four Bar mechanism, slider crank mechanism and Simple Mechanisms by vector polygons: Relative velocity and acceleration of particles .in a common link, relative velocity and accelerations of coincident Particles on separate links- Coriolis component of acceleration. Angular velocity and angular acceleration of links, velocity of rubbing.

07 Hours

UNIT - 4

Velocity Analysis by Instantaneous Center Method: Definition, Kennedy's Theorem, Determination of linear and angular velocity using instantaneous center method

Klein's Construction: Analysis of velocity and acceleration of single slider crank mechanism.

06 Hours

PART – B

UNIT - 5

Velocity and Acceleration Analysis of Mechanisms (Analytical Methods): Analysis of four bar chain and slider crank chain using analytical expressions. (Use of complex algebra and vector algebra)

06 Hours

UNIT - 6

Spur Gears: Gear terminology, law of gearing, Characteristics of involute action, Path of contact. Arc of contact, Contact ratio of spur, helical, bevel and worm gears, Interference in involute gears. Methods of avoiding interference, Back lash. Comparison of involute and cycloidal teeth. Profile Modification.

07 Hours

UNIT - 7

Gear Trains: Simple gear trains, Compound gear trains for large speed. reduction, Epicyclic gear trains, Algebraic and tabular methods of finding velocity ratio of epicyclic gear trains. Tooth load and torque calculations in epicyclic gear trains.

07 Hours

UNIT - 8

Cams: Types of cams, Types of followers. Displacement, Velocity and, Acceleration time curves for cam profiles. Disc cam with reciprocating follower having knife-edge, roller and flat-face follower, Disc cam with oscillating roller follower. Follower motions including SHM, Uniform velocity, uniform acceleration and retardation and Cycloidal motion.

06 Hours

TEXT BOOKS:

1. **"Theory of Machines",** Rattan S.S, Tata McGraw-Hill Publishing Company Ltd., New Delhi, and 3rd edition -2009.
2. **"Theory of Machines",** Sadhu Singh, Pearson Education (Singapore) Pvt. Ltd, Indian Branch New Delhi, 2nd Edi. 2006

REFERENCE BOOKS:

1. **"Theory of Machines & Mechanisms**", J.J. Uicker, , G.R. Pennock, J.E. Shigley. OXFORD 3rd Ed. 2009.
2. **Mechanism and Machine theory**, Ambekar, PHI, 2007

Graphical Solutions may be obtained either on the Graph Sheets or on the Answer Book itself.

MANUFACTURING PROCESS – II
(Metal Removing Process)

Subject Code	**: 10ME45**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Theory of Metal Cutting: Single point cutting tool nomenclature, geometry. Mechanics of Chip Formation, Types of Chips. Merchants circle diagram and analysis, Ernst Merchant's solution, shear angle relationship, problems of Merchant's analysis. Tool Wear and Tool failure, tool life. Effects of cutting parameters on tool life. Tool Failure Criteria, Taylor's Tool Life equation. Problems on tool life evaluation.

07 Hours

UNIT - 2

Cutting Tool Materials: Desired properties and types of cutting tool materials – HSS, carbides coated carbides, ceramics. Cutting fluids. Desired properties, types and selection. Heat generation in metal cutting, factors

affecting heat generation. Heat distribution in tool and work piece and chip. Measurement of tool tip temperature.

07 Hours

UNIT - 3

Turning (Lathe), Shaping and Planing Machines: Classification, constructional features of Turret and Capstan Lathe. Tool Layout, shaping Machine, Planing Machine, Driving mechanisms of lathe, shaping and planing machines, Different operations on lathe, shaping machine and planing machine. Simple problems on machining time calculations

07 Hours

UNIT - 4

Drilling machines: Classification, constructional features, drilling & related operations. Types of drill & drill bit nomenclature, drill materials.
Introduction to CNC machines- Principles of operation. Axes of NC machine-Coordinate systems. Basics of Manual part programming methods.

06 Hours

PART – B

UNIT - 5

Milling machines: Classification, constructional features, milling cutters nomenclature, milling operations, up milling and down milling concepts. Various milling operations.
Indexing: Simple, compound, differential and angular indexing calculations. Simple problems on simple and compound indexing.

06 Hours

UNIT - 6

Grinding machines: Types of abrasives, Grain size, bonding process, grade and structure of grinding wheels, grinding wheel types. Classification, constructional features of grinding machines (Centerless, cylindrical and surface grinding). Selection of grinding wheel. Grinding process parameters. Dressing and truing of grinding wheels.

07 Hours

UNIT - 7:

Broaching process - Principle of broaching. Details of a broach. Types of broaching machines-constructional details. Applications. Advantages and Limitations.

Finishing and other Processes Lapping and Honing operations – Principles, arrangement of set up and application. Super finishing process, polishing, buffing operation and application.

06 Hours

UNIT - 8

Non-traditional machining processes: Need for non traditional machining, Principle, equipment & operation of Laser Beam, Plasma Arc Machining, Electro Chemical Machining, Ultrasonic Machining, Abrasive Jet Machining, Water Jet Machining, Electron Beam Machining, Electron Discharge Machining and Plasma Arc Machining.

06 Hours

TEXT BOOKS:

1. **Workshop Technology,** Hazara Choudhry, Vol-II, Media Promoters & Publishers Pvt. Ltd. 2004
2. **Production Technology,** R.K.Jain, Khanna Publications, 2003.
3. **Production Technology,** HMT, Tata Mc Graw Hill, 2001.

REFERENCE BOOKS:

1. **Manufacturing Science**, Amitabha Ghosh and Mallik, affiliated East West Press, 2003.
2. **Fundamentals of Metal Machining and Machine Tools,** G. Boothroyd, McGraw Hill, 2000.

DESIGN OF MACHINE ELEMENTS-I

Subject Code	**: 10ME52**	**IA Marks**	**25**
Hours/Week	**: 04**	**Exam Hours**	**03**
Total Hours	**: 52**	**Exam Marks**	**100**

PART – A

UNIT- 1

Introduction: Definitions: normal, shear, biaxial and tri axial stresses, Stress tensor, Principal Stresses. Engineering Materials and their mechanical properties, Stress-Strain diagrams, Stress Analysis, Design considerations: Codes and Standards.

05 Hours

UNIT- 2

Design For Static & Impact Strength:

Static Strength: Static loads and factor of safety, Theories of failure: Maximum normal stress theory, Maximum shear stress theory, Maximum strain theory, Strain energy theory, Distortion energy theory. Failure of brittle and ductile materials, Stress concentration, Determination of Stress concentration factor.

Impact Strength: Introduction, Impact stresses due to axial, bending and torsional loads, effect of inertia.

07 Hours

UNIT - 3

Design For Fatigue Strength: Introduction- S-N Diagram, Low cycle fatigue, High cycle fatigue, Endurance limit, Modifying factors: size effect, surface effect, Stress concentration effects, Fluctuating stresses, Goodman and Soderberg relationship, stresses due to combined loading, cumulative fatigue damage.

08 Hours

UNIT - 4

Threaded Fasteners: Stresses in threaded fasteners, Effect of initial tension, Design of threaded fasteners under static, dynamic and impact loads, Design of eccentrically loaded bolted joints.

06 Hours

PART – B

UNIT - 5

Design Of Shafts: Torsion of shafts, design for strength and rigidity with steady loading, ASME codes for power transmission shafting, shafts under fluctuating loads and combined loads.

07 Hours

UNIT - 6

Cotter And Knuckle Joints, Keys And Couplings: Design of Cotter and Knuckle joints, Keys: Types of keys, Design of keys, Couplings: Rigid and flexible couplings, Flange coupling, Bush and Pin type coupling and Oldham's coupling.

07 Hours

UNIT - 7

Riveted and Welded Joints – Types, rivet materials, failures of riveted joints, Joint Efficiency, Boiler Joints, Lozanze Joints, Riveted Brackets. Welded Joints – Types, Strength of butt and fillet welds, eccentrically loaded welded joints.

07 Hours

UNIT - 8

Power Screws: Mechanics of power screw, Stresses in power screws, efficiency and self-locking, Design of Power Screw, Design of Screw Jack: (Complete Design).

05 Hours

TEXT BOOKS:

1. **Mechanical Engineering Design,** Joseph E Shigley and Charles R. Mischke. McGraw Hill International edition, 6^{th} Edition 2009.
2. **Design of Machine Elements,** V.B. Bhandari, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2^{nd} Edition 2007.

DESIGN DATA HANDBOOK:

1. **Design Data Hand Book,** K. Lingaiah, McGraw Hill, 2^{nd} Ed.
2. **Data Hand Book,** K. Mahadevan and Balaveera Reddy, CBS Publication
3. **Design Data Hand Book,** H.G. Patil, I. K. International Publisher, 2010.

REFERENCE BOOKS:

1. **Machine Design,** Robert L. Norton, Pearson Education Asia, 2001.
2. **Design of Machine Elements,** M. F. Spotts, T. E. Shoup, L. E. Hornberger, S. R. Jayram and C. V. Venkatesh, Pearson Education, 2006.
3. **Machine Design,** Hall, Holowenko, Laughlin (Schaum's Outlines series) Adapted by S.K. Somani, Tata McGraw Hill Publishing Company Ltd., New Delhi, Special Indian Edition, 2008.
4. **Fundamentals of Machine Component Design,** Robert C. Juvinall and Kurt M Marshek, Wiley India Pvt. Ltd., New Delhi, 3^{rd} Edition, 2007.

ENERGY ENGINEERING

Subject Code	**: 10ME53**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Steam Power Plant: Different Types of Fuels used for steam generation, Equipment for burning coal in lump form, strokers, different types, Oil burners, Advantages and Disadvantages of using pulverized fuel, Equipment for preparation and burning of pulverized coal, unit system and bin system. Pulverized fuel furnaces, cyclone furnace, Coal and ash handling, Generation of steam using forced circulation, high and supercritical pressures.

07 Hours

UNIT - 2

A Brief Account Of Benson, Velox Schmidt Steam Generators. Chimneys: Natural, forced, induced and balanced draft, Calculations and numericals involving height of chimney to produce a given draft. Cooling towers and Ponds. Accessories for the Steam generators such as Superheaters, De-superheater, control of superheaters, Economizers, Air pre-heaters and re-heaters.

07 Hours

UNIT - 3

Diesel Engine Power Plant: Applications of Diesel Engines in Power field. Method of starting Diesel engines. Auxiliaries like cooling and lubrication system, filters, centrifuges, Oil heaters, intake and exhaust system, Layout of diesel power plant.

06 Hours

UNIT - 4

Hydro-Electric Plants: Hydrographs, flow duration and mass curves, unit hydrograph and numericals. Storage and pondage, pumped storage plants,

low, medium and high head plants, Penstock, water hammer, surge tanks, gates and valves. General layout of hydel power plants.

06 Hours

PART – B

UNIT - 5

Nuclear Power Plant: Principles of release of nuclear energy; Fusion and fission reactions. Nuclear fuels used in the reactors. Multiplication and thermal utilization factors. Elements of the nuclear reactor; moderator, control rod, fuel rods, coolants. Brief description of reactors of the following types-Pressurized water reactor, Boiling water reactor, Sodium graphite reactor, Fast Breeder reactor, Homogeneous graphite reactor and gas cooled reactor, Radiation hazards, Shieldings, Radio active waste disposal.

06 Hours

UNIT - 6

Solar Energy: Solar Extra terrestrial radiation and radiation at the earth surface, radiation-measuring instruments, working principles of solar flat plate collectors, solar pond and photovoltaic conversion (Numerical Examples).

Wind Energy: Properties of wind, availability of wind energy in India, wind velocity and power from wind; major problems associated with wind power, wind machines; Types of wind machines and their characteristics, horizontal and vertical axis wind mills, coefficient of performance of a wind mill rotor (Numerical Examples).

08 Hours

UNIT - 7

Tidal Power: Tides and waves as energy suppliers and their mechanics; fundamental characteristics of tidal power, harnessing tidal energy, limitations.

Ocean Thermal Energy Conversion: Principle of working, Rankine cycle, problems associated with OTEC.

Geothermal Energy Conversion: Principle of working, types of geothermal station with schematic diagram, problems associated with geothermal conversion, scope of geothermal energy.

06 Hours

UNIT - 8

Energy From Bio Mass: Photosynthesis, photosynthetic oxygen production, energy plantation.

Bio Chemical Route: Biogas production from organic wastes by anaerobic fermentation, classification of bio gas plants, factors affecting bio gas generation.

Thermo Chemical Route: Thermo chemical conversion on bio mass, types of gasifiers.

06 Hours

TEXT BOOKS:

1. **Power Plant Engineering**, P. K. Nag Tata McGraw Hill 2nd edn 2001.
2. **Power Plant Engineering,** Domakundawar, Dhanpath Rai sons. 2003

REFERENCE BOOKS:

1. **Power Plant Engineering,** R. K. Rajput, Laxmi publication, New Delhi.
2. **Principles of Energy conversion**, A. W. Culp Jr., McGraw Hill. 1996
3. **Non conventional Energy sources**, G D Rai Khanna Publishers.
4. **Non conventional resources,** B H Khan TMH - 2007

1.

MANUFACTURING PROCESS – III

(METAL FORMING PROCESS)

Subject Code	**: 10ME55**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Introduction And Concepts: Classification of metal working processes, characteristics of wrought products, advantages and limitations of metal working processes.Concepts of true stress, true strain, triaxial & biaxial

stresses. Determination of flow stress. Principal stresses, Tresca & Von-Mises yield criteria, concepts of plane stress & plane strain.

06 Hours

UNIT - 2

Effects Of Parameters: Temperature, strain rate, friction and lubrication, hydrostatic pressure in metalworking, Deformation zone geometry, workability of materials, Residual stresses in wrought products.

06 Hours

UNIT - 3

Forging: Classification of forging processes. Forging machines & equipment. Expressions for forging pressures & load in open die forging and closed die forging by slab analysis, concepts of friction hill and factors affecting it. Die-design parameters. Material flow lines in forging. Forging defects, Residual stresses in forging. Simple problems.

07 Hours

UNIT - 4

Rolling: Classification of Rolling processes. Types of rolling mills, expression for RoIling load. Roll separating force. Frictional losses in bearing, power required in rolling, Effects of front & back tensions, friction, friction hill. Maximum possible reduction. Defects in rolled products. Rolling variables, simple problems.

06 Hours

PART - B

UNIT - 5

Drawing: Drawing equipment & dies, expression for drawing load by slab analysis, power requirement. Redundant work and its estimation, optimal cone angle & dead zone formation, drawing variables, Tube drawing, classification of tube drawing, simple problems.

07 Hours

UNIT - 6

Extrusion: Types of extrusion processes, extrusion equipment & dies, deformation, lubrication & defects in extrusion. Extrusion dies, Extrusion of seamless tubes. Extrusion variables, simple problem

06 Hours

UNIT - 7

Sheet & Metal Forming: Forming methods, dies & punches, progressive die, compound die, combination die. Rubber forming. Open back inclinable press (OBI press), piercing, blanking, bending, deep drawing, LDR in drawing, Forming limit criterion, defects of drawn products, stretch forming. Roll bending & contouring, Simple problems

06 Hours

UNIT - 8

High Energy Rate Forming Methods: Principles, advantages and applications, explosive forming, electro hydraulic forming, Electromagnetic forming.

Powder Metallurgy: Basic steps in Powder metallurgy brief description of methods of production of metal powders, conditioning and blending powders, compaction and sintering application of powder metallurgy components, advantages and limitations.

07 Hours

TEXT BOOKS:

1. **Mechanical metallurgy (SI units),** G.E. Dieter, Mc Graw Hill pub.2001
2. **Manufacturing Process – III,** Dr. K.Radhakrishna, Sapna Book House, 2009.

REFERENCE BOOKS:

1. **Materials and Processes in Manufacturing,** E.paul, Degramo, J.T. Black, Ronald, A.K. Prentice -hall of India 2002
2. **Principles of Industrial metal working process,** G.W. Rowe, CBSpub. 2002
3. **Manufacturing Science,** Amitabha Ghosh & A.K. Malik - East - Westpress 2001
4. **Technology of Metal Forming Process**, Surendra kumar, PHI – 2008

FLUID MECHANICS AND MACHINES LABORATORY

Subject Code	**: 10MEL57**	**IA Marks**	**: 25**
Hours/Week	**: 03**	**Exam Hours**	**: 03**
Total Hours	**: 42**	**Exam Marks**	**: 50**

PART - A

1. Determination of coefficient of friction of flow in a pipe.

2. Determination of minor losses in flow through pipes.

3. Determination of force developed by impact of jets on vanes.

4. Calibration of flow measuring devices

a. Orifice Plate meter
b. Nozzle
c. Venturimeter
d. V-notch

18 Hours

PART - B

5. Performance testing of Turbines
    a. Pelton wheel
    b. Francis Turbine
    c. Kaplan Turbines

6. Performance testing of Pumps
    a. Single stage / Multi stage centrifugal pumps
    b. Reciprocating pump

7. Performance test of a two stage Reciprocating Air Compressor

8. Performance test on an Air Blower

24 Hours

<u>Scheme for Examination:</u>

One Question from Part A	-	15 Marks (05 Writeup + 10)
One Question from Part B	-	25 Marks (05 Writeup + 20)
Viva-Voce	-	10 Marks

	Total	**50 Marks**

ENERGY CONVERSION ENGINEERING LABORATORY

Subject Code	**: 10MEL58**	**IA Marks**	**: 25**
Hours/Week	**: 03**	**Exam Hours**	**: 03**
Total Hours	**: 42**	**Exam Marks**	**: 50**

PART - A

1. Determination of Flash point and Fire point of lubricating oil using Abel Pensky and Marten’s (closed) / Cleavland’s (Open Cup) Apparatus.

2. Determination of Calorific value of solid, liquid and gaseous fuels.

3. Determination of Viscosity of a lubricating oil using Redwoods, Saybolt and Torsion Viscometers.

4. Valve Timing/port opening diagram of an I.C. engine (4 stroke/2 stroke).

5. Use of planimeter

21 Hours

PART - B

1. Performance Tests on I.C. Engines, Calculations of IP, BP, Thermal efficiencies, Volumetric efficiency, Mechanical efficiency, SFC, FP, A:F Ratio heat balance sheet for

    (a) Four stroke Diesel Engine

    (b) Four stroke Petrol Engine

    (c) Multi Cylinder Diesel/Petrol Engine, (Morse test)

    (d) Two stroke Petrol Engine

    (e) Variable Compression Ratio I.C. Engine.

21 Hours

<u>Scheme for Examination:</u>

One Question from Part A	-	15 Marks (05 Writeup+10)
One Question from Part B	-	25 Marks (05 Writeup+20)
Viva-Voce	-	10 Marks

Total		**50 Marks**

COMPUTER INTEGRATED MANUFACTURING

Subject Code	**: 10ME61**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART-A

UNIT - 1

Computer Integrated Manufacturing Systems: Introduction, Automation definition, Types of automation, CIM, processing in manufacturing, Production concepts, Mathematical Models-Manufacturing lead time, production rate, components of operation time, capacity, Utilization and availability, Work-in-process, WIP ratio, TIP ratio, Problems using mathematical model equations.

8 Hours

UNIT - 2

High Volume Production System: Introduction Automated flow line-symbols, objectives, Work part transport-continuous, Intermittent, synchronous, Pallet fixtures, Transfer Mechanism-Linear-Walking beam,. roller chain drive, Rotary-rack and pinion, Rachet & Pawl, Geneva wheel, Buffer storage, control functions-sequence, safety, Quality, Automation for machining operation.

6 Hours

UNIT - 3

Analysis Of Automated Flow Line & Line Balancing: General terminology and analysis, Analysis of Tranfer Line without storage upper bound approach, lower bound approach and problems, Analysis of Transfer lines with storage buffer, Effect of storage, buffer capacity with simple problem, Partial automation-with numerical problems, flow lines with more than two stages, Manual Assembly lines, line balancing problem.

6 Hours

UNIT - 4

Minimum Rational Work Element: Work station process time, Cycle time, precedence constraints. Precedence diagram, Balance delay methods of line balancing-largest Candidate rule, Kilbridge and Westers method, Ranked positional weight method, Numerical problems covering all above methods and computerized line balancing.

6 Hours

PART-B

UNIT - 5

Automated Assembly Systems: Design for automated assembly systems, types of automated assembly system, Parts feeding devices-elements of parts delivery system-hopper, part feeder, Selectors, feed back, escapement and placement analysis of Multistation Assembly Machine analysis of single station assembly. **Automated Guided Vehicle System:** Introduction, Vehicle guidance and routing, System management, Quantitative analysis of AGV's with numerical problems and application.

8 Hours

UNIT - 6

Computerized Manufacturing Planning System: Introduction, Computer Aided Process Planning, Retrieval types of process planning, Generative type of process planning, Material requirement planning, Fundamental concepts of MRP inputs to MRP, Capacity planning.

6 Hours

UNIT - 7

Cnc Machining Centers: Introduction to CNC, elements of CNC, CNC machining centers, part programming, fundamental steps involved in development of part programming for milling and turning.

6 Hours

UNIT - 8

Robotics: Introduction to Robot configuration, Robot motion, programming of Robots end effectors, Robot sensors and Robot applications.

6 Hours

TEXT BOOKS:

2. **Automation, Production system & Computer Integrated manufacturing,** M. P. Groover Person India, 2007 2nd edition.
3. **Principles of Computer Integrated Manufacturing**, S. Kant Vajpayee, Prentice Hall India.

REFERENCE BOOKS:

1. **Computer Integrated Manufacturing**, J. A. Rehg & Henry. W. Kraebber.
2. **CADlCAM** by Zeid, Tata McGraw Hill.

s

DESIGN OF MACHINE ELEMENTS – II

Subject Code	**: 10ME62**	**IA Marks**	**25**
Hours/Week	**: 04**	**Exam Hours**	**03**
Total Hours	**: 52**	**Exam Marks**	**100**

PART – A

UNIT - 1

Curved Beams: Stresses in curved beams of standard cross sections used in crane hook, punching presses & clamps, closed rings and links

Cylinders & Cylinder Heads: Review of Lame's Equations; compound cylinders, stresses due to different types of fits, cylinder heads, flats.

08 Hours

UNIT - 2

Belts Ropes and Chains: Flat belts: Length & cross section, Selection of V-belts, ropes and chains for different applications.

05 Hours

UNIT - 3

Springs: Types of springs - stresses in Helical coil springs of circular and non-circular cross sections. Tension and compression springs, springs under fluctuating loads, Leaf Springs: Stresses in leaf springs.

Equalized stresses, Energy stored in springs, Torsion, Belleville and Rubber springs.

08 Hours

UNIT - 4

Spur & Helical Gears: Spur Gears: Definitions, stresses in gear tooth: Lewis equation and form factor, Design for strength, Dynamic load and wear load. Helical Gears: Definitions, formative number of teeth, Design based on strength, dynamic and wear loads.

07 Hours

PART – B

UNIT - 5

Bevel and Worm Gears: Bevel Gears: Definitions, formative number of teeth, Design based on strength, dynamic and wear loads. Worm Gears: Definitions, Design based on strength, dynamic, wear loads and efficiency of worm gear drives.

07 Hours

UNIT - 6

Clutches & Brakes: Design of Clutches: Single plate, multi plate and cone clutches. Design of Brakes: Block and Band brakes: Self locking of brakes: Heat generation in Brakes.

05 Hours

UNIT - 7

Lubrication and Bearings: Lubricants and their properties, Mechanisms of Lubrication bearing modulus, coefficient of friction, minimum oil film thickness, Heat Generated, Heat dissipated, Bearing Materials, Examples of journal bearing and thrust bearing design.

07 Hours

UNIT - 8

IC Engine Parts: Design of piston, connecting rod and crank shaft.

05 Hours

DESIGN DATA HANDBOOK:

1. **Design Data Hand Book** , K. Lingaiah, McGraw Hill, 2nd Ed.
2. **Data Hand Book,** K. Mahadevan and Balaveera Reddy, CBS Publication
3. **Design Data Hand Book,** H.G. Patil, I. K. International Publisher, 2010.

TEXT BOOKS:

1. **Mechanical Engineering Design,** Joseph E Shigley and Charles R. Mischke. McGraw Hill International edition, 6th Edition 2003.
2. **Design of Machine Elements,** V. B Bhandari, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2nd Edition 2007

REFERNCE BOOKS:

1. **Machine Design,** Robert L. Norton, Pearson Education Asia, 2001.
2. **Design of Machine Elements,** M. F. Spotts, T. E. Shoup, L. E. Hornberger, S. R. Jayram and C. V. Venkatesh, Pearson Education, 2006.
3. **Machine Design,** Hall, Holowenko, Laughlin (Schaum's Outlines series) Adapted by S.K. Somani, Tata McGraw Hill Publishing Company Ltd., New Delhi, Special Indian Edition, 2008.
4. **Machine Design,** A CAD Approach: Andrew D DIMAROGONAS, John Wiley Sons, Inc, 2001.

HEAT AND MASS TRANSFER

Subject Code	**: 10ME63**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Introductory Concepts And Definitions: Modes of heat transfer: Basic laws governing conduction, convection, and radiation heat transfer; Thermal conductivity; convective heat transfer coefficient; radiation heat transfer;

combined heat transfer mechanism. Boundary conditions of 1^{st}, 2^{nd} and 3^{rd} kind

Conduction: Derivation of general three dimensional conduction equation in Cartesian coordinate, special cases, discussion on 3-D conduction in cylindrical and spherical coordinate systems (No derivation). One dimensional conduction equations in rectangular, cylindrical and spherical coordinates for plane and composite walls. Overall heat transfer coefficient. Thermal contact resistance.

07 Hours

UNIT - 2

Variable Thermal Conductivity: Derivation for heat flow and temperature distribution in plane wall. Critical thickness of insulation without heat generation, Thermal resistance concept & its importance. Heat transfer in extended surfaces of uniform cross-section without heat generation, Long fin, short fin with insulated tip and without insulated tip and fin connected between two heat sources. Fin efficiency and effectiveness. Numerical problems.

06 Hours

UNIT - 3

One-Dimensional Transient Conduction: Conduction in solids with negligible internal temperature gradient (Lumped system analysis), Use of Transient temperature charts (Heisler's charts) for transient conduction in slab, long cylinder and sphere; use of transient temperature charts for transient conduction in semi-infinite solids. Numerical Problems.

06 Hours

UNIT - 4

Concepts And Basic Relations In Boundary Layers: Flow over a body velocity boundary layer; critical Reynolds number; general expressions for drag coefficient and drag force; thermal boundary layer; general expression for local heat transfer coefficient; Average heat transfer coefficient; Nusselt number. Flow inside a duct- velocity boundary layer, hydrodynamic entrance length and hydro dynamically developed flow; flow through tubes (internal flow discussion only). Numericals based on empirical relation given in data handbook.

Free Or Natural Convection: Application of dimensional analysis for free convection- physical significance of Grashoff number; use of correlations of free convection in vertical, horizontal and inclined flat plates, vertical and horizontal cylinders and spheres, Numerical problems.

07 Hours

PART – B

UNIT - 5

Forced Convections: Applications of dimensional analysis for forced convection. Physical significance of Reynolds, Prandtl, Nusselt and Stanton numbers. Use of various correlations for hydro dynamically and thermally developed flows inside a duct, use of correlations for flow over a flat plate, over a cylinder and sphere. Numerical problems.

06 Hours

UNIT - 6

Heat Exchangers: Classification of heat exchangers; overall heat transfer coefficient, fouling and fouling factor; LMTD, Effectiveness-NTU methods of analysis of heat exchangers. Numerical problems.

06 Hours

UNIT - 7

Condensation And Boiling: Types of condensation (discussion only) Nusselt's theory for laminar condensation on a vertical flat surface; use of correlations for condensation on vertical flat surfaces, horizontal tube and horizontal tube banks; Reynolds number for condensate flow; regimes of pool boiling, pool boiling correlations. Numerical problems. Mass transfer definition and terms used in mass transfer analysis, Ficks First law of diffusion (no numericals).

07 Hours

UNIT - 8

Radiation Heat Transfer: Thermal radiation; definitions of various terms used in radiation heat transfer; Stefan-Boltzman law, Kirchoff's law, Planck's law and Wein's displacement law. Radiation heat exchange between two parallel infinite black surfaces, between two parallel infinite gray surfaces; effect of radiation shield; intensity of radiation and solid angle;

Lambert's law; radiation heat exchange between two finite surfaces- configuration factor or view factor. Numerical problems.

07 Hours

TEXT BOOKS:

1. **Heat & Mass transfer,** Tirumaleshwar, Pearson education 2006
2. **Heat transfer-A basic approach,** Ozisik, Tata McGraw Hill 2002

REFERENCE BOOKS:

1. **Heat transfer, a practical approach,** Yunus A- Cengel Tata Mc Graw Hill
2. **Principles of heat transfer,** Kreith Thomas Learning 2001
3. **Fundamentals of heat and mass transfer,** Frenk P. Incropera and David P. Dewitt, John Wiley and son's.
4. **Heat transfer,** P.K. Nag, Tata McGraw Hill 2002.

FINITE ELEMENT METHODS

Subject Code	**: 10ME64**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART-A

UNIT-1

Introduction: Equilibrium equations in elasticity subjected to body force, traction forces, and stress-strain relations for plane stress and plane strains. General description of Finite Element Method, Application and limitations. Types of elements based on geometry. Node numbering, Half band width.

07 Hours

UNIT-2

Basic Procedure: Euler - Lagrange equation for bar, beam (cantilever / simply supported fixed) Principle of virtual work, principle of minimum potential energy, Raleigh's Ritz method. Direct approach for stiffness matrix formulation of bar element. Galerkin's method.

07 Hours

UNIT-3

Interpolation Models: Interpolation polynomials- Linear, quadratic and cubic. Simplex complex and multiplex elements. 2D PASCAL's triangle. CST elements-Shape functions and Nodal load vector, Strain displacement matrix and Jacobian for triangular and rectangular element.

07 Hours

UNIT-4

Solution of 1-D Bars: Solutions of bars and stepped bars for displacements, reactions and stresses by using penalty approach and elimination approach. Guass-elimination technique.

06 Hours

PART-B

UNIT-5

Higher Order Elements: Langrange's interpolation, Higher order one dimensional elements-Quadratic and cubic element and their shape functions. Shape function of 2-D quadrilateral element-linear, quadric element Iso-parametric, Sub parametric and Super parametric elements. numerical integration : 1, 2 and 3 gauge point for 1D and 2D cases.

06 Hours

UNIT-6

Trusses: Stiffness matrix of Truss element. Numerical problems.

06 Hours

UNIT-7

Beams: Hermite shape functions for beam element, Derivation of stiffness matrix. Numerical problems of beams carrying concentrated, UDL and linearly varying loads.

06 Hours

UNIT-8

Heat Transfer: Steady state heat transfer, 1D heat conduction governing equations. Functional approach for heat conduction. Galerkin's approach for heat conduction. 1D heat transfer in thin fins.

07 Hours

TEXT BOOKS:

1. **Finite Elements in Engineering**, T.R.Chandrupatla, A.D Belegunde, 3rd Ed PHI.
2. **Finite Element Method in Engineering**, S.S. Rao, 4th Edition, Elsevier, 2006.

REFERENCE BOOKS:

1. **"Finite Element Methods for Engineers"** U.S. Dixit, Cengage Learning, 2009
2. **Concepts and applications of Finite Element Analysis**, R.D. Cook D.S Maltus, M.E Plesha, R.J.Witt, Wiley 4th Ed, 2009
3. **Finite Element Methods**, Daryl. L. Logon, Thomson Learning 3rd edition, 2001.
4. **Finite Element Method**, J.N.Reddy, McGraw -Hill International Edition.

MECHATRONICS & MICROPROCESSOR

Subject Code	**: 10ME65**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART - A

UNIT - 1

Introduction to Mechatronic Systems: Measurement and control systems Their elements and functions, Microprocessor based controllers.

06 Hours

UNIT - 2

Review of Transducers and Sensors: Definition and classification of transducers. Definition and classification of sensors. Principle of working and applications of light sensors, proximity sensors and Hall effect sensors.

07 Hours

UNIT - 3

Electrical Actuation Systems: Electrical systems, Mechanical switches, solid-state switches, solenoids, DC & AC motors, Stepper motors and their merits and demerits.

06 Hours

UNIT - 4

Signal Conditioning: Introduction to signal conditioning. The operational amplifier, Protection, Filtering, Wheatstone bridge, Digital signals Multiplexers, Data acquisition, Introduction to Digital system. Processing Pulse-modulation.

07 Hours

PART – B

UNIT - 5

Introduction to Microprocessors: Evolution of Microprocessor, Organization of Microprocessors (Preliminary concepts), basic concepts of programming of microprocessors.

Review of concepts - Boolean algebra, Logic Gates and Gate Networks, Binary & Decimal number systems, memory representation of positive and negative integers, maximum and minimum integers. Conversion of real, numbers, floating point notation, representation of floating point numbers, accuracy and range in floating point representation, overflow and underflow, addition of floating point numbers, character representation.

07 Hours

UNIT - 6

Logic Function: Data word representation. Basic elements of control systems 8085A processor architecture terminology such as CPU, memory and address, ALU, assembler data registers, Fetch cycle, write cycle, state, bus, interrupts. Micro Controllers. Difference between microprocessor and micro controllers. Requirements for control and their implementation in microcontrollers. Classification of micro controllers.

07 Hours

UNIT - 7

Organization & Programming of Microprocessors: Introduction to organization of INTEL 8085-Data and Address buses, Instruction set of 8085, programming the 8085, assembly language programming.

06 Hours

UNIT - 8

Central Processing Unit of Microprocessors: Introduction, timing and control unit basic concepts, Instruction and data flow, system timing, examples of INTEL 8085 and INTEL 4004 register organization.

06 Hours

TEXT BOOKS:

1. **Mechatronics,** W.Bolton, Longman, 2Ed, Pearson Publications, 2007.
2. **Microprocessor Architecture, Programming And Applications With 8085/8085A,** R.S. Ganokar, Wiley Eastern.

REFERENCE BOOKS:

1. **Mechatronics and Microprocessors,** K.P.Ramchandran, G.K.Vijayraghavan, M.S.Balasundran, Wiley, 1st Ed, 2009
2. **Mechatronics - Principles, Concepts and applications** – Nitaigour and Premchand Mahilik **-** Tata McGraw Hill**-** 2003.
3. **Mechatronics Principles & applications**, Godfrey C. Onwubolu, Elsevier..
4. **Introduction Mechatronics & Measurement systems**, David.G. Aliciatore & Michael. B. Bihistaned, Tata McGraw Hill, 2000.

HEAT & MASS TRANSFER LABORATORY

Subject Code	**: 10MEL67**	**IA Marks**	**: 25**
Hours/Week	**: 03**	**Exam Hours**	**: 03**
Total Hours	**: 42**	**Exam Marks**	**: 50**

PART - A

1. Determination of Thermal Conductivity of a Metal Rod.
2. Determination of Overall Heat Transfer Coefficient of a Composite wall.
3. Determination of Effectiveness on a Metallic fin.
4. Determination of Heat Transfer Coefficient in a free Convection on a vertical tube.

5. Determination of Heat Transfer Coefficient in a Forced Convention Flow through a Pipe.
6. Determination of Emissivity of a Surface.

21 Hours

PART – B

1. Determination of Steffan Boltzman Constant.
2. Determination of LMDT and Effectiveness in a Parallel Flow and Counter Flow Heat Exchangers
3. Experiments on Boiling of Liquid and Condensation of Vapour
4. Performance Test on a Vapour Compression Refrigeration.
5. Performance Test on a Vapour Compression Air - Conditioner
6. Experiment on Transient Conduction Heat Transfer

21 Hours

<u>Scheme for Examination:</u>

One Question from Part A	-	20 Marks (05 Write up +15)
One Question from Part B	-	20 Marks (05 Write up +15)
Viva-Voce	-	10 Marks

Total		**50 Marks**

COMPUTER AIDED MODELING AND ANALYSIS LABORATORY

Subject Code	**: 10MEL68**	**IA Marks**	**: 25**
Hours/Week	**: 03**	**Exam Hours**	**: 03**
Total Hours	**: 42**	**Exam Marks**	**: 50**

PART - A

Study of a FEA package and modeling stress analysis of

a. Bars of constant cross section area, tapered cross section area and stepped bar

6 Hours

b. Trusses – (Minimum 2 exercises)

3 Hours

c. Beams – Simply supported, cantilever, beams with UDL, beams with varying load etc (Minimum 6 exercises)

12 Hours

PART - B

a) Stress analysis of a rectangular plate with a circular hole

3 Hours

b) Thermal Analysis – 1D & 2D problem with conduction and convection boundary conditions(Minimum 4 exercises)

9 Hours

c) Dynamic Analysis
   1) Fixed – fixed beam for natural frequency determination
   2) Bar subjected to forcing function
   3) Fixed – fixed beam subjected to forcing function

9 Hours

REFERENCE BOOKS:

1. **A first course in the Finite element method,** Daryl L Logan, Thomason, Third Edition
2. **Fundaments of FEM,** Hutton – McGraw Hill, 2004
3. **Finite Element Analysis,** George R. Buchanan, Schaum Series

Scheme for Examination:

One Question from Part A	-	20 Marks (05 Write up +15)
One Question from Part B	-	20 Marks (05 Write up +15)
Viva-Voce	-	10 Marks

Total		**50 Marks**

HYDRAULICS AND PNEUMATICS

Subject Code	**: 10ME73**	**IA Marks**	**25**
Hours/Week	**: 04**	**Exam Hours**	**03**
Total Hours	**: 52**	**Exam Marks**	**100**

PART – A

UNIT -1

Introduction to Hydraulic Power: Definition of hydraulic system, advantages, limitations, applications, Pascal's law, structure of hydraulic control system, problems on Pascal's law.

The source of Hydraulic Power: Pumps Classification of pumps, Pumping theory of positive displacement pumps, construction and working of Gear pumps, Vane pumps, Piston pumps, fixed and variable displacement pumps, Pump performance characteristics, pump Selection factors, problems on pumps.

07 Hours

UNIT -2

Hydraulic Actuators and Motors: Classification cylinder and hydraulic motors, Linear Hydraulic Actuators [cylinders], single and double acting cylinder, Mechanics of Hydraulic Cylinder Loading, mounting arrangements, cushioning, special types of cylinders, problems on cylinders, construction and working of rotary actuators such as gear, vane, piston motors, Hydraulic Motor Theoretical Torque, Power and Flow Rate, Hydraulic Motor

Performance, problems, symbolic representation of hydraulic actuators (cylinders and motors).

06 Hours

UNIT - 3

Control Components in Hydraulic Systems: Classification of control valves, Directional Control Valves- Symbolic representation, constructional features of poppet, sliding spool, rotary type valves solenoid and pilot operated DCV, shuttle valve, check valves, Pressure control valves - types, direct operated types and pilot operated types. Flow Control Valves - compensated and non-compensated FCV, needle valve, temperature compensated, pressure compensated, pressure and temperature compensated FCV, symbolic representation.

07 Hours

UNIT - 4

Hydraulic Circuit Design And Analysis: Control of Single and Double - Acting Hydraulic Cylinder, Regenerative circuit, Pump Unloading Circuit, Double Pump Hydraulic System, Counter balance Valve Application, Hydraulic Cylinder Sequencing Circuits, Automatic cylinder reciprocating system, Locked Cylinder using Pilot check Valve, Cylinder synchronizing circuit using different methods, factors affecting synchronization, Hydraulic circuit for force multiplication, Speed Control of Hydraulic Cylinder, Speed Control of Hydraulic Motors, Safety circuit, Accumulators, types, construction and applications with circuits.

06 Hours

PART – B

UNIT - 5

Maintenance of Hydraulic System: Hydraulic Oils - Desirable properties, general type of Fluids, Sealing Devices, Reservoir System, Filters and Strainers, wear of Moving Parts due to solid -particle Contamination, temperature control (heat exchangers), Pressure switches, trouble shooting.

06 Hours

UNIT - 6

Introduction to Pneumatic Control: Definition of pneumatic system, advantages, limitations, applications, Choice of working medium. Characteristic of compressed air. Structure of Pneumatic control System, fluid conditioners and FRL unit.

Pneumatic Actuators: Linear cylinder - Types, Conventional type of cylinder- working, End position cushioning, seals, mounting arrangements- Applications. Rod - Less cylinders types, working, advantages, Rotary cylinders- types construction and application, symbols.

07 Hours

UNIT-7

Pneumatic Control Valves: DCV such as poppet, spool, suspended seat type slide valve, pressure control valves, flow control valves, types and construction, use of memory valve, Quick exhaust valve, time delay valve, shuttle valve, twin pressure valve, symbols. Simple Pneumatic Control: Direct and indirect actuation pneumatic cylinders, speed control of cylinders - supply air throttling and Exhaust air throttling and Exhaust air throttling.

Signal Processing Elements: Use of Logic gates - OR and AND gates in pneumatic applications. Practical Examples involving the use of logic gates, Pressure dependant controls- types - construction - practical applications, Time dependent controls principle. Construction, practical applications.

07 Hours

UNIT-8

Multi- Cylinder Application: Coordinated and sequential motion control, Motion and control diagrams. Signal elimination methods, Cascading method- principle, Practical application examples (up to two cylinders) using cascading method (using reversing valves).

Electro- Pneumatic Control: Principles - signal input and out put, pilot assisted solenoid control of directional control valves, Use of relay and contactors. Control circuitry for simple signal cylinder application.

Compressed Air: Production of compressed air- Compressors Preparation of compressed air-Driers, Filters, Regulators, Lubricators, Distribution of compressed air Piping layout.

06 Hours

TEXT BOOKS:

1. **"Fluid Power with Applications",** Anthony Esposito**,** Sixth edition, Pearson Education, Inc, 2000.
2. **'Pneumatics and Hydraulics',** Andrew Parr, Jaico Publishing Co

REFERENCE BOOKS:

1. **'Oil Hydraulic systems', Principles and Maintenance** S. R. Majurr, Tata McGraw Hill Publishing Company Ltd. - 2001
2. **'Industrial Hydraulics', Pippenger, Hicks"** McGraw Hill, New York
3. **'Hydraulic & Pneumatic Power for Production'**, Harry L. Stewart
4. **'Pneumatic Systems',** S. R. Majumdar, Tata McGraw Hill Publish 1995
5. **Power Hydraulics'** Michael J Pinches & John G Ashby, Prentice Hall

OPERATION RESEARCH

Subject Code	**: 10ME74**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART- A

UNIT -1

Introduction: Evolution of OR, definition of OR, scope of OR, application areas of OR, steps (phases) in OR study, characteristics and limitations of OR, models used in OR, linear programming (LP) problem-formulation and solution by graphical method.

04 Hours

UNIT -2

Solution Of Linear Programming Problems: The simplex method-canonical and standard form of an LP problem, slack, surplus and artificial variables, big M method and concept of duality, dual simplex method.

08 Hours

UNIT -3

Transportation Problem: Formulation of transportation problem, types, initial basic feasible solution using different methods, optimal solution by MODI method, degeneracy in transportation problems, application of transportation problem concept for maximization cases. Assignment Problem-formulation, types, application to maximization cases and travelling salesman problem.

08 Hours

UNIT -4

Integer Programming: Pure and mixed integer programming problems, solution of Integer programming problems-Gomory's all integer cutting plane method and mixed integer method, branch and bound method, Zero-One programming.

06 Hours

PART- B

UNIT -5

Pert-CPM Techniques: Introduction, network construction **-** rules, Fulkerson's rule for numbering the events, AON and AOA diagrams; Critical path method to find the expected completion time of a project, floats; PERT for finding expected duration of an activity and project, determining the probability of completing a project, predicting the completion time of project; crashing of simple projects.

08 Hours

UNIT -6

Queuing Theory: Queuing systems and their characteristics, Pure-birth and Pure-death models (only equations), empirical queuing models – M/M/1 and M/M/C models and their steady state performance analysis.

06 Hours

UNIT -7

Game Theory: Formulation of games, types, solution of games with saddle point, graphical method of solving mixed strategy games, dominance rule for solving mixed strategy games.

06 Hours

UNIT -8

Sequencing: Basic assumptions, sequencing 'n' jobs on single machine using priority rules, sequencing using Johnson's rule-'n' jobs on 2 machines, 'n' jobs on 3 machines, 'n' jobs on 'm' machines. Sequencing 2 jobs on 'm' machines using graphical method.

06 Hours

TEXT BOOKS:

1. **Operations Research,** P K Gupta and D S Hira, Chand Publications, New Delhi - 2007
2. **Operations Research,** Taha H A, Pearson Education

REFERNCE BOOKS:

1. **Operations Research,** A P Verma, S K Kataria &Sons, 2008
2. **Operations Research,** Paneerselvan, PHI
3. **Operations Research,** A M Natarajan, P Balasubramani, Pearson Education, 2005
4. **Introduction to Operations Research,** Hillier and Liberman,8^{th} Ed., McGraw Hill
5. **Operations Research** S.D. Sharma, Ledarnath Ramanath & Co, 2002

NON-CONVENTIONAL ENERGY SOURCES

Subject Code	**: 10ME754**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART A

UNIT – 1

Introduction : Energy source, India's production and reserves of commercial energy sources, need for non-conventional energy sources, energy alternatives, solar, thermal, photovoltaic. Water power, wind bio-mass, ocean temperature difference, tidal and waves, geothermal, tarsands and oil shale, nuclear (Brief descriptions); advantages and disadvantages, comparison (Qualitative and Quantitative).

6 Hours

UNIT – 2

Solar Radiation : Extra-Terrestrial radiation, spectral distribution of extra terrestrial radiation, solar constant, solar radiation at the earth's surface, beam, diffuse and global radiation, solar radiation data.

Measurement of Solar Radiation : Pyrometer, shading ring pyrheliometer, sunshine recorder, schematic diagrams and principle of working.

Solar Radiation Geometry : Flux on a plane surface, latitude, declination angle, surface azimuth angle, hour angle, zenith angle, solar altitude angle expression for the angle between the incident beam and the normal to a plane surface (No derivation) local apparent time. Apparent motion of sum, day length, numerical examples.

9 Hours

UNIT – 3

Radiation Flux on a Tilted Surface : Beam, diffuse and reflected radiation, expression for flux on a tilted surface (no derivations) numerical examples.

Solar Thermal Conversion : Collection and storage, thermal collection devices, liquid flat plate collectors, solar air heaters concentrating collectors (cylindrical, parabolic, paraboloid) (Quantitative analysis); sensible heat storage, latent heat storage, application of solar energy water heating. Space heating and cooling, active and passive systems, power generation, refrigeration. Distillation (Qualitative analysis) solar pond, principle of working, operational problems.

9 Hours

UNIT – 4

Performance Analysis of Liquid Flat Plate Collectors : General description, collector geometry, selective surface (qualitative discussion) basic energy-balance equation, stagnation temperature, transmissivity of the cover system, transmissivity – absorptivity product, numerical examples. The overall loss coefficient, correlation for the top loss coefficient, bottom and side loss coefficient, problems (all correlations to be provided). Temperature distribution between the collector tubes, collector heat removal factor, collector efficiency factor and collector flow factor, mean plate temperature, instantaneous efficiency (all expressions to be provided). Effect of various parameters on the collector performance; collector orientation, selective surface, fluid inlet temperature, number covers, dust.

4 Hours

PART B

UNIT – 5

Photovoltaic Conversion : Description, principle of working and characteristics, applications.

Wind Energy : Properties of wind, availability of wind energy in India, wind velocity and power from wind; major problems associated with wind power, wind machines; Types of wind machines and their characteristics, horizontal and vertical axis wind mills, elementary design principles; coefficient of performance of a wind mill rotor, aerodynamic considerations of wind mill design, numerical examples.

8 Hours

UNIT – 6

Tidal Power : Tides and waves as energy suppliers and their mechanics; fundamental characteristics of tidal power, harnessing tidal energy, limitations.

Ocean Thermal Energy Conversion : Principle of working, Rankine cycle, OTEC power stations in the world, problems associated with OTEC.

Geothermal Energy Conversion : Principle of working, types of geothermal station with schematic diagram, geothermal plants in the world, problems associated with geothermal conversion, scope of geothermal energy.

7 Hours

UNIT – 7

Energy from Bio Mass : Photosynthesis, photosynthetic oxygen production, energy plantation, bio gas production from organic wastes by anaerobic fermentation, description of bio-gas plants, transportation of bio-gas, problems involved with bio-gas production, application of bio-gas, application of bio-gas in engines, advantages.

4 Hours

UNIT – 8

Hydrogen Energy : Properties of Hydrogen with respected to its utilization as a renewable form of energy, sources of hydrogen, production of hydrogen, electrolysis of water, thermal decomposition of water, thermo chemical production bio-chemical production.

Storage & Transportation Methods : Gaseous, cryogenic and metal hydrides, application of hydrogen, domestic and industrial safe burning of hydrogen.

5 Hours

TEXT BOOKS:

1. Non-Conventional Energy Sources by *G.D Rai K*, Khanna Publishers, 2003.
2. Solar energy, by *Subhas P Sukhatme* – Tata McGraw Hill, 2^{nd} Edition, 1996.

REFERENCE BOOKS:

1. Renewable Energy Sources and Conversion Technology by *N.K.Bansal, Manfred Kleeman & Mechael Meliss*, Tata McGraw Hill, 2001.
2. Renewable Energy Resources, *John W.Twidell Anthony D. Weir El*, BG 2001.
3. Solar Power Engineering, *P.K.Nag*, Tata McGraw Hill, 2003.

CONTROL ENGINEERING

Subject Code	**: 10ME82**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Introduction: Concept of automatic controls, Open loop and closed loop systems, Concepts of feedback, requirements of an ideal control system, Types of controllers- Proportional, Integral Proportional Integral, Proportional Integral Differential controllers.

06 Hours

UNIT- 2

Mathematical Models: Transfer function models, models of mechanical systems, models of electrical circuits, DC and AC motors in control systems, models of thermal systems, models of hydraulic systems, pneumatic system, Analogous systems: Force voltage, Force current.

06 Hours

UNIT - 3

Block Diagrams and Signal Flow Graphs: Transfer Functions definition, function, block representation of systems elements, reduction of block diagrams, Signal flow graphs: Mason’s gain formula.

07 **Hours**

UNIT- 4

Transient and Steady State Response Analysis: Introduction, first order and second order system response to step, ramp and impulse inputs, concepts of time constant and its importance in speed of response. System stability: Routh's-Hurwitz Criterion.

06 Hours

PART - B

UNIT - 5

Frequency Response Analysis: Polar plots, Nyquist stability criterion, Stability analysis, Relative stability concepts, Gain margin and phase margin, M&N circles.

06 Hours

UNIT - 6

Frequency Response Analysis Using Bode Plots: Bode attenuation diagrams, Stability analysis using Bode plots, Simplified Bode Diagrams.

07 Hours

UNIT - 7

Root Locus Plots: Definition of root loci, General rules for constructing root loci, Analysis using root locus plots.

06 Hours

UNIT 8

System Compensation and State Variable Characteristics of Linear Systems: Series and feedback compensation, Introduction to state concepts, state equation of linear continuous data system. Matrix representation of state equations, controllability and observability, Kalman and Gilberts test.

07 Hours

TEXT BOOKS :

1. **Modern Control Engineering,** Katsuhiko Ogatta, Pearson Education,2004.
2. **Control Systems Principles and Design,** M.Gopal, 3rd Ed., TMH,2000.

REFERENCE BOOKS :

1. **Modern Control Systems**, Richard.C.Dorf and Robert.H.Bishop, Addison Wesley,1999
2. **System dynamics & control**, Eronini-Umez, Thomson Asia pte Ltd. singapore, 2002.
3. **Feedback Control System**, Schaum's series. 2001.

ELECTIVE-IV (GROUP - D)

TRIBOLOGY

Subject Code	**: 10ME831**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Introduction To Tribology: Properties of oils and equation of flow: Viscosity, Newton's Law of viscosity, Hagen-Poiseuille Law, Flow between parallel stationary planes, viscosity measuring apparatus. Lubrication principles, classification of lubricants.

06 Hours

UNIT - 2

Hydrodynamic Lubrication: Friction forces and power loss in lightly loaded bearing, Petroff's law, Tower's experiments, mechanism of pressure development in an oil film, Reynold's investigation and Reynold's equation in 2D.

06 Hours

UNIT - 3

Idealized Journal Bearing: Introduction to idealized journal bearing, load carrying capacity, condition for equilibrium, Sommerfeld's numbers and significance of it; Partial bearings, end leakages in journal bearing, numerical problems.

07 Hours

UNIT - 4

Slider / Pad Bearing With A Fixed And Pivoted Shoe: Pressure distribution, Load carrying capacity, coefficient of friction, frictional resistance in a pivoted shoe bearing, numerical examples.

07 Hours

PART – B

UNIT - 5

Oil Flow And Thermal Equilibrium Of Journal Bearing: Oil flow through bearings, self-contained journal bearings, bearings lubricated under pressure, thermal equilibrium of journal bearings.

06 Hours

UNIT - 6

Hydrostatic Lubrication: Introduction to hydrostatic lubrication, hydrostatic step bearings, load carrying capacity and oil flow through the hydrostatic step bearing.

06 Hours

UNIT - 7

Bearing Materials: Commonly used bearings materials, properties of typical bearing materials. Advantages and disadvantages of bearing materials.

07 Hours

UNIT - 8

Behavior Of Tribological Components: Selection, friction, Wear of ceramic materials, wear measurements, effects of speed, temperature and pressure. Tribological measures, Material selection, improved design, surface engineering

07 Hours

TEXT BOOKS:

1. **Fundamentals of Tribology** , Basu S K., Sengupta A N., Ahuja B. B., , PHI 2006
2. **Introduction to Tribology Bearings,** Mujumdar B. C., S. Chand company pvt. Ltd 2008.

REFERENEC BOOKS:

1. **Theory and Practice of Lubrication for Engineers,** Fuller, D., New York company 1998
2. **Principles and Applications of Tribology,** Moore, Pergamaon press 1998
3. **Tribology in Industries,** Srivastava S., S Chand and Company limited, Delhi 2002
4. **Lubrication of bearings – Theoretical Principles and Design,** Redzimovskay E I., Oxford press company 2000

AUTOMOTIVE ENGINEERING

Subject Code	**: 10ME844**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Engine Components And Cooling & Lubrication Systems: Spark Ignition (SI) & Compression Ignition (CI) engines, cylinder – arrangements and their relatives merits, Liners, Piston, connecting rod, crankshaft, valves, valve actuating mechanisms, valve and port timing diagrams, Types of combustion chambers for S.I.Engine and C.I.Engines, Compression ratio, methods of a Swirl generation, choice of materials for different engine components, engine positioning, cooling requirements, methods of cooling, thermostat valves, different lubrication arrangements.

07 Hours

UNIT - 2

Fuels, Fuel Supply Systems For Si And Ci Engines: Conventional fuels, alternative fuels, normal and abnormal combustion, cetane and octane numbers, Fuel mixture requirements for SI engines, types of carburetors, C.D.& C.C. carburetors, multi point and single point fuel injection systems, fuel transfer pumps, Fuel filters, fuel injection pumps and injectors.

07 Hours

UNIT - 3

Superchargers And Turbochargers: Naturally aspirated engines, Forced Induction, Types pf superchargers, Turbocharger construction and operation, Intercooler, Turbocharger lag.

06 Hours

UNIT - 4

Ignition Systems: Battery Ignition systems, magneto Ignition system, Transistor assist contacts. Electronic Ignition, Automatic Ignition advance systems.

06 Hours

PART – B

UNIT - 5

Power Trains: General arrangement of clutch, Principle of friction clutches, Torque transmitted, Constructional details, Fluid flywheel, Single plate, multi-plate and centrifugal clutches.

Gear box: Necessity for gear ratios in transmission, synchromesh gear boxes, 3, 4 and 5 speed gear boxes. Free wheeling mechanism, planetary gears systems, over drives, fluid coupling and torque converters, Epicyclic gear box, principle of automatic transmission, calculation of gear ratios, Numerical calculations for torque transmission by clutches.

08 Hours

UNIT - 6

Drive To Wheels: Propeller shaft and universal joints, Hotchkiss and torque tube drives, differential, rear axle, different arrangements of fixing the wheels to rear axle, steering geometry, camber, king pin inclination, included angle, castor, toe in & toe out, condition for exact steering, steering gears, power steering, general arrangements of links and stub axle, over steer, under steer and neutral steer, numerical problems, types of chassis frames.

06 Hours

UNIT - 7

Suspension, Springs And Brakes: Requirements, Torsion bar suspension systems, leaf spring, coil spring, independent suspension for front wheel and rear wheel. Air suspension system.

Types of brakes, mechanical compressed air, vacuum and hydraulic braking systems, construction and working of master and wheel cylinder, brake shoe arrangements, Disk brakes, drum brakes, Antilock –Braking systems, purpose and operation of antilock-braking system, ABS Hydraulic Unit, Rear-wheel antilock & Numerical Problems

06 Hours

UNIT - 8

Automotive Emission Control Systems: Automotive emission controls, Controlling crankcase emissions, Controlling evaporative emissions, Cleaning the exhaust gas, Controlling the air-fuel mixture, Controlling the combustion process, Exhaust gas recirculation, Treating the exhaust gas, Air-injection system, Air-aspirator system, Catalytic converter, Emission standards- Euro I, II, III and IV norms, Bharat Stage II, III norms.

6 Hours

TEXT BOOKS:

1. **Automotive mechanics,** William H Crouse & Donald L Anglin, 10th Edition Tata McGraw Hill Publishing Company Ltd., 2007
2. **Automotive Mechanics,** S. Srinivasan, 2nd Ed., Tata McGraw Hill 2003.

REFERENCE BOOKS:

1. **Automotive mechanics: Principles and Practices**, Joseph Heitner, D Van Nostrand Company, Inc
2. **Fundamentals of Automobile Engineering,** K.K.Ramalingam, Scitech Publications (India) Pvt. Ltd.
3. **Automobile Engineering**, R. B. Gupta, Satya Prakashan, 4th edn. 1984.
4. **Automobile engineering**, Kirpal Singh. Vol I and II 2002.

MANAGEMENT & ORGANIZATIONAL BEHAVIOR

Subject Code	: 14MBA11	IA Marks	: 50
No. of Lecture Hours / Week	: 04	Exam Hours	: 03
Total Number of Lecture Hours	: 56	Exam Marks	: 100
Practical Component	: 01 Hour / Week		

Objectives:

1. To make students understand fundamental concepts and principles of management, including the basic roles, skills, and functions ofmanagement
2. To make students knowledgeable of historical development, theoretical aspects and practice application of managerialprocess
3. To understand the basic concepts and theories underlying individual behavior besides developing better insights into one’s ownself
4. To make students aware of Individual behavior in groups, dynamics of groups and team building besides developing a better awareness of how they can be better facilitators for building effective teams as leadersthemselves

Part A- Principles of Management

Module1: (6 Hours)
Introduction: Management: Introduction, definition of management, nature, purpose and functions, levels and types of managers, managerial roles, skills for managers, evolution of management thought, Fayol’s fourteen principles of management and recent trends in management.

Module2: (12 Hours)
Planning and Organizing:
Planning: Nature of planning, planning process, objectives, MBO, strategies, level of strategies, policies, methods and programs, planning premises, decision making, process of decision making, types of decisions, techniques in decision making.
Organizing: Organization structure, formal and informal organizations, principles of organizations-chain of command, span of control, delegation, decentralization, and empowerment. Functional, divisional, geographical, customer based and matrix organizations, tram based structures, virtual organizations, boundary lessorganizations.

Module3: (4 Hours)
Controlling: Controlling, importance of controlling, controlling process, types of control, factors influencing control effectiveness.

RECOMMENDED BOOKS

1. Essentials of Management-Koontz, 8/e, McGraw Hill
2. Management: Text and Cases-VSP Rao, ExcelBOOKS
3. MGMT, An Innovative approach to teaching and learning Principles of Management, Chuck Williams, Cengage Publications,2010
4. Principles and practices of Management, Kiran Nerkar, Vilas Chopde, Dreamtech Press,2011

5. Management Theory & practice – Chandan J. S, Vikas PublishingHouse.
6. Management Theory & Practice Text & Cases – Subba Rao P &HimaBindu, Himalaya Publication.

Part B- Organizational Behaviour

Module4: **(4 hours)**

Introduction: Organizational Behaviour: Introduction, definition, historical development, fundamental principles of OB, contributing disciplines, challenges and opportunities.

Module5: **(16 Hours)**

Foundations of Individual Behaviour: Individual behaviour: Foundations of individual behaviour. Ability: Intellectual abilities, Physical ability, the role of disabilities.
Personality: Meaning, formation, determinants, traits of personality, big five and MBTI, personality attributes influencing OB.
Attitude: Formation, components of attitudes, relation between attitude and behaviour.
Perception: Process of perception, factors influencing perception, link between perception and individual decision making.
Emotions: Affect, mood and emotion and their significance, basic emotions, emotional intelligence, self-awareness, self-management, social awareness, relationship management.

Module6: **(10 Hours)**

Motivation and Leadership:
Motivation: Meaning, theories of motivation-needs theory, two factor theory, Theory X and Y, application of motivational theories.
Leadership: Meaning, styles of leadership, leadership theories, trait theory, behavioural theories, managerial grid, situational theories-Fiedler's model, SLT, transactional and transformation leadership.

Module7: **(4 Hours)**

Group Behaviour: Definition, types, formation of groups, building effective teams. Conflict: Meaning, nature, types, process of conflict, conflict resolution.
Power and politics: Basis of power, effectiveness of power tactics. The ethics of behaving politically.

Practical Component

1. Studying organizational structures of any 10 companies and classifying them into different types of organizations which are studied in Module 2 and justifying why such structures are chosen by thoseorganizations.
2. Preparing the leadership profiles of any 5 business leaders and studying their leadership qualities and behaviours with respects to the trait, behavioural and contingency theoriesstudied.
3. Identifying any five job profiles and listing the various types abilities required for those jobs and also the personality traits/attributes required for the jobsidentified.

Note: Faculty can either identify the organizations/ leaders/jobs or students can be allowed to choose the same.

RECOMMENDED BOOKS:

1. Organizational behaviour, Stephen P Robbins, Timothy A. Judge, Neharika Vohra, Pearson, 14th Edition,2012.
2. Introduction to OrganisationalBehaviour – Michael Butler, Jaico PublishingHouse,
3. Organization Behaviour – Ashwathappa, Himalaya PublicationHouse
4. ORGB - Nelson, Quick, Khanelwal, 2/e, Cengage Learning,2012.
5. Organizational Behaviour - Anada Das Gupta, Biztantra,2011.
6. Organizational Behaviour: A modern approach - Arun Kumar and Meenakshi, Vikas Publishing House,2011.
7. Organizational Behaviour – Rao V. S. P, Excel BOOKS,2009.

REFERENCE BOOKS:

1. Organizational Behaviour - Fred Luthans, 12/e, McGraw Hill International,2011.
2. Management and Organizational Behaviour - Laurie J Mullins, Pearsoneducation
3. Fundamentals of Organizational Behaviour - Slocum/Hillriegel.CengeneLearning
4. Organizational Behaviour - Aquinas P. G, ExcelBOOKS.

ACCOUNTING FOR MANAGERS

Subject Code	: 14MBA13	IA Marks	: 50
No. of Lecture Hours / Week	: 04	Exam Hours	: 03
Total Number of Lecture Hours	: 56	Exam Marks	: 100
Practical Component	: 01 Hour / Week		

Objectives:

1. Explain fundamental accounting concepts, the elements of financial statements, and basic accountingvocabulary
2. Explain and use the accounting equation in basic financial analysis and explain how the equation is related to the financialstatements.
3. Prepare basic entries for business transactions and present the data in an accurate and meaningfulmanner
4. Prepare basic financial statements and explain the articulation between the basic statements.
5. To analyze a company's financial statements and come to a reasoned conclusion about the financial situation of thecompany.

Module1: **(4 Hours)**
Introduction to Accounting: Need and Types of Accounting, Users of Accounting, concepts and conventions of Accounting, Accounting Equation (problems on accounting equation).

Module2: **(10 Hours)**
Preparation of books of Accounts: Journals, Subsidiary books, three column cash book, ledgers and trial balance. Depreciation- Straight line and Written down Value Methods.

Module3: **(12 Hours)**
Preparation of Financial Statements: Preparation of final accounts of sole traders. Preparation of final accounts / statement of companies-both horizontal & vertical form of financial statements. (Basic problems on Final accounts of companies)

Module4: **(14 Hours)**
Analysis of Financial Statements: Comparative, common size and trend analysis, Ratio Analysis, Preparation of financial statements using ratios, Preparation of Cash flow Statement (only indirect method).

Module5: **(6 Hours)**
Accounting Standards and IFRS: Need for accounting standards. IFRS and proposed changes in Indian Accounting Standards.

Module6: **(4 Hours)**
Emerging issues in Accounting: Corporate Governance and clause 49 of the listing agreement, Human Resource Accounting, Forensic Accounting, Window Dressing-Sustainability Reporting

Module7: (6 Hours)

Fundamentals of Taxation: Overview of Heads of Income, deductions u/s 80C, Income Tax Rates and Returns – For Individuals only (Only Theory)

Practical Components:

1. Collecting Annual reports of the companies and analyzing the financial statements using different techniques and presenting the same in theclass.
2. Analyzing the companies' cash flow statements and presenting the same in theclass.
3. Exposing the students to usage of accounting software's (PreferablyTally)
4. Filling up of ITRforms
5. Identify the sustainability report of a company and study thecontents.

RECOMMENDED BOOKS:

1. Narayanaswamy R Financial Accounting: A Managerial Perspective –, 5/e , PHI, 2014
2. Maheswari S. N,Maheswari Sharad K. Maheswari ,A Text book of Accounting For Management , , 2/e, Vikas Publishing house (P)Ltd.
3. Tulsian P. C, Financial Accounting, 1/e, PearsonEducation.
4. Madegowda J, Accounting for managers, Himalaya PublishingHouse.
5. Gupta R. L &Radhaswamy M, Advanced Accountancy, Sultan ChandPublications
6. Jain S. P and Narang K L. Financial Accounting -, KalyaniPublishers
7. Business Taxation, Akhileshwar Pathak and SavanGodiawala, 2/e, McGraw Hill Education(India) Pvt. Ltd.2013

REFERENCE BOOKS:

1. Ambrish Gupta, Financial Accounting for Management: An Analytical Perspective, 4/e, PearsonEducation.
2. Ashish K Bhattacharya, Introduction to Financial Statement Analysis, ElsevierIndia
3. Raman B. S, Financial Accounting –, Vol I & Vol II, United Publishers,1/e, 2009.
4. Gary A. Porter & Curtis L. Norton, Financial Accounting (IFRS update)–, 6/e, Cengage Learning.
5. Arora M. N., Accounting For Management, Himalaya PublishingHouse.
6. Bhattacharya Essentials of Financial Accounting (Based on IFRS) , 2/e, Prentice Hall India,
7. Comdex (Computer and Financial Accounting with Tally 9.0 Course Kit). - Dream Tech.
8. Namrata Agrawal Comdex – Tally 9, -DreamTech.
9. Jasmine Kaur, IFRS: A Practical approach, McGrawHill.

BUSINESS, GOVERNMENT AND SOCIETY

Subject Code	: 14MBA14	IA Marks	: 50
No. of Lecture Hours / Week	: 04	Exam Hours	: 03
Total Number of Lecture Hours	: 56	Exam Marks	: 100
Practical Component	: 01 Hour / Week		

Objectives:

1. To enable students to understand the challenges and complexities faced by businesses and their leaders as they endeavor maximize returns while responsibly managing their duties to stakeholders andsociety.
2. To help students to understand the rationale for government interventions in market systems.
3. To help students develop an understanding of Social Responsibility and make their own judgments as to the proper balance of attention to multiple bottomlines.
4. To help students develop the skills needed to work through ethicaldilemmas

Module1: (8 Hours)

The Study of Business, Government and Society (BGS): Importance of BGS to Managers –Models of BGS relationships – Market Capitalism Model, Dominance Model, Countervailing Forces Model and Stakeholder Model – Global perspective – Historical Perspective.

Module2: (8 Hours)

Corporate Governance: Introduction, Definition, Market model and control model, OECD on corporate governance, A historical perspective of corporate governance, Issues in corporate governance, relevance of corporate governance, need and importance of corporate governance, benefits of good corporate governance, the concept of corporate, the concept of governance, theoretical basis for corporate governance, obligation to society, obligation to investors, obligation to employees, obligation to customers, managerial obligation, Indian cases

Module3: (4 Hours)

Public Policies: The role of public policies in governing business, Government and public policy, classification of public policy, areas of public policy, need for public policy in business and levels of public policy.

Module4: (8 Hours)

Environmental concerns and corporations: History of environmentalism, environmental preservation-role of stakeholders, international issues, sustainable development, costs and benefits of environmental regulation, industrial pollution, role of corporate in environmental management, waste management and pollution control, key strategies for prevention of pollution, environmental audit, Laws governing environment.

Module5: (8 Hours)

Business Ethics: Meaning of ethics, business ethics, relation between ethics and business ethics, evolution of business ethics, nature of business ethics, scope, need and purpose, importance, approaches to business ethics, sources of ethical knowledge for business roots of unethicalbehaviour, ethical decision making, some unethical issues, benefits from managing ethics at workplace, ethical organizations

Module6: (6 Hours)

Corporate Social Responsibility: Types and nature of social responsibilities, CSR principles and strategies, models of CSR, Best practices of CSR, Need of CSR, Arguments for and against CSR, CSR in Indian perspective, Indian examples.

Module7: (14 Hours)

Business Law: Law of contract - meaning of contract, agreement, essential elements of a valid contract. Law of agency- meaning, creation and termination of agency.Bailment and Pledge - meaning, rights and duties of bailor and bailee.

Negotiable Instruments Act 1881: Nature and Characteristics of Negotiable instruments, Kinds of Negotiable Instruments – Promissory Notes, Bills of Exchange and Cheques. Discharge and Dishonour of Negotiable Instruments.

Sale of Goods Act 1930: Definition of Sale, Sale v/s Agreement to Sell, Goods, Condition and Warranties, Express and Implied Condition, "Doctrine of Caveat Emptor", Right and duties of Unpaid Seller.

Meaning, scope and objectives of - Intellectual property law, law relating to patents, law relating to copyrights, law relating to trade mark.

Practical Components:

1. Students are expected to study any five CSR initiatives by Indian organizations and submit a report for thesame.
2. A group assignment on "The relationship between Business, Government and Society in Indian Context and relating the same with respect the models studied in Module1.
3. Case studies/Role plays related ethical issues in business with respect to Indian context.

RECOMMENDED BOOKS:

1. Business, Government, and Society: A Managerial Perspective, Text and Cases – John F. Steiner, 12/e, McGraw-Hill,2011.
2. Business and Government – Francis Cherunilam,HPH.
3. Corporate Governance: principles, policies and practices – Fernando A. C, 2/e, Pearson,2011.
4. Business Ethics and Corporate Governance - Ghosh B. N, Tata McGraw-Hill,2012.
5. Business Law for Managers, Goel P. K, Biztantra,2012.
6. CorporateSocialResponsibility:AStudyofCSRPracticesinIndianIndustry,Baxi C. V &Rupamanjari Sinha Ray, Vikas Publishing House, 2012.

REFERENCE BOOKS:

1. Business and Society - Lawrence and Weber, 12/e, Tata McGraw- Hill,2010.
2. Business Ethics - Bajaj P. S & Raj Agarwal, Biztantra,2012.
3. Corporate Governance - Keshoo Prasad, 2/e,PHI.
4. Corporate Governance, Ethics and social responsibility - Balachandran V, &Chandrashekharan V, 2/e, PHI,2011.
5. Corporate Governance – Machiraju H. R,HPH.
6. Business Ethics and Corporate Governance – Prabakaran S, ExcelBOOKS.
7. Corporate Goverance – Badi N. V, Vrinda Publications,2012.
8. Civic Sense – Prakash Pillappa, Excel BOOKS,2012.

MARKETING MANAGEMENT

Subject Code	: 14MBA15	IA Marks	: 50
No. of Lecture Hours / Week	: 04	Exam Hours	: 03
Total Number of Lecture Hours	: 56	Exam Marks	: 100
Practical Component	: 01 Hour / Week		

Objectives:

1. To provide students an insight to basic concepts of marketingmanagement.
2. To help students understand various marketing tools/models for solving marketing problems in the changing businessenvironment.
3. To understand fundamental premise underlying market drivenstrategies.

Module1: **(8 hours)**

Introduction to Marketing: Introduction, Definitions of market and marketing, The Exchange Process, Elements of Marketing Concept, Functions of Marketing, Old Concept or Product- oriented Concept, New or Modern or Customer- oriented Concept, Marketing Environment, Techniques used in environment analysis, Characteristics (Micro and Macro), Marketing to the 21st century customer

Module2: **(8 hours)**

Consumer Behaviour Analysis: Meaning and Characteristics, Importance, Factors Influencing Consumer Behaviour, Consumer Purchase Decision Process, Buying Roles, Buying Motives, Buyer Behaviour Models

Module3: **(8 hours)**

Market Segmentation, Targeting & Positioning: Concept of Market Segmentation, Benefits, Requisites of Effective Segmentation, Bases for Segmenting Consumer Markets, Market Segmentation Strategies.

Targeting - Bases for identifying target Customer target Marketing strategies,

Positioning - Meaning, Product Differentiation Strategies, Tasks involved in Positioning.

Branding - Concept of Branding, Types, Brand Equity, Brandingstrategies.

Module4: **(8 hours)**

Managing the Product: Concept, product hierarchy, product line, product mix, product mix strategies, Product life cycle and its strategies, New Product Development, packing as a marketing tool, Role of labelling in packing.

Module-5 **(8hours)**

Pricing decisions: Significance of pricing, factor influencing pricing (Internal factor and External factor), objectives, Pricing Strategies-Value based, Cost based, Market based, Competitor based, Pricing Procedure.

Marketing Channels: Meaning, Purpose, Factors Affecting Channel Choice, Channel Design, Channel Management Decision, Channel Conflict, Designing a physical Distribution System, Network Marketing,

Module 6: **(10 hours)**

Integrated Marketing communication: Meaning and Importance of Marketing Communication, Communication Objectives, Steps in Developing Effective Communication Advertising - Objectives, Ad Budget, AIDA Model, Advertising Copy Deciding Media, Evaluating Advertising Effectiveness,
Sales Promotion - Kinds of Promotion, Tools and Techniques of Sales Promotion, Push and Pull Strategies
Personnel Selling - Concept, Features, Functions, and Steps involved in personal Selling.
Publicity - Meaning, Objectives, Types, Functions of Public relations,
Direct Marketing - Meaning, Features, Functions, Basic Concepts of E-Commerce, E-Business

Module7: **(6 hours)**

Marketing Planning: Meaning, Concepts, Steps involved in Marketing planning,
Marketing Audit- Meaning, Feature, Various components of Marketing Audit
Marketing Strategy-Analysis of Industry and Competition, Strategic Planning Process,

Case Studies of Indian Context

Practical Components

1. Analyze Product Life Cycle of few Products like-Electronic goods,Computers.
2. Analyze Packaging strategies used by FMCGcompanies
3. Analyze Marketing strategies/planning used by automobile cosmetic and FMCG companies

RECOMMENDED BOOKS

1. MarketingManagement: A South Asian Perspective – Kotler, Keller, Koshy &Jha, 13/e, Pearson Education,2012
2. Marketing Management, Ramaswamy V. S. &Namakumari S. 4/e, TMH,2014
3. Fundamentals of Marketing Management, Etzel M.J BJ Walker & William J. Stanton, 14/e, MH,2012
4. Marketing Management Concepts & Cases–S.A.Sherlekar
5. Marketing Management, Tapan Panda, 2/e, ExcelPublication

REFERENCE BOOKS

1. Marketing Management, Arun Kumar &Meenakshi N, 2/e, Vikas,2012
2. Applied Case Studies in Marketing – Shajahan S, Primus BOOKS,2011.
3. Marketing Management – Karunakaran, HPH.
4. Marketing in India: Text and Cases- Neelamegham S, 4/e,Vikas.
5. Marketing- Lamb, Hair, Mc Danniel, 7/e, Cengage Learning2012.
6. Marketing: Marketing in the 21st Century - Evans & Berman, 2/e, Cengage Learning, 2005.

Marketing: Planning, Implementation, and Control -William M. Pride, Ferrell O. C, Cengage Learning, 2010.

HUMAN RESOURCE MANAGEMENT

Subject Code	: 14MBA21	IA Marks	: 50
No. of Lecture Hours / Week	: 04	Exam Hours	: 03
Total Number of Lecture Hours	: 56	Exam Marks	: 100
Practical Component	: 01 Hour / Week		

OBJECTIVES:

1. To develop a meaningful understanding of HRM theory, functions andpractices.
2. To apply HRM concepts and skills across various types oforganizations.

Module1: **(8 hours)**
Human Resource Management:
Introduction, meaning, nature, scope of HRM.Importance and Evolution of the concept of HRM.Major functions of HRM, Principles of HRM, Organization of Personnel department, Role of HR Manager. HRM's evolving role in the 21^{st} century.

Module2: **(8 hours)**
Job Analysis: Meaning, process of Job Analysis, methods of collecting job analysis data, Job Description and Job Specification, Role Analysis.
Human Resource Planning: Objectives, Importance and process of Human Resource Planning, Effective HRP.

Module3: **(8 hours)**
Recruitment: Definition, Constraints and Challenges, Sources and Methods of Recruitment, New Approaches to recruitment.
Selection: Definition and Process of Selection.
Placement: Meaning, Induction/Orientation, Internal Mobility, Transfer, Promotion, Demotion and Employee Separation.

Module4: **(8 hours)**
Training and development: Training v/s development, Training v/s Education, Systematic Approach to Training, Training Methods, Executive Development, Methods and Development of Management Development, Career and SuccessionPlanning.

Module5: **(8 hours)**
Performance Appraisal: Concept of Performance Appraisal, the Performance Appraisal Process, Methods of Performance Appraisal, Essential Characteristic of an Effective Appraisal System.
Compensation: Objectives of Compensation Planning, Job Evaluation, Compensation Pay Structure in India, Wage and Salary Administration, Factors Influencing Compensation Levels, Executive Compensation.

Module6: (8 hours)

Employee Welfare: Introduction, Types of Welfare Facilities and Statutory Provisions.
Employee Grievances: Employee Grievance procedure, Grievances Management in Indian Industry.
Discipline: Meaning, approaches to discipline, essential of a good disciplinary system, managing difficult employees.

Module7: (8 hours)

Industrial Relations: Overview of industrial relations and industrial conflict.
Industrial disputes: preventive and settlement machinery, collective bargaining, industrial relations scenario: current issues and future challenges.

Practical Component:

1. Give a case and ask the students to prepare the recruitment advertisement for a newspaper.
2. Expose students to standard selection tests followed in varioussectors.
3. Exploring training and developmentpractices.
4. Exploring performance appraisal practices in varioussectors.
5. Exploring employee separationpractices.
6. Give a job analysis case and ask the students to prepare job description and job specification.
7. Ask the students to prepare an appointment letter for the post of office manager of a company known toyou.

RECOMMENDED BOOKS:

1. Human Resource Management – Rao V. S. P, Excel BOOKS,2010
2. Human Resource Management - Cynthia D. Fisher, 3/e, AIPD,Chennai.
3. Human Resources Management: A South Asian Perspective, Snell, Bohlander, & Vohra, Cengage Learning, 16th Rep., 2012.
4. Human Resource Management - Lawrence S. Kleeman, Biztantra ,2012.
5. Human Resource Management – Aswathappa KHPH

REFERENCE BOOKS:

1. Human Resource Management - John M. Ivancevich, 10/e, McGrawHill.
2. Human Resource Management in practice - Srinivas R. Kandula, PHI,2009
3. Managing Human Resources - Luis R Gomez-Mejia, David B. Balkin, Robert L. Cardy,6/e, PHI,2010.
4. P.Subba Rao, Human Resource Management & Industrial relations, Himalaya Publishing House,Mumbai.

FINANCIAL MANAGEMENT

Subject Code	: 14MBA22	IA Marks	: 50
No. of Lecture Hours / Week	: 04	Exam Hours	: 03
Total Number of Lecture Hours	: 56	Exam Marks	: 100
Practical Component	: 01 Hour / Week		

Objectives:

1. To explain the basic functions and responsibilities of a financial department in a business/firm;
2. To elaborate the key decision areas in financial management-investment, financing, dividend and working capitalmanagement
3. To explain the various techniques of evaluation of investmentproposals
4. To discuss the various factors to be considered in designing the target capital structure.

Module1: (10 Hours)

Financial management – Introduction to financial management, objectives of financial management – profit maximization and wealth maximization.Changing role of finance managers. Interface of Financial Management with other functional areas.

Indian financial system – Primary market, Secondary market – stocks & commodities market, Money market, Forex markets. (Theory Only)

Sources of Financing: Shares, Debentures, Term loans, Lease financing, Hybrid financing, Venture Capital, Angel investing and private equity, Warrants and convertibles (Theory Only)

Module2: (10 Hours)

Time value of money –Future value of single cash flow & annuity, present value of single cash flow, annuity & perpetuity.Simple interest & Compound interest, Capital recovery & loan amortization.

Module3: (8 Hours)

Cost of Capital Cost of capital – basic concepts. Cost of debenture capital, cost of preferential capital, cost of term loans, cost of equity capital (Dividend discounting and CAPM model). Cost of retained earnings. Determination of Weighted average cost of capital (WACC) and Marginal cost of capital.

Module4: (10 Hours)

Investment decisions -– Investment evaluation techniques – Net present value, Internal rate of return, Modified internal rate of return, Profitability index, Payback period, discounted payback period, accounting rate of return. Estimation of cash flow for new project, replacement projects.

Module5: (6 Hours)

Working capital management – factors influencing working capital requirements. Current asset policy and current asset finance policy. Determination of operating cycle and cash cycle. Estimation of working capital requirements of a firm (Does not include Cash, Inventory & ReceivablesManagement)

Module6: (8 Hours)

Capital structure and dividend decisions – Planning the capital structure. (No capital structure theories to be covered) Leverages – Determination of operating leverage, financial leverage and total leverage. Dividend policy – Factors affecting the dividend policy - dividend policies- stable dividend, stable payout. (No dividend theories to becovered).

Module7: (4 Hours)

Emerging Issues in Financial management: Derivatives, Mergers and Acquisitions, Behavioural Finance, Financial Modelling, Financial engineering, risk management. (Theory Only)**.**

RECOMMENDED BOOKS:

1. PrasannaChandra ,Financial Management -, 8/e, TMH,2011.
2. R K Sharma and Shashi K Gupta, Financial Management, Kalyani Publications-2012
3. Khan M. Y.& Jain P. K Financial Management, 6/e, TMH,2011.
4. Rajiv Srivastava and Anil Misra, Financial Management, Second edition,Oxford UniversityPress,2011
5. Vanhorne, James C, Financial Management & Policy-., 12/e, Pearson,2002

REFERENCE BOOKS:

1. I M Pandey, Financial Management , Vikas Publications-2013
2. Brigham & Houston, Fundamentals of Financial Management, 10/e, Cengage Learning.
3. Damodaran, Corporate Finance, , 2/e, Wiley India (P) Ltd.,2004
4. Paresh P., Shah Financial Management, 2/e, Biztantra.
5. Sheeba Kapil, Fundamentals of FinancialManagement,Pearson,2013

RESEARCH METHODS

SubjectCode	:14MBA23	IAMarks	50
No. of Lecture Hours/Week	: 04	Exam Hours	03
Total Number ofLectureHours	: 56	Exam Marks	100
PracticalComponent	: 01 Hour /Week		

Objectives:
1. To provide an understanding on the basic concepts of researchmethods
2. To expose the students to the role that statistics plays in businessdecisions

Module1: (6 hours)
Business Research – Meaning, types, process of research- management problem, defining the research problem, formulating the research Hypothesis, developing the research proposals, research design formulation, sampling design, planning and collecting the data for research, data analysis and interpretation. Research Application in business decisions, Features of good research study.

Module2: (8 hours)
Types of Business Research Design: Exploratory and Conclusive Research Design
Exploratory Research: Meaning, purpose, methods –secondary resource analysis, comprehensive case methods**,** expert opinion survey, focus groupdiscussions**.**
Conclusive research Design - Descriptive Research - Meaning, Types – cross sectional studies and longitudinal studies. –
Experimental research design – Meaning and classification of experimental designs- Pre experimental design, Quasi-experimental design, True experimental design, statistical experimental design.
Observation Research – Meaning – Uses – Participation and Non-participation – Evaluation – Conducting an Observation study – Datacollection

Module3: (6 hours)
Sampling: Concepts- Types of Sampling - Probability Sampling – simple random sampling, systematic sampling, stratified random sampling, cluster sampling -Non Probability Sampling – convenience sampling- judgemental sampling, snowball sampling- quota sampling - Errors insampling.

Module4: (6 hours)
Data Collection: Primary and Secondary data
Primary data collection methods - Observations, survey, Interview and Questionnaire, Qualitative Techniques of data collection.
Questionnaire design – Meaning - process of designing questionnaire.
Secondary data -Sources – advantages and disadvantages
Measurement and Scaling Techniques: Basic measurement scales-Nominal scale, Ordinal scale, Interval scale, Ratio scale. Attitude measurement scale - Likert’s Scale, Semantic Differential Scale, Thurstone scale, Multi-Dimensional Scaling.

Module5: (8 hours)
Preparing the Data for Analysis: Editing, Coding, Classification, Tabulation, Validation Analysis and Interpretation

Module6: (16 hours)
Hypothesis: Meaning, Types, characteristics, source, Formulation of Hypothesis, Errors in Hypothesis
Parametric and Non Parametric Test: T-Test, Z-Test, F-Test, U-Test, K-W Test (Theory Only)
Statistical Analysis: Bivarate Analysis (Chi-Square only), Multivariate Analysis (Theory Only)
ANOVA: One- Way and Two Way Classification. (Theory Only)

Module7: (6 hours)
Report writing and presentation of results: Importance of report writing, types of research report, report structure, guidelines for effective documentation.

Practical Components:

1. Students are expected to write the research design on Exploratory and Descriptive Research.
2. Students are asked to prepare the questionnaire on brand awareness, effectiveness of training in public sector organization, Investors attitude towards Mutual funds in any financialinstitutions.
3. Students are asked to conduct Market survey to know the consumer perception towards anyFMCG.
4. Identify the problem and collect relevant literatures and data foranalysis
5. Data Interpretation and report writing: Short and Longreports.
6. Report presentation methods, ex: Power Point Presentation,etc

RECOMMENDED BOOKS

1. Research Methodology- C R Kothari, Vishwa Prakashan,2002
2. Business Research Methods. Donald R. Cooper & Pamela s Schindler,TMH/9e/2007
3. Business Research Methods-SL Guptah and HeteshGuptha, McGraw hill -2012
4. Marketing Research- Naresh K Malhotrs- Pearson Education/PHI/5e/2007
5. Business Research Methodology – J K Sachdeva –HPH-2e-2011

REFERENCE BOOKS

1. Research Methods- William M C Trochi,- Biztantra, 2/e,2007
2. Methodology of Research in social Sciences- O R Krishnaswami, M Ranganatham, HPH,2007
3. Research Methodology – concepts and cases – Deepak Chawla and NeenaSondhi - Vikas Publication -2011
4. Research Methodology –C Murthy- Vrinda Publication -2011

STRATEGIC MANAGEMENT

Subject Code	: 14MBA25	IA Marks	: 50
No. of Lecture Hours / Week	: 04	Exam Hours	: 03
Total Number of Lecture Hours	: 56	Exam Marks	: 100
Practical Component	: 01 Hour / Week		

Objectives:

1. To explain core concepts in strategic management and provide examples of their relevance and use by actualcompanies
2. To focus on what every student needs to know about formulating, implementing and executing business strategies in today's marketenvironments
3. To teach the subject using value-adding cases that features interesting products and companies, illustrate the important kinds of strategic challenges managers face, embrace valuable teaching points and spark student'sinterest.

ModuleI **(8 Hours)**

Meaning and Nature of Strategic Management, its importance and relevance.Characteristics of Strategic Management.The Strategic Management Process. Relationship between a Company's Strategy and its Business Model.

ModuleII **(8 Hours)**

Strategy Formulation – Developing Strategic Vision and Mission for a Company – Setting Objectives – Strategic Objectives and Financial Objectives – Balanced Scorecard.Company Goals and Company Philosophy.The hierarchy of Strategic Intent – Merging the Strategic Vision, Objectives and Strategy into a Strategic Plan.

ModuleIII **(7Hours)**

Analyzing a Company's External Environment – The Strategically relevant components of a Company's External Environment – Industry Analysis – Industry Analysis – Porter's dominant economic features – Competitive Environment Analysis – Porter's Five Forces model – Industry diving forces – Key Success Factors – concept andimplementation.

ModuleIV **(8Hours)**

Analyzing a company's resources and competitive position – Analysis of a Company's present strategies – SWOT analysis – Value Chain Analysis – Benchmarking

Generic Competitive Strategies – Low cost provider Strategy – Differentiation Strategy – Best cost provider Strategy – Focused Strategy – Strategic Alliances and Collaborative Partnerships – Mergers and Acquisition Strategies – Outsourcing Strategies –International Business levelStrategies.

ModuleV **(7 Hours)**

Business Planning in different environments – Entrepreneurial Level

Business planning – Multi stage wealth creation model for entrepreneurs– Planning for large and diversified companies – brief overview of Innovation, integration, Diversification, Turnaround Strategies - GE nine cell planning grid and BCG matrix.

\ModuleVI (10 Hours)

Strategy Implementation – Operationalizing strategy, Annual Objectives, Developing Functional Strategies, Developing and communicating concise policies. Institutionalizing the strategy.Strategy, Leadership and Culture.Ethical Process and Corporate SocialResponsibility.

ModuleVII (8 Hours)

Strategic Control, guiding and evaluating strategies.Establishing Strategic Controls.Operational Control Systems. Monitoring performance and evaluating deviations, challenges of Strategy Implementation. Role of Corporate Governance

Practical Components:

- Business Plan: Students should be asked to prepare a Business Plan and present it at the end of the semester. This should include thefollowing:
    - ExecutiveSummary
    - Overview of Business and industryanalysis
    - Description of recommended strategy andjustification
    - Broad functional objectives and Key ResultAreas.
    - Spreadsheet with 5-year P&L, Balance Sheet, CashFlow projections, with detailed worksheets for the revenue and expensesforecasts.
- Analysing Mission and Vision statements of a few companies and comparingthem
- ApplyingMichaelPorter'smodeltoanindustry(Retail,Telecom, Infrastructure, FMCG, Insurance, Banking etc
    - Pick a successful growing company. Do a web-search of all news related to that company over a one-year period. Analyse the news items to understand and write down the company's strategy and executionefficiency.

· Pick a company that has performed very badly compared to its competitors. Collect information on why the company failed. What were the issues in strategy and execution that were responsible for the company's failure in the market.Analyse the internal and externalfactors

oMap out GE 9-cell matrix and BCG matrix for some companies and comparethem

· Conduct SWOT analysis of your institution and validate it by discussing withfaculty

· Conduct SWOT analysis of companies around your campus by talking to them

RECOMMENDED BOOKS:

1. Crafting and Executing Strategy, Arthur A. Thompson Jr., AJ Strickland III, John E Gamble, 18/e, Tata McGraw Hill,2012.
2. Strategic Management, Alex Miller, Irwin McGrawHill
3. Strategic Management - Analysis, Implementation, Control, Nag A, 1/e, Vikas,2011.
4. Strategic Management - An Integrated Approach, Charles W. L. Hill, Gareth R. Jones, CengageLearning.
5. Business Policy and Strategic Management, Subba Rao P,HPH.
6. Strategic Management, Kachru U, Excel BOOKS,2009.

REFERENCE BOOKS:

1. Strategic Management: Concepts and Cases, David R, 13/e,PHI.
2. Strategic Management: Building and Sustaining Competitive Advantage, Robert A. Pitts & David Lei, 4/e, CengageLearning.
3. Competitive Advantage, Michael E Porter, Free PressNY
4. Essentials of Strategic Management, Hunger, J. David, 5/e,Pearson.
5. Strategic Management, SarojDatta, jaico Publishing House,2011.
6. Business Environment for Strategic Management, Ashwathappa,HPH.
7. Contemporary Strategic Management, Grant, 6/e, 2012, WileyIndia.
8. Strategic Management-The Indian Context, R. Srinivasan,PHI

CONSUMER BEHAVIOUR

Subject Code	: 14MBA MM301	IA Marks	: 50
No. of Lecture Hours / Week	: 04	Exam Hours	: 03
Total Number of Lecture Hours	: 56	Exam Marks	: 100
Practical Component	: 01 Hour / Week		

Objectives:

1. To understand the concept of consumer behavior, decision making by consumers, behavior variables and influences on consumerbehavior.
2. To comprehend the social and cultural dimensions of consumer behavior, factors impacting attitudes andbehavior.
3. To arm the budding marketers with an insight of the psychological and behavioral concepts of consumers thus enabling them to achieve their objectives andexcel.

Module1: **(4 Hours)**

Introduction to the study of Consumer Behaviour: Meaning & Definition of CB, Difference between consumer & Customer, Nature & characteristics of Indian Consumers, Consumer Movement in India, Rights & Responsibilities of consumers in India, Benefits of consumerism.

Module2: **(8 Hours)**

Role of Research in understanding consumer behaviour: Consumer Research: Consumer Research Paradigms (Qualitative & Quantitative Research Methods) Developing research objectives, collecting secondary data, designing primary research, data analysis and reporting research findings.

Models of Consumer Behaviour: Input-Process-Output Model, *Nicosia Model, Howard Sheth Model*, Engel-Kollat-Blackwell *Models* of Consumer Behaviour, Internal Influences: Motivation, Personality, Perception, Learning, Attitude, Communications, External Influences: Social Class, Culture, REFERENCE Groups, Family members.

Levels of Consumer Decision Making – Consumer Buying Decision Process, Complex Decision Making or Extensive Problem Solving Model, Low Involvement Decision Making or Limited Problem Solving Model, Routinised Response Behaviour, Four views of consumer decision making. On-line Decision Making: Meaning &Process/Stages

Situational Influences- Nature of Situational Influence (The communication Situation, The Purchase Situation, The usage situation, The disposition situation) Situational Characteristics and consumption behaviour (Physical features, Social Surroundings, Temporal Perspectives, Task Definition, Antecedent States.)

Module3: **(10 Hours)**

Individual Influences on Consumer Behaviour and CRM: Part 1

A) Motivation: Basics of Motivation, Needs, Goals, Positive & Negative Motivation, Rational Vs Emotional motives, Motivation Process, Arousal of motives, Selection ofgoals.

Motivation Theories and Marketing Strategy - Maslow's Hierarchy of Needs, McGuire's Psychological Motives (Cognitive Preservation Motives, Cognitive Growth Motives, Affective Preservation Motives, Affective Growth Motives).

B) Personality: Basics of Personality, Theories of Personality and Marketing Strategy(Freudian Theory, Neo-Freudian Theory, Trait Theory), Applications of Personality concepts in Marketing, Personality and understanding consumer diversity(Consumer Innovativeness and related personality traits, Cognitive personality factors, Consumer Materialism, Consumer Ethnocentrisms), Brand Personality (Brand Personification, Gender,

Geography, Colour), Self and Self-Image (One or Multiple selves, The extended self, Altering theself).
C) Perception: Basics of Perception & Marketing implications, Elements of Perception(Sensation, Absolute Threshold, Differential Threshold, Subliminal Perception), Dynamics of Perception (Perceptual Selection, Perceptual Interpretation, Perceptual Organization ,perceived price, perceived quality, price/quality relationship, Perceived Risk, Types of risk, How consumers' handle risk.
Customer RelationshipManagement
Meaning & Significance of CRM, Types of CRM (Operational, Collaborative, Analytical), Strategies for building relationship marketing, e-CRM, Meaning, Importance of e-CRM, Difference Between CRM &e-CRM

Module4: (08 Hours)
Individual Influences on Consumer Behaviour: Part 2
A) Learning: Elements of Consumer Learning, Motivation, Cues, Response, Reinforcement, Marketing Applications of Behavioural Learning Theories, Classical Conditioning Pavlovian Model, Neo-Pavlovian Model), Instrumental Conditioning, Elaboration LikelihoodModel.
B) Attitude: Basics of attitude, the nature of attitude, Models of Attitude and Marketing Implication, (Tri-component Model of attitude, Multi attribute attitudemodels.
C) Persuasive Communication: Communications strategy, Target Audience, Media Strategy, Message strategies, Message structure andpresentation.

Module5: (07 Hours)
External Influences on Consumer Behaviour: Part 1
A) Social Class: Social Class Basics, What is Social Class? (Social class & Social status, the dynamics of status consumption, Features of Social Class, Five Social-Class Categories in India
B) Culture and Subculture - Major Focus on IndianPerspective
Culture: Basics, Meaning, Characteristics, Factors affecting culture, Role of customs, values and beliefs in Consumer Behaviour.
Subculture: Meaning, Subculture division and consumption pattern in India,
Types of subcultures (Nationality subcultures, Religious subcultures, Geographic and regional subcultures, racial subcultures, age subcultures, sex as asubculture)
Cross-cultural consumer analysis: Similarities and differences among people, the growing global middle class; Acculturation is a needed marketing viewpoint, applying research techniques Cross-cultural marketing strategy: Cross-cultural marketing problems in India, Strategies to overcome cross-cultural problems.

Module6: (07 Hours)
External Influences on Consumer Behaviour: Part 2
Groups: Meaning and Nature of Groups, Types

Family: The changing structure of family, Family decision making and consumption related roles, Key family consumption roles, Dynamics of husband-wife decision making, The expanding role of children in family decision making, The family life cycle & marketing strategy, Traditional family life cycle & marketing implications, Reference Groups: Understanding the power & benefits of reference groups, A broadened perspective on reference groups, Factors that affect reference group influence, Types of reference groups, Friendship groups, Shopping groups, Work groups, Virtual groups, Consumer-action groups, reference group appeals, Celebrities.

Module7: (08 Hours)
Consumer Influence and Diffusion of Innovations
Opinion Leadership: Dynamics of opinion leadership process, Measurement of opinion leadership, Market Mavens, Opinion Leadership & Marketing Strategy, Creation of Opinion Leaders
Diffusion of Innovations: Diffusion Process (Innovation, Communication channels, Social System, Time) Adoption Process: Stages, categories of adopters
Post Purchase Processes: Post Purchase Processes, Customer Satisfaction, and customer commitment: Post purchase dissonance, Product use and non use, Disposition, Product disposition.

Case studies in Indiancontextonly (04 Hours)
PracticalComponent:
1. Students can go to malls and unorganized retail outlets and observe the behavior of consumers of different demographic segments while buying different category of goods. Come back to class and present the findings / observations followed with a groupdiscussion.
2. Students can prepare a questionnaire and do a survey on consumer buying behavior and present the findings in theclass.
3. Find three advertisements that appeal to the need for power, affiliation and achievement and discuss their effectiveness. Rewrite these for persons in different levels of Maslow’sHierarchy?
4. Meet your friends and conduct a survey to find what are the important factors in their purchase of mobiles, shoes, bags etc. There are now plenty of advertisements regarding most products – how do they deal with this informationoverload?

RECOMMENDED BOOKS:

1. Consumer Behavior - Leon Schiff man, LesslieKanuk, 10/e, Pearson,2010.
2. Consumer Behavior: Building Marketing Strategy – Del I. Hawkins, & Others, 11/e TMH.
3. Consumer behavior - Jay D. Lindquist, Joseph Sirgy, 1/e, CengageLearning.
4. Consumer behavior – David L. Louden, Della Bitta, 4/e, McGrawHill.
5. Consumer Behavior – Raju M. S & Dominique Xardel, Vikas PublishingHouse.

REFERENCE BOOKS:

1. Consumer Behavior - Henry Asseal, CenageLearning.
2. Consumer Behavior in Indian Perspective – Suja Nair, HimalayaPublications
3. Customer Behavior: A Managerial Perspective – Sheth, Mittal, CengageLearning.
4. Consumer Behavior- Satish K. Batra& S H HKazmi, ExcelBOOKS.
5. CRM – Alok Kumar, Chhabi Sinha, 7/e,Biztantra.
6. Customer Relationship Management - Peru Ahamed&Sagadevan, VikasPublishing.
7. Consumer Behavior – Kumar Rajeev, HimalayaPublisher.

MARKETING RESEARCH

Subject Code	: 14MBA MM303	IA Marks	: 50
No. of Lecture Hours / Week	: 04	Exam Hours	: 03
Total Number of Lecture Hours	: 56	Exam Marks	: 100
Practical Component	: 01 Hour / Week		

Objectives of the course:

1. To provide an understanding of the basics of marketing research and to build a research vocabulary, key terms andideas.
2. To provide a balance of the theoretical and practical aspects of marketing research and encourage the students to take up analytical and critical thinking through research.
3. To highlight importance of research inmanagement

Module1: (8 Hours)

Introduction: Meaning, scope and importance of marketing research; own vs. agency marketing research; marketing information system; meaning, need and components, marketing information system and marketing research; marketing research process-I an overview; problem definition, formulation and preparation of research proposal.

Module2: (8 Hours)

Primary Data Collection: Primary data collection methods; mail survey, telephone survey and interviews and their evaluation; observations; experimental methods, questionnaire preparation and administering, organizing fieldwork for collecting data.

Module3: (8 Hours)

Research Design and Information Sources: Meaning and scope of research design; types of research designs, exploratory, descriptive and conclusive; sources and uses of secondary data, collection of secondary data.

Module4: (8 Hours)

Sample Design and Sampling: Determining universe, sampling frame and sampling unit; determining sampling method; non probability and probability methods; sample size determination; sampling errors vs. non-sampling errors.
Sampling: Steps &Types: Probability / non probability (simple, systematize; stratified proportionate, disproportionate), Sample size determination

Module5: (8 Hours)

Questionnaire design:-Steps in Q.D. with examples for each step. Rating Scales, Juster, Likert, Semantic Differential, Thurston, Attitude Scales, Scales for illiterate respondents

Module6: (8 Hours)

Measurement Techniques: Nominal Scale, Ordinal Scale, Interval Scale, Ratio Scale; Scale Types: Comparative Scaling, Non-comparative Scaling; Attitude Measurement, Self-Reporting Methods, Methods for Rating Attributes, Data Analysis, Customer Research, Advertising Research, Product Research, Distribution Research, Sales Research, Marketing Environment Research, Internet Marketing Research, and International Marketing Research

Module7: (8 Hours)

Research trends, Behavioural Science Based Approach, Economic and Competitive Pressures, Consumer Insight Groups, Quantifying Emotions, Impact of the Social Media, Do-it-Yourself (DIY) Research; Research ethics, typical research errors, Research andculture;

Practical Components:

1. Choose 5 successful products or services and identify the insight behind them through a fieldsurvey.
2. Do a comprehensive essay on the difference between consumer vs. trade vs. competition insights & how best to exploitthem.
3. Take 5 recent digital innovations e.g. twitter or face book and identify the insights. Locate 5 non-users of search or mail and Interview theirreasons.
4. Choose 5 recent successful campaigns and identify their insights through consumer interviews. Present your findings to theclass
5. Choose 3 successful movies e.g. Dabang&Zindaginamilegi& My name is Khan--- and interview consumers about the reasons for their success. Similarly repeat this with 3 recent expensive flop movies and Present your findings to theclass

RECOMMENDED BOOKS:

1. Marketing Research contemporary approach- Naraynreddy and GVRK Acharyalu Excelpublications
2. Marketing Research and consumer Behavior Saravanavel et.al Vikas publishinghouse
3. Essentials of Marketing Research – 4/e, Tony Proctor, PHI,2005
4. Essentials of Marketing Research – William G. Zikmund et.al. 4/e, Cengage Learning,2010.
5. Research Skills for Students: Transferable and Learning Skills - Allison, et.al.1996.
6. Market Research - Robin Birn, Patrick Forsyth, John Wiley and Sons Inc.2002.

REFERENCE BOOKS:

1. Market Research: a guide to planning, methodology & evaluation - Paul Hague, Kogan Page,1996.
2. Market Research Best Practice. 30 Visions of the Future – Peter Mouncey, et.al,2007.

INDUSTRIAL RELATIONS AND LEGISLATIONS

Subject Code	: 14MBA HR301	IA Marks	: 50
No. of Lecture Hours / Week	: 04	Exam Hours	: 03
Total Number of Lecture Hours	: 56	Exam Marks	: 100
Practical Component	: 01 Hour / Week		

Objectives:

1. To enable students to grasp and apply the principles of IR and develop an awareness of the significance of industrialpeace.
2. To provide a conceptual basis of IndustrialRelations.
3. To give an understanding of the components and meaning of sustaining Industrial peace anchored on harmonious Employee-Managementrelations.

PART A:
INDUSTRIAL RELATIONS
MODULE1: (8 hours)
Introduction:
Background of Industrial Relations – Definition, scope, objectives, factors affecting IR, participants of IR, importance of IR. Approaches to Industrial relations, system of IR in India – Historical perspective &post independence period, Code of Discipline and historical initiatives for harmonious IR, Government policies relating to labor, ILO and its influence on Legal enactments inIndia.

MODULE2: (8 Hours)
Collective Bargaining & Negotiation:
Collective Bargaining: Definition, Meaning, Nature, essential conditions for the success of collective bargaining, functions of collective bargaining, importance of Collective Bargaining, collective bargaining process, prerequisites for collective bargaining, implementation and administration ofagreements.
Negotiations-Types of Negotiations-Problem solving attitude, Techniques of negotiation, negotiation process, essential skills for negotiation, Workers Participation in Management

Module3: (8 Hours)
Trade Union
Trade Unions: Meaning, trade union movement in India, The role of the Trade Unions in Modern Industrial Society of India, functions of trade unions, objectives of important trade unions, The Trade Union Act, 1926, procedure for registration of Trade Union, Grounds for the withdrawal and cancellation of registration, union structure, Rights and responsibilities, Penalties for offences of trade unions, Difference between a registered and a recognised Trade Union, problems of trade unions, future trends of trade union movement inIndia.

Module4: (8 Hours)
Grievance procedure and Discipline management:
Grievance - Meaning and forms, sources of grievance, approaches to grievance machinery, Grievance procedures, model grievance procedure.

Discipline - Causes of Indiscipline - Maintenance of discipline. Principles of Natural Justice, Judicial approach to discipline, Domestic enquiries, Disciplinary procedures, approaches to manage discipline in Industry, Principles of Hot stove rule.

Module5: (8 Hours)
Industrial Conflicts:
Industrial conflict – perspectives, Nature of conflicts and its manifestations causes and types of Industrial conflicts, prevention of Industrial conflicts, industrial disputes act of 1947, settlement Machinery of Industrial disputes.
Paradigm shift from industrial relations to employee relations – shift in focus, difference, employee relations management at work, culture and employee relations, future of employee relations.

RECOMMENDED BOOKS:

1. Employee Relations Management - P N Singh, Singh P. N., PearsonPublications
2. Dynamics of Industrial Relations – Mamoria&Mamoria,
3. Human Resource Management, Principles & Practice – Aquinas, VikasPublication
4. Personnel Management & Industrial Relations – Nair
5. Essentials of Human Resource Management and Industrial Relations - Subba Rao – 3rd Revisededition
6. Malhotra, O.P. : The Law of IndustrialDisputes
7. Arya, V.P. : A Guide to Settlement of IndustrialDisputes
8. Aggarwal, Dr. Arjun P. and Larki, H. : Gherao and Industrial Relations, Trade Unionism in the NewSociety
9. Aggarwal, S.L. : Labour Relations Law inIndia

PART B:
INDUSTRIAL LEGISLATIONS (16 hours)

- Factories Act1948,
- Industrial Employment (Standing orders) Act,1946
- Employees’ State Insurance (ESI) Act,1948,
- Maternity benefit Act,1961
- Workmen’s compensation Act,1923
- Payment of Gratuity Act1972,
- Employees’ Provident Fund and Miscellaneous Provisions Act1952;
- Payment of Bonus Act,1965.
- Payment of Wages Act,1936,
- Child Labour (Prohibition & Regulation) Act,1986

RECOMMENDED BOOKS:

1. Labor Laws for Managers, BD Singh, ExcelBOOKS
2. Industrial Relations and Labor laws, 5th Edition, SC Srivastava, VikasPublications
3. Elements of Mercantile Law - N. DKapoor
4. Labor Industrial Laws – Dr. V. G. Goswami , EighthEdition
5. P R N Sinha et al Industrial Relations, Trade Unions &Labour Legislation, Pearson Education
6. Bareacts

RECRUITMENT & SELECTION

SubjectCode	:14MBAHR302	IAMarks	50
No. of Lecture Hours/Week	: 04	Exam Hours	03
Total Number ofLectureHours	: 56	Exam Marks	100
PracticalComponent	: 01 Hour /Week		

Module1: **(6 Hours)**
Job Analysis: Meaning, definition and purpose. Methods of job analysis: job analysis interviews, job analysis questionnaire, task analysis inventory, position analysis questionnaire, subject expert workshops, critical incident technique, F1eisclunann job analysis survey, functional job analysis, job element method, repertory grid, critical incident technique

Module2: **(9 Hours)**
Hiring Process & Hiring decision: Nature of hiring: regular, temporary, full time, part time, apprentice, contractual, and outsourcing, Existing post or new post to be created, Need analysis, cost analysis and job analysis.

Module3: **(7 Hours)**
Hiring internally: Meaning and definition of internal recruitment, Advantages and disadvantages in terms of cost, time, quality andsuitability.
Sources of internal recruitment: - circulars, intranet advertisements, employee referrals, Appointment or promotion, Policy guidelines and union settlements.

Module4: **(10 Hours)**
External Hiring: Meaning and definition of external recruitment.
Sources of recruitment:- advertisement, in newspaper, TV/Radio, Internet, search on the internet, wanted signboards, consultants, employment exchange, campus recruitment, employee referrals and unsolicited applications. Advantages and disadvantages of the above sources in terms of cost, time, convenience, reach of the targeted population, and quality of applicant pool.
Job advertisement: drafting, size and contents. Contents of public sector recruitment: single or multiple sources and choosing the best source

Module5: **(8 Hours)**
Screening the candidates: Application Forms: bio-data / resume / curriculum vitae and weighted application blanks: meaning definition, purpose, advantages and disadvantages – taking a Behavioural approach to recruitment: spotting personality patterns, making basic assumptions, predicting the future, strategy Vs. Technique, Pinning down what is needed: targeted interviewing, focusing on behaviour, assessing how person performs, assuming they have been hired. – Identifying the ingredients of success: the winning candidate‟s profile, challenges in the interview, the starting point, day to day execution, dealing with people, the inner person, additional characteristics. Studying the CV.

Module6: **(8 Hours)**
Testing: Meaning, definition, purpose, advantages and disadvantages, Ability tests clerical ability test, mechanical ability test, mental ability test, physical ability test, personality assessment test, typing test, shorthand test, computer proficiency test

Interviewing: Planning the interview, Interview process - getting started, examining the 5 interview areas, examining the strengths & weaknesses, listening to what are being said, digging for Behavioural gold, probing for specifics, spotting patterns, using an interview checklist, Allowing candidates to ask questions at the end, explaining the procedure of selection and concluding with a happy note, making the decision. Interview in public sector undertaking, statutory requirements.

Module7: (8 Hours)

Reference checking & Appointment orders: meaning, definition and purpose. Verification of character, criminal antecedents, previous work behavior and education qualifications. Verification of community certificates in public sector companies

Meaning, definition, and purpose.Statutory requirements (under the Shops and commercial establishments Act).Contents of appointment letter, hard copy (or soft copy), method of delivery and retrieving the acknowledgement copy.Medical Examination & acceptance of offer for joining.

Practical Component:

1. Students need to identify two jobs in the college and need to do job analysis for those positions using any of the job analysismethods.
2. In teams students can be asked to give presentations about various types of jobs **(**regular, temporary, full time, part time, apprentice, contractual, and outsourcing) in different industries along with its advantages anddisadvantages
3. In Teams, select and analyze any two of the Job postings advertisements in Newspapers to know more about job description and job specification mentioned in each advertisement for everypost.
4.Obtain online access to the resume data base of Naukri.com or Monsterindia.com for a week give at least four Job Descriptions and specification to each student, to search and download from the data base at least five resumes for eachpositions.
5. Students can identify 4 or 5 jobs of their interest and can create Advertisements for the same imaging that they are Proprietors of the companies and hiring for thesepositions.
6. Debate on Advantages and disadvantages of hiring external and Internal for the selected jobs like Police Constable, Doctor, CEO, Mechanical Engineer, Professoretc.,
7. Role play : Students can do the role play for the entire process of hiring and selecting 3 or 4 selected roles in a specificindustry.

RECOMMENDED BOOKS:

1. Human Resource Selection by Robert D. Gatewood and Hubert S. Feild, South western Cengage Learning, Mason, Ohio2001
2. Staffing Organization, Herbert G. Heneman III, Timothy A. Judge, 5th Edition, McGraw HillInternational

REFERENCE BOOKS:

1. Employee Selection, Lilly M Berry, ThomsonPublications
2. Hiring & keeping the best people, HBSPress
3. Human Resource Planning, Dipak Kumar Bhattacharyya, 2nd edition, ExcelBOOKS.
4. High performance hiring by Robert w. Wendover, Crisp Publication, California,1991.

PUBLIC RELATIONS

Subject Code	: 14MBA HR407	IA Marks	: 50
No. of Lecture Hours / Week	: 04	Exam Hours	: 03
Total Number of Lecture Hours	: 56	Exam Marks	: 100
Practical Component	: 01 Hour / Week		

Objective:
To provide an understanding of the fundamentals tools of public relations practice and to provide a multidisciplinary understanding of the emerging trends in the field of public relations

Module1: (8 Hours)
What is Public Relation? – Proactive and Reactive Approaches – Public Relations Process – Behavoiural Public Relations Model – Persuasion Model – Two way symmetrical Communications Model – When communications is not enough – 20 great truths about PublicRelations

Module2: (8 Hours)
Theoretical basis for Public Relations –Theories of Relationships –Systems Theory – situational Theory – Theories of Persuasion and Social Influence – Social Exchange Theory – Diffusion Theory – Social Learning Theory – Elaborated Likelihood Theory - Theories of Mass communication – Uses and Gratification Theory – Agenda Setting Theory – Public Relations roles – Models of Public Relations – Approaches to Conflict Resolutions

Module3: (8 Hours)
Employee communications – Role of employee communication – concept of Organizational culture – Establishing Communication Policy – Organizational change – Importance of employee communication – Special employee Communication Situations – Media of Employee communications – Objectives of Internal media – Starting internal media – controlling internal media- Occasional and Special media
Rules of Effective Employee Relations. Frontline supervisors as the key communicators
Case: Investing in Employees Pays Off (CJSS)
Case: Southwest Airlines – Where Fun, LUV, and Profit Go Hand –in Hand (CJSS)
Case: Employee Retention: It is the employer who is on probation (LLHT)
Case: Maintaining Employee Relationship in a Tragedy (LLHT)
Kodak Communicates One – on - One with All of its Employees (CJSS)

Module4: (8 Hours)
Community Relations – Importance of Public Relations – Community Relations Process – Guidelines for Effective Relations Programs -Specific Functions of Public Relations – Criteria for Community relations Activities – Corporate Social Responsibility & Philanthropy-Emerging Challenge of CommunityActivism
Case: Community Relationships Maintained During Hospital Closing (CJSS)

Module5: (8 Hours)

Media Relations – Media Relations –Role of Media in Public Relations – Social Media – working with the media –Media Relations Program Elements –Role of Technology in Public Relations

Case: Fatal Tiger Attack at San Francisco Zoo(LLHT)

Case: There's a Syringe in My Pepsi Can(CJSS)

Module6: (8 Hours)

Issues in Public Relations – public relations challenges –Types of Issues - Target audiences- Public Service as Preventive Public Relations – Special Interests – Importance of Compromise – Issue Anticipation – Scenario Technique

Case: Take your choice – Tobacco or Health (CJSS)

Module7: (8 Hours)

Crisis Management – Understanding how people typically react to issues – Human Nature – Role of communications – Types of crises – News media influence - Fundamental guidelines

Case: Bhopal – A Nightmare for Union Carbide (CJSS

Case: Sir Ganga Ram Hospital – Disaster management Plan (IS))

Pedagogy: Lecture+ Case Studies + Seminars. Faculty should bring latest issues concerning public relations in class discussions.

Practical Component:

1. Related cases for each module to be discussed in the classes and presentation can be done for each case by group ofstudents.
2. Team of students can be made and asked to report the media personalities about the event held in the college. Different styles of reporting the same event can be discussed in the class with its possible reactions from themedia.
3. Collect the newspaper articles about various messages from organizations through spokespersons and analyze the effect of each type of delivery and impact on theaudience.
4. Conduct a CSR Programme for the college like Blood donation, Eye camps in association with Lions, Rotary clubs etc and gather the information's about various challenges these organizations face during such community orientedprogrammes.

RECOMMENDED BOOKS

1. Lattimore, Laskin, Heiman &Toth, "Public Relations – The Profession and Practice", third edition, Tata McGraw Hill, 2012(LLHT)
2. Center, Jackson, Smith and Stansbury, "Public Relations Practices – Managerial Case Studies and Problems", Seventh Edition, Prentice Hall of India,2008(CJSS)
3. Iqbal Sachdeva, "Public Relations – Principles and Practices, Oxford University Press, 2009(IS)

WORKPLACE ETHICS AND VALUE SYSTEMS

Subject Code	: 14MBA HR408	IA Marks	: 50
No. of Lecture Hours / Week	: 04	Exam Hours	: 03
Total Number of Lecture Hours	: 56	Exam Marks	: 100
Practical Component	: 01 Hour / Week		

Objectives:

1. To make students understand the meaning of good ethics, doing things right and the obstacles to making good ethicaldecisions
2. To enable students to identify and critically assess the principles and values they personally embrace and use in addressing the ethical issues which arise in their workinglives.
3. To acquaint students with some of the major kinds of ethical problems encountered while performing work assignments and some possible ways of responding tothem.

Module1: (8 Hours)

Workplace Ethics: Introduction, Needs, Principals, Development of Personal Ethics, Workplace Ethics for Employees-Ethical behaviour in workplace- Professionalism, Ethical violations by employees, Employee Attitude and Ethics, Employee Etiquettes. Benefits of ethics in Workplace- employee commitment, investor loyalty, customer satisfaction, profits

Module2: (8 Hours)

Conducting Professionalism at Workplace: Unethical Conduct for employees and employers.Factors leading to Unethical Behaviours.Different unethical behaviours.Measures to control unethical behaviours. Rewarding ethicalbehaviour

Module3: (10 Hours)

Business Ethics and Corporate Governance: Overview of Business Ethics, Corporate Governance, Ethical issues in human resource management- The principal of ethical hiring, Firing, worker safety, whistle blowing, Equality of opportunity, Discrimination, Ethics and remuneration, Ethics in retrenchment. Ethical Dilemmas at workplace, Ethical issues in global business, corporate responsibility ofemployers.

Module4: (8 Hours)

Workplace Privacy & Ethics: Watching what you say and what you do in the workplace, Hardware, Software and Spyware, Plagiarism and Computer Crimes, Convenience and Death of Privacy, Defence of employee privacy rights.

Module5: (8 Hours)

Teamwork in the Workplace & Ethics: Teams, Elements of team, Stages of team development, team meetings, team rules, and teams work and professional responsibility, rules of professional responsibility, ASME code of ethics.

Module6: (8 Hours)

Managing Change in Workplace through Ethics: Introduction to Change Management, Models of change, the Ethics of Managing Change, the role of ethics and responsibilities in leading innovation and change, ethics based model for change management, ethics and risks of change management

Module7: **(6 Hours)**

Ethics, Discrimination and Harassment at Workplace: Discrimination, sexual harassment, Creating awareness about workplace harassment, Vishaka Dutta vs. State of Rajasthan – Supreme Court directions. Compulsory workplace guidelines.

Practical Components:

1. To solve case studies on WorkplaceEthics
2. To visit organizations and find out the problems and causes for unethical behavior at workplace.
3. To visit organizations and find out the measures adopted to control unethical behavior ofemployees.
4. To compare and contrast the various ethical codes of conduct practiced in organizations.
5. To study the recent cases on breach of workplaceprivacy.

RECOMMENDED BOOKS:

1. Ethical Theory and Business, 8^{th} Edition, Tom L. Beauchamp, Norman E. Bowie and DenisArnold
2. Business Ethics, 9^{th} Edition, O.C. Ferrell, John Fraedrich, and Linda Ferrell, Cengage Learning.
3. How technology is compromising Workplace Privacy, Fredrick S Lane 111, AMACOM Div American Mgmt Assn,2003
4. Ethics in the Workplace, Dean Bredeson, Keith Goree, Cengage Learning,2011.
5. Ethics in 21^{st} Century, Mary Alice Trent, Oral Roberts University,Longman.
6. Ethics in workplace, Elizabeth P Tierney, Oak treepress
7. Ethics in Workplace: System Perspective, William F Roth, Pearson,2014.

CONCRETE TECHNOLOGY
(COMMON TO CV/TR/CTM)

Sub Code	**:**	**10 CV 42**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

Unit- 1

Cement, Chemical composition, hydration of cement, Types of cement, manufacture of OPC by wet and dry, process (flow charts only) Testing of cement - Field testing, Fineness by sieve test and Blaine's air permeability test, Normal consistency, testing time, soundness, Compression strength of cement and grades of cement, Quality of mixing water. –7 Hours

Unit-2

Fine aggregate - grading, analysis, Specify gravity, bulking, moisture content, deleterious materials. Coarse aggregate – Importance of size, shape and texture.Grading of aggregates - Sieve analysis, specific gravity, Flakiness and elongation index, crushing, impact and abrasion tests. - 6 Hours

Unit-3

Workability - factors affecting workability, Measurement of workability - slump, flow tests, Compaction factor and vee-bee consistometer tests, Segregation and bleeding, Process of manufactures of concrete : Batching, Mixing, Transporting, Placing, Compaction, Curing. -7 Hours

Unit-4

Chemical admixtures - plasticizers, accelerators, retarders and air entraining agents, Mineral admixtures - Fly ash, Silica fumes and rice husk ash. -6 Hours

Part-B

Unit-5

Factors affecting strength, w/c ratio, gel/space ratio, maturity concept, Effect of aggregate properties, relation between compressive strength, and tensile strength, bond strength, modulus of rupture, Accelerated curing, aggregate - cement bond strength, Testing of hardened concrete - compressive strength, split tensile strength, Flexural strength, factors influencing strength test results. - 6Hours

Unit-6

Elasticity - Relation between modulus of elasticity and Strength, factors affecting modulus of elasticity, Poisson , Ratio, Shrinkage - plastic shrinkage and drying shrinkage, Factors affecting shrinkage, Creep - Measurement of creep, factors affecting creep, effect of creep, - 7 Hours

Unit-7

Durability - definition, significance, permeability, Sulphate attack, Chloride attack, carbonation, freezing and thawing, Factors contributing to cracks in concrete - plastic shrinkage, settlement cracks, construction joints, Thermal expansion, transition zone, structural design deficiencies, - 6 Hours

Unit-8

Concept of Concrete Mix design, variables in proportioning , exposure conditions, Procedure of mix design as per IS 10262-1982, Numerical examples of Mix Design - 7 Hours

TEXT BOOKS:

1. "Concrete Technology" - Theory and Practice, M.S.Shetty, S.Chand and Company, New Delhi, 2002.

REFERENCES :

1. "Properties of Concrete"Neville, A.M. : , ELBS, London
2. "Concrete Technology" – A.R.Santakumar. Oxford University Press (2007)'
3. "Concrete Manual" - Gambhir Dhanpat Rai & Sons, New Delhi.
4. "Concrete Mix Design" - N.Krishna Raju, Sehgal - publishers.
5. "Recommended guidelines for concrete mix design" - IS:10262,BIS Publication

2. **Fundamentals of Surveying** - S.K. Roy – Prentice Hall of India
3. **Surveying**, Arther Bannister et al., Pearson Education, India

STRUCTURAL ANALYSIS –I
(COMMON TO CV/TR)

Sub Code	**:**	**10 CV 43**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:
STRUCTURAL SYSTEMS AND ENERGY CONCEPT
1.1 Forms of structures, 1.2 Conditions of equilibrium, 1.3 Degree of freedom, 1.4 Linear and Non linear structures, 1.5 One, two, three dimensional structural systems, 1.6 Determinate and indeterminate structures [Static and Kinematics]. 1.7 Strain energy and complimentary strain energy, 1.8 Strain energy due to axial load, bending and shear, 1.9 Theorem of minimum potential energy, 1.10 Law of conservation of energy, 1.11 Principle of virtual work,

7 Hours

UNIT 2:
DEFLECTION OF BEAMS
2.1 Moment area method, 2.2 Conjugate beam method

6 Hours

UNIT 3:
DEFLECTION OF BEAMS AND FRAMES BY STRAIN ENERGY
3.1 The first and second theorem of Castigliano, problems on beams, frames and trusses, 3.2 Betti's law, 3.3 Clarke - Maxwell's theorem of reciprocal deflection.

7 **Hours**

UNIT 4:
ANALYSIS OF BEAMS AND PLANE TRUSSES BY STRAIN ENERGY
4.1 Analysis of beams (Propped cantilever and Fixed beams) and trusses using strain energy and unit load methods

7 Hours

PART – B

UNIT 5:
ARCHES AND CABLES
5.1 Three hinged circular and parabolic arches with supports at same levels and different levels, 5.2 Determination of thrust, shear and bending moment, 5.3 Analysis of cables under point loads and UDL, length of cables (Supports at same levels and at different levels).

6 Hours

UNIT 6:
ANALYSIS OF BEAMS
6.1 Consistent deformation method – Propped cantilever and fixed beams

6 Hours

UNIT 7:
7.1 Clapeyron's theorem of three moments – continuous beams and fixed beams

6 Hours

UNIT 8:
ANALYSIS OF ARCHES
8.1 Two hinged parabolic arch, 8.2 Two hinged Circular Arch

7 Hours

TEXT BOOKS:
1. **Theory of Structures**, Pandit and Guptha, Vol. – I, Tata McGraw Hill, New Delhi.
2. **Basic Structural Analysis** Reddy C. S., Tata McGraw Hill, New Delhi.
3. **Strength of Materials and theory of structures** Vol I & II, B.C. Pumia , R.K., Jain Laxmi Publication New Delhi

REFERENCE BOOKS:
1. **Elementary Structural Analysis**, Norris and Wilbur, International Student Edition. McGraw Hill Book Co: New York
2. **Structural Analysis**, 4th SI Edition by Amit Prasanth & Aslam Kassimali, Thomson Learning.
3. **Analysis of Structures**, Thandava Murthy, Oxford University Press, Edition 2005.

SURVEYING – II
(COMMON TO CV/TR/EV/CTM)

Sub Code	**:**	**10 CV 44**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:
THEODOLITE SURVEY

1.1 Thedolite and types, 1.2 Fundamental axes and parts of a transit theodolite, 1.3 Uses of theodolite, 1.4 Temperary adjustments of a transit thedolite, 1.5 Measurement of horizontal angles – Method of repetitions and reiterations, 1.6 Measurements of vertical angles, 1.7 Prolonging a straight line by a theodolite in adjustment and theodolite not in adjustment

6 Hours

UNIT 2:
PERMANENT ADJUSTMENT OF DUMPY LEVEL AND TRANSIT THEODOLITE

2.1 Interrelationship between fundamental axes for instrument to be in adjustment and step by step procedure of obtaining permanent adjustments

7 Hours

UNIT 3:
TRIGONOMETRIC LEVELING

3.1 Determination of elevation of objects when the base is accessible and inaccessible by single plane and double plane method, 3.2 Distance and difference in elevation between two inaccessible objects by double plane method. Salient features of Total Station, Advantages of Total Station over conventional instruments, Application of Total Station.

8 Hours

UNIT 4:
TACHEOMETRY

4.1 Basic principle, 4.2 Types of tacheometric survey, 4.3 Tacheometric equation for horizontal line of sight and inclined line of sight in fixed hair method, 4.4 Anallactic lens in external focusing telescopes, 4.5 Reducing the constants in internal focusing telescope, 4.6 Moving hair method and

tangential method, 4.7 Subtance bar, 4.8 Beaman stadia arc.

7 Hours

PART – B

UNIT 5:

CURVE SETTING (Simple curves)

5.1 Curves – Necessity – Types, 5.2 Simple curves, 5.3 Elements, 5.4 Designation of curves, 5.5 Setting out simple curves by linear methods, 5.6 Setting out curves by Rankines deflection angle method.

6 Hours

UNIT 6:

CURVE SETTING (Compound and Reverse curves)

6.1 Compound curves 6.2 Elements 6.3 Design of compound curves 6.4 Setting out of compound curves 6.5 Reverse curve between two parallel straights (Equal radius and unequal radius).

6 Hours

UNIT 7:

CURVE SETTING (Transition and Vertical curves)

7.1 Transition curves 7.2 Characteristics 7.3 Length of Transition curve 7.4 Setting out cubic Parabola and Bernoulli's Lemniscates, 7.5 Vertical curves – Types – Simple numerical problems.

6 Hours

UNIT 8:

AREAS AND VOLUMES

8.1 Calculation of area from cross staff surveying, 8.2 Calculation of area of a closed traverse by coordinates method. 8.3 Planimeter – principle of working and use of planimeter to measure areas, digital planimter, 8.4 Computations of volumes by trapezoidal and prismoidal rule, 8.5 Capacity contours

6 Hours

TEXT BOOKS:

1.'**Surveying'** Vol 2 and Vol 3 - B. C. Punmia, Laxmi Publications
2**.'Plane Surveying'** A. M. Chandra – New age international (P) Ltd
3**.'Higher Surveying'** A.M. Chandra New age international (P) Ltd

REFERENCE BOOKS:

1. **Fundamentals of Surveying** - Milton O. Schimidt – Wong, Thomson Learning.

DESIGN OF RCC STRUCTURAL ELEMENTS

Subject Code	**: 10CV52**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

GENERAL FEATURES OF REINFORCED CONCRETE: Introduction, Design Loads, Materials for Reinforced Concrete and Code requirements. Design Philosophy – Limit State Design principles. Philosophy of limit state design, Principles of limit states, Factor of Safety, Characteristic and design loads, Characteristic and design strength.

6 Hours

UNIT - 2

PRINCIPLES OF LIMIT STATE DESIGN AND ULTIMATE STRENGTH OF R.C. SECTION: General aspects of Ultimate strength, Stress block parameters for limit state of collapse, Ultimate flexural strength of singly reinforced rectangular sections, Ultimate flexural strength of doubly reinforced rectangular sections, Ultimate flexural strength of flanged sections, Ultimate shear strength of RC sections, Ultimate torsional strength of RC sections, Concepts of development length and anchorage, Analysis examples of singly reinforced, doubly reinforced, flanged sections, shear strength and development length.

7 Hours

UNIT - 3

FLEXURE AND SERVICEABILITY LIMIT STATES: General Specification for flexure design of beams-practical requirements, size of beam, cover to reinforcement-spacing of bars. General aspects of serviceability-Deflection limits in IS: 456 – 2000-Calculation of deflection (Theoretical method), Cracking in structural concrete members, Calculation of deflections and crack width.

6 Hours

UNIT - 4

DESIGN OF BEAMS: Design procedures for critical sections for moment and shears. Anchorages of bars, check for development length, Reinforcement requirements, Slenderness limits for beams to ensure lateral stability, Design examples for Simply supported and Cantilever beams for rectangular and flanged sections.

8 Hours

PART - B

UNIT - 5

DESIGN OF SLABS: General consideration of design of slabs, Rectangular slabs spanning one direction, Rectangular slabs spanning in two directions for various boundary conditions. Design of simply supported, cantilever and continuous slabs as per IS: 456 – 2000.

8 Hours

UNIT - 6

DESIGN OF COLUMNS: General aspects, effective length of column, loads on columns, slenderness ratio for columns, minimum eccentricity, design of short axially loaded columns, design of column subject to combined axial load and uniaxial moment and biaxial moment using SP – 16 charts.

5 Hours

UNIT - 7

DESIGN OF FOOTINGS: Introduction, load for footing, Design basis for limit state method, Design of isolated rectangular footing for axial load and uniaxial moment, design of pedestal.

6 Hours

UNIT - 8

DESIGN OF STAIR CASES: General features, types of stair case, loads on stair cases, effective span as per IS code provisions, distribution of loading on stairs, Design of stair cases. With waistslabs.

6 Hours

REFERENCE BOOKS:

1. **Limit State Design of Reinforced concrete-**by P.C. Varghese, PHI Learning Private Limited 2008-2009
2. **Fundamentals of Reinforced concrete Design-**by M.L.Gambhir, PHI Learning Private Limited 2008-2009.
3. **Reinforced concrete Design-**by Pallai and Menon, TMH Education Private Limited,
4. **Reinforced concrete Design-**by S.N.Shinha, TMH Education Private Limited,

5. **Reinforced concrete Design**-by Karve & Shaha, Structures Publishers Pune.
6. **Design of RCC Structural Elements** S. S. Bhavikatti, Vol-I, New Age International Publications, New Delhi.
7. **IS-456-2000 and SP-16**

GEOTECHNICAL ENGINEERING – I

Subject Code	**: 10CV54**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT- 1

INTRODUCTION: History of soil mechanics, Definition, origin and formation of soil. Phase Diagram, Voids ratio, Porosity, Percentage Air Voids, Air content, Degree of saturation, Water content, Specific Gravity of soil solids and soil mass, Densities and Unit weights - Bulk, Dry, Saturated & Submerged and their inter relationships.

6 Hours

UNIT - 2

INDEX PROPERTIES OF SOIL AND THEIR DETERMINATION: Index Properties of soil- Water content , Specific Gravity, Particle size distribution, Relative Density, Consistency limits and indices, in-situ density, Activity of Clay, Laboratory methods of determination of index properties of soil: Water content (Oven Drying method & Rapid Moisture method), Specific gravity of soil solids (Pycnometer and density bottle method), Particle size distribution (Sieve analysis and Hydrometer analysis only), Liquid Limit- (Casagrande and Cone penetration methods), Plastic limit and shrinkage limit.

7 Hours

UNIT - 3

CLASSIFICATION OF SOILS: Purpose of soil classification, Particle size classification – MIT classification and IS classification, Textural classification. IS classification - Plasticity chart and its importance, Field identification of soils.

CLAY MINERALOGY AND SOIL STUCTURE: Single grained, honey combed, flocculent and dispersed structures, Valence bonds, Soil-Water system, Electrical diffuse double layer, adsorbed water, base-exchange capacity, Isomorphous substitution. Common clay minerals in soil and their structures- Kaolinite, Illite and Montmorillonite.

8 Hours

UNIT - 4

FLOW OF WATER THROUGH SOILS: Darcy's law- assumption and validity, coefficient of permeability and its determination (laboratory and field), factors affecting permeability, permeability of stratified soils, Seepage

velocity, Superficial velocity and coefficient of percolation, quick sand phenomena, Capillary Phenomena.

6 Hours

PART - B

UNIT - 5

SHEAR STRENGTH OF SOIL: Concept of shear strength, Mohr-coulomb theory, conventional and modified failure envelops, Effective stress concept-total stress, effective stress and Neutral stress, Concept of pore pressure, Total and effective shear strength parameters, factors affecting shear strength of soils, Sensitivity and Thixotropy of clay.

7 Hours

UNIT - 6

COMPACTION OF SOIL: Definition, Principle of compaction, Standard and Modified proctor's compaction tests, factors affecting compaction, effect of compaction on soil properties, Field compaction control – compactive effort & method, lift thickness and number of passes, Proctor's needle, Compacting equipment.

6 Hours

UNIT - 7

CONSOLIDATION OF SOIL: Definition, Mass-spring analogy, Terzaghi's one dimensional consolidation theory-assumption and limitations (no derivation), Normally consolidated, under consolidated and over consolidated soils, pre-consolidation pressure and its determination by Casagrande's method. Consolidation characteristics of soil (C_c, a_v, m_v and C_v).

UNIT- 8

DETERMINATION OF SHEAR STRENGTH AND CONSOLIDATION OF SOIL: Measurement of shear parameters- Direct shear test, unconfined compression test, Triaxial compression test and vane shear test, Test under different drainage conditions.

Laboratory one dimensional consolidation test, Determination of consolidation characteristics of soils-compression index and coefficient of consolidation (square root of time fitting method, logarithmic time fitting method).

6 Hours

TEXT BOOKS:

1. **Soil Mechanics and Foundation Engg**.- Punmia B.C. (2005), 16th Edition Laxmi Publications Co. , New Delhi.
2. **Principles of Soil Mechanics and Foundation Engineering**-Murthy V.N.S. (1996), 4th Edition, UBS Publishers and Distributors, New Delhi.

3. **Geotechnical Engineering**; Braja, M. Das (2002), Fifth Edition, Thomson Business Information India (P) Ltd., India

REFERENCES BOOKS:

1. **Foundation Analysis and Design**- Bowles J.E. (1996), 5th Edition, McGraw Hill Pub. Co. New York.
2. **Soil Engineering in Theory and Practice**- Alam Singh and Chowdhary G.R. (1994), CBS Publishers and Distributors Ltd., New Delhi.
3. **Basic and Applied Soil Mechanics**- Gopal Ranjan and Rao A.S.R. (2000), New Age International (P) Ltd., Newe Delhi.
4. **Geotechnical Engineering**- Donold P Coduto Phi Learning Private Limited, New Delhi
5. **Geotechnical Engineering**- Shashi K. Gulathi & Manoj Datta. (2009), " Tata Mc Graw Hill.
6. **Text Book of Geotechnical Engineering**- Iqbal H. Khan (2005),, 2nd Edition, PHI, India.
7. **Numerical Problems, Examples and objective questions in Geotechnical Engineering**- Narasimha Rao A. V. & Venkatrahmaiah C. (2000), Universities Press., Hyderabad.

Hydrology and Irrigation Engineering

Sub Code	**:**	**10CV55**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART-A
HYDROLOGY

UNIT 1: INTRODUCTION & PRECIPITATION

Introduction ,Hydrologic cycle (Horton's representation). Water budget equation

Precipitation: introduction, forms of precipitation, types of precipitation, measurement of precipitation (Simon's gauge & Syphon gauge only), selection of rain gauge station. Adequacy of raingauges, methods of computing average rainfall, interpolation of missing data, adjustment of missing data by double mass curve method. Hyetograph and mass curve of rainfall, 07 hrs

UNIT 2 : LOSSES FROM PRECIPITATION

Evaporation: Definition, factors affecting, measurement (Class A pan). Estimation using empirical methods (Meyer's and Rohwer's equation), evaporation control.
Evapo-transpiration: Definition, factors affecting, measurement, estimation (Blaney criddle method)
Infiltration: Definition, factors affecting, measurement (double ring infiltrometer), infiltration indices, Horton's equation of infiltration. 07 hrs

UNIT 3: HYDROGRAPHS
Definition, components of hydrographs, unit hydrograph and its derivation from simple storm hydrograph, base flow separation, Prepositions of unit hydrograph- problems
06 hrs

UNIT 4: ESTIMATION OF FLOOD & FLOOD ROUTING
Definition of flood, factors affecting flood, methods of estimation (envelope curves, empirical formulae, rational method).
Flood routing: Introduction to hydrological routing, relationship of out flow and storage, general storage equation, Muskingum routing method. 07 hrs

PART-B
IRRIGATION ENGINEERING

UNIT 5 : INTRODUCTION
Introduction, need for irrigation, advantages and disadvantages of irrigation, environmental impacts of irrigation, Systems of irrigation: Gravity irrigation, lift irrigation, well irrigation, tube well irrigation, infiltration galleries, sewage irrigation, supplemental irrigation.
06 hrs

UNIT 6: SOIL-WATER-CROP RELATIONSHIP

Introduction, soil profile, physical properties of soil, soil classification. Indian soils, functions of irrigation soils, maintaining soil fertility, soil-water-plant relationship, soil-moisture. Irrigation relationship, frequency of irrigation.
06 hrs

UNIT 7: WATER REQUIREMENT OF CROPS

Introduction, definitions, crop seasons of India, water requirement of a crop, duty, delta, base period. Consumptive use. Irrigation efficiencies. Assessment of irrigation water.

07 hrs

Unit 8: Canals

Definition, Types of canals, Alignment of canals, Design of canals by Kenedy's and Lacey's methods- Problems
06 hrs

TEXT BOOKS:

1. Engineering Hydrology – Subramanya.K; Tata Mcgraw Hill NewDelhi-2008 (Ed)

2. Hydrology- Madan Mohan Das, Mim Mohan Das-PHI Learning private Ltd. New Delhi-2009 (Ed)

3. A Text Book Of Hydrology- Jayarami Reddy, Laksmi Publications, New Delhi-2007 (Ed)

4. Irrigation, water Resources and water power Engineering- P.N.Modi- standard book house, New Delhi.

5. Irrigation and Water Power Engineering-Madan Mohan Das & Mimi Das Saikia; PHILearning pvy. Ltd. New Delhi 2009 (Ed).

REFERENCE BOOKS:

1. Hydrology & Soil Conservation Engineering- Ghanshyam Das- PHI Learning Private Ltd., New Delhi- 2009 (Ed)

2. Hydrology & Water Resources Engineering- Patra K.C. Narosa Book Distributors Pvt. Ltd. New Delhi-2008 (Ed)

3. Hydrology & Water Resources Engineering- R.K.Sharma & Sharma, Oxford and Ibh, New Delhi

4. Irrigation Engineering and Hydraulic structures- S. K. garg- Khanna Publication, New Delhi.

TRANSPORTATION ENGINEERING I

Subject Code :10CV56
I A Marks :25
No. of lecture Hours/week :04
Exam Hours :03
Total No. of Lecture Hours :52
Exam Marks :100

PART – A

UNIT – 1

PRINCIPLES OF TRANSPORTATION ENGINEERING: Importance of transportation, Different modes of transportation and comparison, Characteristics of road transport Jayakar committee recommendations, and implementation – Central Road Fund, Indian Roads Congress, Central Road Research Institute

04 Hrs

UNIT – 2

HIGHWAY DEVELOPMENT AND PLANNING: Road types and classification, road patterns, planning surveys, master plan – saturation system of road planning, phasing road development in India, problems on best alignment among alternate proposals Salient Features of 3rd and 4th twenty year

road development plans and Policies, Present scenario of road development in India (NHDP & PMGSY) and in Karnataka (KSHIP & KRDCL) Road development plan - vision 2021.
06 Hrs

UNIT – 3

HIGHWAY ALIGNMENT AND SURVEYS: Ideal Alignment, Factors affecting the alignment, Engineering surveys-Map study, Reconnaissance, Preliminary and Final location & detailed survey, Reports and drawings for new and re-aligned projects **04 Hrs**

HIGHWAY GEOMETRIC DESIGN – I: Importance, Terrain classification, Design speed, Factors affecting geometric design, **Cross sectional elements**-Camber- width of pavement-Shoulders-, Width of formation- Right of way, Typical cross sections **05 Hrs**

UNIT – 4

HIGHWAY GEOMETRIC DESIGN – II: Sight Distance-Restrictions to sight distance- Stopping sight distance-Overtaking sight distance- overtaking zones- Examples on SSD and OSD- Sight distance at intersections, **Horizontal alignment**-Radius of Curve- Superelevation – Extra widening-Transition curve and its length, setback distance – Examples, **Vertical alignment**-Gradient-summit and valley curves with examples. **07 Hrs**

PART - B

UNIT – 5

PAVEMENT MATERIALS: Subgrade soil - desirable properties-HRB soil classification-determination of CBR and modulus of subgrade reaction-Examples on CBR and Modulus of subgrade reaction, **Aggregates-** Desirable properties and list of tests, **Bituminous materials**-Explanation on Tar, bitumen,cutback and emulsion-List of tests on bituminous materials **06 Hrs**

UNIT – 6

PAVEMENT DESIGN: Pavement types, component parts of flexible and rigid pavements and their functions,design factors, ESWL and its determination-Examples, **Flexible pavement**-Design of flexible pavements as per IRC;37-2001-Examples, **Rigid pavement**- Westergaard's equations for load and temperature stresses- Examples- Design of slab thickness only as per IRC:58-2002

06 Hrs

UNIT – 7

PAVEMENT CONSTRUCTION: Earthwork –cutting-Filling, Preparation of subgrade, Specification and construction of i) Granular Subbase, ii) WBM Base, iii) WMM base, iv) Bituminous Macadam, v) Dense Bituminous Macadam vi) Bituminous Concrete, vii) Dry Lean Concrete sub base and PQC viii) concrete roads **05 Hrs**

HIGHWAY DRAINAGE: Significance and requirements, Surface drainage system and design-Examples, sub surface drainage system, design of filter materials

03 Hrs

UNIT – 8

HIGHWAY ECONOMICS: Highway user benefits, VOC using charts only-Examples, Economic analysis - annual cost method-Benefit Cost Ratio method-NPV-IRR methods-Examples, Highway financing-BOT-BOOT concepts

06 Hrs

TEXT BOOKS:

1. **Highway Engineering –** S K Khanna and C E G Justo, Nem Chand Bros, Roorkee

2. **Highway Engineering** - L R Kadiyali, Khanna Publishers, New Delhi
3. **Transportation Engineering** – K P Subramanium, Scitech Publications, Chennai
4. **Transportation Engineering – James** H Banks, Mc. Graw. Hill Pub. New Delhi
5. **Highway Engineeering** –R. Sreenivasa Kumar, University Press. Pvt.Ltd. Hyderabad

REFERENCE BOOKS:

1. **Relevant IRC Codes**
2. **Specifications for Roads and Bridges-MoRT&H, IRC, New Delhi.**
3. **Transportation Engineering** – C. Jotin Khisty, B. Kent lal, PHI Learning Pvt. Ltd. New Delhi.

VI SEMESTER

ENVIRONMENTAL ENGINEERING-I

Subject Code	: 10CV61	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

Part - A

Unit - 1

INTRODUCTION: Human activities and environmental pollution. Water for various beneficial uses and quality requirement. Need for protected water supply.

2 Hours

DEMAND OF WATER: Types of water demands- domestic demand in detail, institutional and commercial, public uses, fire demand. Per capita consumption –factors affecting per capita demand, population forecasting, different methods with merits &demerits- variations in demand of water. Fire demand – estimation by Kuichling's formula, Freeman formula & national board of fire underwriters formula, peak factors, design periods & factors governing the design periods

6 Hours

Unit - 2

SOURCES: Surface and subsurface sources – suitability with regard to quality and quantity.

3 Hours

COLLECTION AND CONVEYANCE OF WATER: Intake structures – different types of intakes; factor of selection and location of intakes. Pumps- Necessity, types – power of pumps; factors for the selection of a pump. Pipes – Design of the economical diameter for the rising main; Nomograms – use; Pipe appurtenances.

6 Hours

Unit - 3

QUALITY OF WATER: Objectives of water quality management. wholesomeness & palatability, water borne diseases. Water quality parameters – Physical, chemical and Microbiological. Sampling of water for examination. Water quality analysis (IS: 3025 and IS: 1622) using analytical and instrumental techniques. Drinking water

standards BIS & WHO guidelines. Health significance of Fluoride, Nitrates and heavy metals like Mercury, Cadmium, Arsenic etc. and toxic / trace organics.

6 Hours

Unit - 4

WATER TREATMENT: Objectives – Treatment flow-chart. Aeration-Principles, types of Aerators.

2 Hours

SEDIMENTATION: Theory, settling tanks, types, design. Coagulant aided sedimentation, jar test, chemical feeding, flash mixing, and clari-flocculator.

4 Hours

Part - B

Unit - 5

FILTRATION: Mechanism – theory of filtration, types of filters, slow sand, rapid sand and pressure filters including construction, operation, cleaning and their design – excluding under drainage system – back washing of filters. Operational problems in filters.

6 Hours

Unit - 6

DISINFECTION: Theory of disinfection, types of disinfection, Chlorination, chlorine demand, residual chlorine, use of bleaching powder. UV irradiation treatment – treatment of swimming pool water

4 Hours

SOFTENING – definition, methods of removal of hardness by lime soda process and zeolite process RO & Membrane technique.

3 Hours

Unit - 7

MISCELLANEOUS TREATMENT: Removal of color, odor, taste, use of copper sulfate, adsorption technique, fluoridation and defluoridation.

4 Hours

DISTRIBUTION SYSTEMS: System of supply, service reservoirs and their capacity determination, methods of layout of distribution systems.

4
Hours

Unit - 8
MISCELLANEOUS: Pipe appurtenances, various valves, type of fire hydrants, pipefitting, Layout of water supply pipes in buildings.
2
Hours

TEXT BOOKS:
1. Water supply Engineering –S.K.Garg, Khanna Publishers
2. Environmental Engineering I –B C Punima and Ashok Jain
3. Manual on Water supply and treatment –CPHEEO, Minstry of Urban Development, New Delhi

REFERENCES

1. Hammer, M.J., (1986), **Water and Wastewater Technology** –SI Version, 2nd
Edition, John Wiley and Sons.

2. Karia, G.L., and Christian, R.A., (2006), **Wastewater Treatment – Concepts and Design Approach,** Prentice Hall of India Pvt. Ltd., New Delhi.

3. Metcalf and Eddy, (2003), **Wastewater Engineering, Treatment and Reuse ,** 4th Edition, Tata McGraw Hill Edition, Tata McGraw Hill Publishing Co. Ltd.

4. Peavy, H.S., Rowe, D.R., and Tchobanoglous, G., (1986),**Environmental Engineering**–Mc Graw Hill Book Co.

5. Raju, B.S.N., (1995), **Water Supply and Wastewater Engineering, T**ata McGraw Hill Pvt. Ltd., New Delhi.

6. Sincero, A.P., and Sincero, G.A., (1999), **Environmental Engineering – A Design Approach**–Prentice Hall of India Pvt. Ltd., New Delhi.

GEOTECHNICAL ENGINEERING – II

Subject Code	**: 10CV64**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

SUBSURFACE EXPLORATION: Importance of exploration program, Methods of exploration: Boring, Seismic refraction method of grophysical exploration, Types of samples - undisturbed, disturbed and representative samples, Samplers, sample disturbance, area ratio, Recovery ratio, clearance, Stabilisation of boreholes - Typical bore log. Number and depth of borings for various civil engineering structures, soil exploration report.

DRAINAGE AND DEWATERING: Determination of ground water level by Hvorselev's method, Control of ground water during excavation: Dewatering - Ditches and sumps, well point system, Vacuum method, Electro- Osmosis method.

8 Hours

UNIT - 2

STRESSES IN SOILS: Boussinesq's and Westergaard's theories for concentrated, circular and rectangular loads. Comparison of Boussinesq's and westergaard's analysis. Pressure distribution diagrams, Contact pressure, Newmark's chart.

6 Hours

UNIT - 3

FLOWNETS: Laplace equation (no derivation) assumptions and limitations only, characteristics and uses of flownets, Methods of drawing flownets for Dams and sheet piles. Estimating quantity of seepage and Exit gradient. Determination of phreatic line in earth dams with and without filter. Piping and protective filter.

5 Hours

UNIT - 4

LATERAL EARTH PRESSURE: Active and Passive earth pressures, Earth pressure at rest. Rankine's and Coulomb's Earth pressure theories-–assumptions and limitations, Graphical solutions for active earth pressure (cohesionless soil only) – Culmann's and Rebhann's methods, Lateral earth pressure in cohesive and cohesionless soils, Earth pressure distribution.

7 Hours

PART - B

UNIT - 5

STABILITY OF EARTH SLOPES: Types of slopes, causes and type of failure of slopes. Definition of factor of safety, Stability of infinite slopes, Stability of finite slopes by Method of slices and Friction Circle method, Taylor's stability number, Fellineous method,.

7 Hours

UNIT - 6

BEARING CAPACITY: Definitions of ultimate, net and safe bearing capacities, Allowable bearing pressure. Terzaghi's and Brinch Hansen's bearing capacity equations - assumptions and limitations, Bearing capacity of footing subjected to eccentric loading. Effect of ground water table on bearing capacity. Field methods of evaluation of bearing capacity - Plate load test, Standard penetration test and cone penetration test.

8 Hours

UNIT - 7

FOUNDATION SETTLEMENT: Importance and Concept of Settlement Analysis, Immediate, Consolidation and Secondary settlements (no derivations, but, computation using relevant formula for Normally Consolidated soils), Tolerance. BIS specifications for total and differential settlements of footings and rafts.

5 Hours

UNIT – 8

PROPORTIONING SHALLOW AND PILE FOUNDATIONS

Allowable Bearing Pressure, Factors influencing the selection of depth of foundation, Factors influencing Allowable Bearing Pressure, Factors influencing the choice of foundation, Proportioning isolated, combined, strip and mat foundations, Classification of pile foundation, Pile load capacity, Proportioning pile foundation.

6 Hours

TEXT BOOKS:

1. **Soil Engineering in Theory and Practice**- Alam Singh and Chowdhary G.R. (1994), CBS Publishers and Distributors Ltd., New Delhi.
2. **Soil Mechanics and Foundation Engg.**- Punmia B.C. (2005), 16th Edition Laxmi Publications Co. , New Delhi.

REFERENCES BOOKS:

1. **Foundation Analysis and Design**- Bowles J.E. (1996), 5th Edition, McGraw Hill Pub. Co. New York.

2. **Soil Mechanics and Foundation Engineering**- Murthy V.N.S. (1996), 4th Edition, UBS Publishers and Distributors, New Delhi.
3. **Basic and Applied Soil Mechanics**- Gopal Ranjan and Rao A.S.R. (2000), New Age International (P) Ltd., Newe Delhi.
4. **Geotechnical Engineering**- Venkatrahmaiah C. (2006), 3rd Edition New Age International (P) Ltd., Newe Delhi.
5. **Soil Mechanics**- Craig R.F. (1987), Van Nostrand Reinhold Co. Ltd.
6. **Principles of Geotechnical Engineering**- Braja M. Das (2002), 5th Edition, Thomson Business Information India (P) Ltd., India.
7. **Text Book of Geotechnical Engineering**- Iqbal H. Khan (2005), 2nd Edition, PHI, India.

ALTERNATIVE BUILDING MATERIALS AND TECHNOLOGIES

Subject Code	**: 10CV662**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

INTRODUCTION:

1. Energy in building materials
2. Environmental issues concerned to building materials
3. Global warming and construction industry
4. Environmental friendly and cost effective building technologies.
5. Requirements for building of different climatic regions.
6. Traditional building methods and vernacular architecture.

6 Hours

UNIT - 2

ALTERNATIVE BUILDING MATERIALS:

1. Characteristics of building blocks for walls
2. Stones and Laterite blocks
3. Bricks and hollow clay blocks
4. Concrete blocks
5. Stabilized blocks: Mud Blocks, Steam Cured Blocks, Fal-G Blocks and Stone Masonry Block

6 Hours

UNIT - 3

LIME-POZZOLANA CEMENTS

1. Raw materials
2. Manufacturing process
3. Properties and uses
4. Fibre reinforced concretes
5. Matrix materials
6. Fibers : metal and synthetic
7. Properties and applications
8. Fibre reinforced plastics
9. Matrix materials
10. Fibers : organic and synthetic
11. Properties and applications
12. Building materials from agro and industrial wastes
13. Types of agro wastes

14. Types of industrial and mine wastes
15. Properties and applications
16. Field quality control test methods

6 Hours

UNIT - 4
ALTERNATIVE BUILDING TECHNOLOGIES

1. Alternative for wall construction
2. Types
3. Construction method
4. Masonry mortars
5. Types
6. Preparation
7. Properties
8. Ferrocement and ferroconcrete building components
9. Materials and specifications
10. Properties
11. Construction methods
12. Applications
13. Alternative roofing systems
14. Concepts
15. Filler slabs
16. Composite beam panel roofs
17. Masonry vaults and domes

8 ours

PART - B

UNIT - 5
STRUCTURAL MASONRY

1. Compressive strength of masonry elements
2. Factors affecting compressive strength
3. Strength of units, prisms / wallettes and walls
4. Effect of brick work bond on strength
5. Bond strength of masonry : Flexure and shear
6. Elastic properties of masonry materials and masonry

6 Hours

UNIT - 6

1. IS Code provisions
2. Design of masonry compression elements
3. Concepts in lateral load resistance

8 Hours

UNIT - 7
COST EFFECTIVE BUILDING DESIGN

1. Cost concepts in buildings
2. Cost saving techniques in planning, design and construction
3. Cost Analysis : Case studies using alternatives.

6 Hours

UNIT - 8
EQUIPMENT FOR PRODUCTION OF ALTERNATIVE MATERIALS

1. Machines for manufacture of concrete
2. Equipments for production of stabilized blocks
3. Moulds and methods of production of precast elements.

6 Hours

TEXT BOOKS:

1. **Alternative building methodologies for engineers and architects, lecture notes edited**: K.S. Jagadish and B.V. Venkatarama Reddy, Indian Institute of cience, Bangalore.
2. **Structural Masonry** by Arnold W. Hendry.

REFERENCE BOOKS:

1. **Relevant IS Codes.**
2. **Alternative building materials and technologies.**
3. **Proceedings of workshop on Alternative building material and technology,** 19th to 20th December 2003 @ BVB College of Engineering. & Tech., Hubli.

GROUND WATER HYDROLOGY

Subject Code	**: 10CV665**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1
INTRODUCTION: Importance. Vertical distribution of sub-surface water. Occurrence in different types of rocks and soils. Definition of aquifer, Aquifuge, Aquitard and Aquiclude. Confined and unconfined aquifers.

6 Hours

UNIT - 2
AQUIFER PROPERTIES: Aquifer parameters – Specific yield, Specific retention, Porosity, Storage coefficient, derivation of the expression. Determination of specific yield. Land subsidence due to ground water withdrawals.

6 Hours

UNIT - 3
DARCY'S LAW AND HYDRAULIC CONDUCTIVITY: Introduction. Darcy's law. Hydraulic conductivity. Coefficient of permeability and Intrinsic permeability, Transmissibility, Permeability in Isotropic, Unisotropic layered soils. Steady one dimensional flow, different cases with recharge.

7 Hours

UNIT - 4
WELL HYDRAULICS – STEADY FLOW: Introduction. Steady radial flow in confined and unconfined aquifers. Pumping tests.

7 Hours

PART - B

UNIT - 5
WELL HYDRAULICS – UNSTEADY FLOW: Introduction. General equation derivation; Theis method, Cooper and JaCob method, Chow's method. Solution of unsteady flow equations.

7 Hours

UNIT - 6

GROUND WATER DEVELOPMENT: Types of wells. Methods of constructions. Tube well design. Dug wells. Pumps for lifting water: Working principles, Power requirements.

7 Hours

UNIT - 7

GROUND WATER EXPLORATION: Seismic method, Electrical resistivity method, Bore hole geo-physical techniques; Electrical logging, Radio active logging, Induction logging, Sonic logging and Fluid logging.

6 Hours

UNIT - 8

GROUND WATER RECHARGE AND RUNOFF: Recharge by vertical leakage. Artificial recharge. Ground water runoff. Ground water budget.

6 Hours

TEXT BOOKS:

1. **Ground Water**- H.M. Raghunath, - Wiley Eastern Limited, New Delhi.
2. **Ground Water Hydrology**- K. Todd, - Wiley and Sons, New Delhi.
3. **Numerical Ground Water Hydrology**- A.K. Rastogi, - Penram, International Publishing (India), Pvt. Ltd., Mumbai.

REFERENCE BOOKS:

1. **Ground Water Hydrology**- Bower H.- McGraw Hill, New Delhi.
2. **Ground Water and Tube Wells**- Garg Satya Prakash, - Oxford and IBH, New Delhi.
3. **Ground Water Resource Evaluation**- W.C. Walton, - McGraw Hill - Kogakusha Ltd., New Delhi.
4. **Water wells and Pumps** – Michel D.M., Khepar. S.D., Sondhi. S.K., McGraw Hill Education – 2nd Edition.

TRAFFIC ENGINEERING

Subject Code	**: 10CV667**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1
INTRODUCTION: Definition, objectives of Traffic Engineering and scope of Traffic Engineering.

2

Hours

UNIT - 2
TRAFFIC CHARACTERISTICS: Road user characteristics, vehicular characteristics – static and dynamic characteristics, power

performance of vehicles, Resistance to the motion of vehicles – Reaction time of driver – Problems on above.

6 Hours

UNIT - 3

TRAFFIC STUDIES: Various types of traffic engineering studies, data collection, analysis objectives and method of study – Definition of study area – Sample size and analysis.

6 Hours

UNIT - 4

INTERPRETATION OF TRAFFIC STUDIES: Classified traffic Volume at mid block and intersections, PCU, origin and destination, spot speed, speed and delay, parking – on street parking, off street parking, Accident – causes, analysis measures to reduce accident – problems on above.

6 Hours

PART - B

UNIT - 5

TRAFFIC FLOW THEORIES: Traffic flow theory, Green shield theory – Goodness of fit, - correlation and regression analysis (linear only) – Queuing theory, Car following theory and relevant problems on above.

8 Hours

UNIT - 6

STATISTICAL ANALYSIS: Poisson's distribution and application to traffic engineering. Normal Distribution – Significance tests for observed traffic data, Chi Square test – problems on above. Traffic forecast – simulation technique.

12 Hours

UNIT - 7

TRAFFIC REGULATION AND CONTROL: Driver, vehicle and road controls – Traffic regulations – one way – Traffic markings, Traffic signs, Traffic signals – Vehicle actuated and synchronized signals – Signals co-ordination. Webster's method of signal design, IRC method, traffic rotary elements and designs, traffic operation – Street lighting, Road side furniture, Relevant problems on above.

10 Hours

UNIT - 8

INTELLIGENT TRANSPORT SYSTEM: Definition, Necessities, Application in the present traffic scenario

2 Hours

TEXT BOOKS:

1. **Traffic Engineering & Transport Planning** – L.R. Kadiyali-Khanna Publishers.
2. **Highway Engineering Nemchand & Bros**- Khanna & Justo-Roorkee (UA).
3. **Traffic Engg.** - Matson & Smith:-Mc.Graw Hill and Co.
4. **Traffic flow theory** – Drew- Mc. Graw Hill and Co.

REFERENCE BOOKS:

1. **Traffic Engineering.** Pignataro- Prentice Hall.
2. **Highway Capacity Manual** – 2000.
3. **An introduction to traffic engineering**- Jotin Khistey and Kentlal- PHI.
4. **Traffic Engineering**- Mc Shane & Roess- PHI.

ESTIMATION & VALUATION

Subject Code	**: 10CV73**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

ESTIMATION: Study of various drawings with estimates, important terms, units of measurement, abstract Methods of taking out quantities and cost – center line method, long and short wall method or crossing method. Preparation of detailed and abstract estimates for the following Civil Engineering works – Buildings – RCC framed structures with flat, sloped RCC roofs with all Building components.

16 Hours

PART - B

ESTIMATE: Different type of estimates, approximate methods of estimating buildings, cost of materials. Estimation of wooden joineries such as doors, windows & ventilators.

5 Hours

ESTIMATES: Steel truss (Fink and Howe truss), manhole and septic tanks, RCC Culverts.

6 Hours

SPECIFICATIONS: Definition of specifications, objective of writing specifications, essentials in specifications, general and detail specifications of common item of works in buildings.

5 Hours

PART - C

RATE ANALYSIS: Definition and purpose. Working out quantities and rates for the following standard items of works – earth work in different types of soils, cement concrete of different mixes, bricks and stone masonry, flooring, plastering, RCC works, centering and form work for different RCC items, wood and steel works for doors, windows and ventilators.

6 Hours

MEASUREMENT OF EARTHWORK FOR ROADS: Methods for computation of earthwork – cross sections – mid section formula or average end area or mean sectional area, trapezoidal & prismoidal formula with and without cross slopes.

6 Hours

CONTRACTS: Types of contract – essentials of contract agreement – legal aspects, penal provisions on breach of contract. Definition of the terms – Tender, earnest money deposit, security deposit, tender forms, documents and types. Acceptance of contract documents. Termination of contract, completion certificate, quality control, right of contractor, refund of deposit. Administrative approval – Technical sanction. Nominal muster roll, measurement books – procedure for recording and checking measurements – preparation of bills.
Valuation- Definitions of various terms, method of valuation, Freehold & Leasehold properties, Sinking fund, depreciation and method of estimating depreciation, Outgoings.

8 Hours

REFERENCE BOOKS:

1. **Estimating & Costing**, B. N. Dutta, Chand Publisher
2. **Quantity Surveying**- P.L. Basin S. Chand : New Delhi.
3. **Estimating & Specification** - S.C. Rangwala :: Charotar publishing house, Anand.
4. **Text book of Estimating & Costing**- G.S. Birde, Dhanpath Rai and sons : New Delhi.
5. **A text book on Estimating, Costing and Accounts**- D.D. Kohli and R.C. Kohli S. Chand : New Delhi.
6. **Contracts and Estimates,** B. S. Patil, University Press, 2006.

DESIGN OF PRE-STRESSED CONCRETE STRUCTURES

Subject Code	**: 10CV74**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1
MATERIALS: High strength concrete and steel, Stress-Strain characteristics and properties.

2 Hours

BASIC PRINCIPLES OF PRESTRESSING: Fundamentals, Load balancing concept, Stress concept, centre of Thrust. Pre-tensioning and post-tensioning systems, tensioning methods and end anchorages.

4 Hours

UNIT - 2
ANALYSIS OF SECTIONS FOR FLEXURE: Stresses in concrete due to pre-stress and loads, stresses in steel due to loads, Cable profiles.

8 Hours

UNIT - 3
LOSSES OF PRE-STRESS: Various losses encountered in pre-tensioning and post tensioning methods, determination of jacking force.

6 Hours

UNIT - 4
DEFLECTIONS: Deflection of a pre-stressed member – Short term and long term deflections, Elastic deflections under transfer loads and due to different cable profiles. Deflection limits as per IS 1343. Effect of creep on deflection, load verses deflection curve, methods of reducing deflection

6 Hours

PART - B

UNIT - 5
LIMIT STATE OF COLLAPSE: Flexure -IS Code recommendations – Ultimate flexural strength of sections.

5 Hours

UNIT - 6
LIMIT STATE OF COLLAPSE (cont…): Shear - IS Code recommendations, shear resistance of sections, shear reinforcement. Limit state of serviceability – control of deflections and cracking.

7 Hours

UNIT - 7
DESIGN OF END BLOCKS: Transmission of prestress in pretensioned members, transmission length, Anchorage stress in post-tensioned members. Bearing stress and bursting tensile force-stresses in end blocks-Methods, I.S. Code, provision for the design of end block reinforcement.

6 Hours

UNIT - 8
DESIGN OF BEAMS: Design of pre-tensioned and post-tensioned symmetrical and asymmetrical sections. Permissible stress, design of prestressing force and eccentricity, limiting zone of pre-stressing force cable profile.

8 Hours

REFERENCE BOOKS:

1. **Pre-stressed Concrete**- N. Krishna Raju - Tata Mc. Graw Publishers.
2. **Pre-stressed Concrete**- P. Dayarathnam : Oxford and IBH Publishing Co.

3. **Design of pre-stressed concrete structures**- T.Y. Lin and Ned H. Burns - John Wiley & Sons, New York.
4. **Fundamental of pre-stressed concrete**- N.C. Sinha & S.K. Roy
5. IS : 1343 : 1980
6. **Pre-stressed Concrete**- N. Rajgopalan

PAVEMENT MATERIALS AND CONSTRUCTION

Subject Code	**: 10CV763**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A
PAVEMENT MATERIALS

UNIT - 1

AGGREGATES: Origin, classification, requirements, properties and tests on road aggregates, concepts of size and gradation – design gradation, maximum aggregate size, aggregate blending by different methods to meet specification.

6 Hours

UNIT - 2

BITUMEN AND TAR: Origin, preparation, properties and chemical constitution of bituminous road binders; requirements.

4 Hours

UNIT - 3

BITUMINOUS EMULSIONS AND CUTBACKS: Preparation, characteristics, uses and tests. Adhesion of Bituminous Binders to Road Aggregates: Adhesion failure, mechanism of stripping, tests and methods of improving adhesion.

8 Hours

UNIT - 4

BITUMINOUS MIXES: Mechanical properties, dense and open textured mixes, flexibility and brittleness, (no Hveem Stabilometer & Hubbar – Field Tests) bituminous mix, design methods using Rothfuch's Method only and

specification, Marshal mixed design criteria- voids in mineral aggregates, voids in total mix, density, flow, stability, percentage voids filled with bitumen.

6 Hours

PART - B

PAVEMENT CONSTRUCTION

UNIT - 5

EQUIPMENT IN HIGHWAY CONSTRUCTION: Various types of equipment for excavation, grading and compaction – their working principle, advantages and limitations. Special equipment for bituminous and cement concrete pavement and stabilized soil road construction.

6 Hours

UNIT - 6

SUBGRADE: Earthwork grading and construction of embankments and cuts for roads. Preparation of subgrade, quality control tests.

6 Hours

UNIT - 7

FLEXIBLE PAVEMENTS: Specifications of materials, construction method and field control checks for various types of flexible pavement layers.

8 Hours

UNIT - 8

CEMENT CONCRETE PAVEMENTS: Specifications and method of cement concrete pavement construction (PQC Importance of providing DLC as sub-base and polythene thin layer between PQC and sub-base); Quality control tests; Construction of various types of joints.

8 Hours

TEXT BOOKS:

1. **Highway Engineering**- Khanna, S.K., and Justo, C.E.G., : Nem Chand and Bros. Roorkee
2. **Construction Equipment and its Management**- Sharma, S.C. : Khanna Publishers.
3. **Hot Mix Asphalt Materials, Mixture Design and Construction**- Freddy L. Roberts, Kandhal, P.S. : University of Texas Austin, Texas. NAPA Education Foundation Lanham, Maryland.

REFERENCES BOOKS:

1. RRL, DSIR, '**Bituminous Materials in Road Construction**', HMSO Publication.
2. RRL, DSIR, '**Soil Mechanics for Road Engineers**', HMSO Publication.
3. Relevant IRC codes and MoRT & H specifications.

CONCRETE AND HIGHWAY MATERIALS LABORATORY

Subject Code	**: 10CVL78**	IA Marks	: 25
No. of Practical Hours/Week	: 03	Exam Hours	: 03
Total No. of Practical Hours	: 42	Exam Marks	: 50

PART - A

CEMENT: Normal Consistency, Setting time, Soundness by Autoclave method, Compression strength test and Air permeability test for fineness, Specific gravity of cement.

FRESH CONCRETE: Workability – slump, Compaction factor and Vee Bee tests.

HARDENED CONCRETE: Compression strength and Split tensile tests. Test on flexural strength of RCC beams, Permeability of concrete.

PART - B

SOIL: Density of Soil by Sand replacement method, CBR Text.

AGGREGATES: Crushing, abrasion, impact and Shape tests (Flaky, Elongation, Angularity number) Specific gravity and water absorption.

BITUMINOUS MATERIALS AND MIXES: Specific Gravity, Penetration,Ductility, Softening point, Flash and fire point, Viscosity, proportioning of aggregate mixes by Rothfutch Method, Marshall Stability tests.

REFERENCE BOOK:

1. Relevant IS Codes and IRC Codes.

2. **Highway Material Testing Laboratory Manual** by Khanna S K and Justo, – CEG Nemi Chand & Bros.
3. M. L. Gambhir : Concrete Manual : Dhanpat Rai & sons New – Delhi.

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VIII -SEMESTER

ADVANCED CONCRETE TECHNOLOGY

Subject Code	**: 10CV81**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

Importance of Bogue's compounds, Structure of a Hydrated Cement Paste, Volume of hydrated product, porosity of paste and concrete, transition Zone, Elastic Modulus, factors affecting strength and elasticity of concrete, Rheology of concrete in terms of Bingham's parameter.

7 Hour

UNIT - 2

CHEMICAL ADMIXTURES- Mechanism of chemical admixture, Plasticizers and super Plasticizers and their effect on concrete property in fresh and hardened state, Marsh cone test for optimum dosage of super plasticizer, retarder, accelerator, Air-entraining admixtures, new generation superplasticiser.

MINERAL ADMIXTURE-Fly ash, Silica fume, GCBS, and their effect on concrete property in fresh state and hardened state.

6 Hours

UNIT - 3

MIX DESIGN - Factors affecting mix design, design of concrete mix by BIS method using IS10262 and current American (ACI)/ British (BS) methods. Provisions in revised IS10262-2004.

6 Hours

UNIT - 4

DURABILITY OF CONCRETE - Introduction, Permeability of concrete, chemical attack, acid attack, efflorescence, Corrosion in concrete. Thermal conductivity, thermal diffusivity, specific heat. Alkali Aggregate Reaction, IS456-2000 requirement for durability.

7 Hours

PART - B

UNIT - 5

RMC concrete - manufacture, transporting, placing, precautions, Methods of concreting- Pumping, under water concreting, shotcrete, High volume fly ash concrete concept, properties, typical mix

Self compacting concrete concept, materials, tests, properties, application and Typical mix.

6 Hours

UNIT - 6

Fiber reinforced concrete - Fibers types and properties, Behavior of FRC in compression, tension including pre-cracking stage and post-cracking stages, behavior in flexure and shear, Ferro cement - materials, techniques of manufacture, properties and application

7 Hours

UNIT - 7

Light weight concrete-materials properties and types. Typical light weight concrete mix High density concrete and high performance concrete-materials, properties and applications, typical mix.

6 Hours

UNIT - 8

Test on Hardened concrete-Effect of end condition of specimen, capping, H/D ratio, rate of loading, moisture condition. Compression, tension and flexure tests. Tests on composition of hardened concrete-cement content, original w/c ratio. NDT tests concepts-Rebound hammer, pulse velocity methods.

7 Hours

TEXT / REFERENCE BOOKS:

1. **Properties of Concrete**- Neville, A.M. - ELBS Edition, Longman Ltd., London
2. **Concrete Technology-** M.S. Shetty
3. **Concrete Technology**- A.R. Santhakumar,-Oxford University Press.
4. **Concrete**- P.K. Mehta, P J M Monteiro,- Prentice Hall, New Jersey (Special Student Edition by Indian Concrete Institute Chennai)
5. ACI Code for Mix Design
6. IS 10262-2004
7. **Concrete Mix Design**- N. Krishna Raju - Sehgal Publishers
8. **Concrete Manual**- Gambhir M.L.- Dhanpat Rai & Sons, New Delhi
9. **Advanced Concrete Technology Processes**- John Newman, Ban Seng Choo, - London.
10. **Advanced Concrete Technology Constituent materials**- John Newman, Ban Seng Choo- London
11. **Non-Destructive Test and Evaluation of Materials**- J.Prasad, C G K Nair,-Mc Graw Hill.
12. **High Performance Concrete**- Prof Aitcin P C- E and FN, London.
13. **Properties of Fresh Concrete**- Power T.C.- E and FN, London

ENVIRONMENTAL IMPACT ASSESSMENT

Subject Code	**: 10CV847**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

Development Activity and Ecological Factors EIA, Rapid and Comprehensive EIA, EIS, FONSI. Need for EIA Studies, Baseline Information,

6 Hours

UNIT - 2

Step-by-step procedures for conducting EIA, Limitations of EIA.

6 Hours

UNIT - 3

Frame work of Impact Assessment. Development Projects-Environmental Setting, Objectives and Scope, Contents of EIA, Methodologies, Techniques of EIA.

8 Hours

UNIT - 4

Assessment and Prediction of Impacts on Attributes Air, Water, Noise, Land Ecology, Soil, Cultural and Socio-economic Environment. EIA guidelines for Development Projects, Rapid and Comprehensive EIA.

6 Hours

PART - B

UNIT - 5

EIA guidelines for Development Projects, Rapid and Comprehensive EIA.

6 Hours

UNIT - 6

Public Participation in Environmental Decision making. Practical Considerations in preparing Environmental Impact Assessment and Statements.

6 Hours

UNIT - 7

Salient Features of the Project Activity-Environmental Parameter Activity Relationships- Matrices.

4 Hours

UNIT - 8

EIA for Water resource developmental projects, Highway projects: Nuclear-Power plant projects, Mining project (Coal, Iron ore), Thermal Power Plant, Infrastructure Construction Activities.

10 Hours

REFERENCES

1. **Environmental Impact Analysis**-Jain R.K.-Van Nostrand Reinhold Co.
2. **Environment Impact Assessment.-** Anjaneyalu. Y.
3. Guidelines for EIA of developmental Projects Ministry of Environment and Forests, GOI.
4. **Environment Impact Assessment** - Larry W. Canter - McGraw Hill Publication.

ADVANCED DESIGN OF RCC STRUCTURES

Subject Code	**: 14CSE12**	IA Marks	: 50
No. of Lecture Hrs./ Week	: 04	Exam Hrs	: 03
Total No. of Lecture Hrs.	: 50	Exam Marks	: 100

Objectives:

The objectives of this course is to make students to learn principles of Structural Design, To design different types of structures and to detail the structures. To evaluate performance of the structures.

Course Outcomes: On completion of this course, students are able to

- **Achieve Knowledge of design and development of problem solving skills.**
- **Understand the principles of Structural Design**
- **Design and develop analytical skills.**
- **Summarize the principles of Structural Design and detailing**
- **Understands the structural performance.**

1. Yield line method of design of slabs. Design of flat slabs.
2. Design of grid floors.
3. Design of continuous beams with redistribution of moments
4. Design of Chimneys, Design of silos and bunkers.
5. Art of detailing earthquake resistant structures. Expansion and contraction joints

REFERENCE BOOKS:

1. A Park and Paulay, **“Reinforced Reinforced and Prestressed Concrete**”
2. Lin TY and Burns N H, “**Reinforced Concrete Design**".
3. Kong KF and Evans T H “**Design of Prestressed Concrete Structures**
4. P.C.Varghese, "**Advanced Reinforced Concrete Design**”, Prentice-Hall of India, New Delhi, 2005.
5. Dr.B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, **“Comprehensive RCC Design”**

STRUCTURAL DYNAMICS

Subject Code	**: 14CSE14**	IA Marks	: 50
No. of Lecture Hrs./ Week	: 04	Exam Hrs	: 03
Total No. of Lecture Hrs.	: 50	Exam Marks	: 100

Objectives:

The objectives of this course is to make students to learn principles of Structural Dynamics, To implement these principles through different methods and to apply the same for free and forced vibration of structures. To evaluate the dynamic characteristics of the structures.

Course Outcomes: On completion of this course, students are able to

- **Achieve Knowledge of design and development of problem solving skills.**
- **Understand the principles of Structural Dynamics**
- **Design and develop analytical skills.**
- **Summarize the Solution techniques for dynamics of Multi-degree freedom systems**
- **Understand the concepts of damping in structures.**

1. Introduction: Introduction to Dynamic problems in Civil Engineering, Concept of degrees of freedom, D'Alembert's principle, principle of virtual displacement and energy principles Dynamics of Single-degree-of-freedom systems: Mathematical models of Single-degree-of-freedom systems system, Free vibration response of damped and undamped systems. Methods of evaluation of damping.
2. Response of Single-degree-of-freedom systems to harmonic loading (rotation unbalance, reciprocating unbalance) including support motion, vibration isolation, transmissibility, Numerical methods applied to Single-degree-of-freedom systems - Duhamel integral, principle of vibration-measuring instruments – seismometer and accelerometer.
3. Dynamics of Multi-degree freedom systems: Mathematical models of multi-degree-of-freedom systems, Shear building concept, free vibration of undamped multi-degree-of-freedom systems - Natural frequencies and mode shapes – orthogonality property of modes.
4. Response of Shear buildings for harmonic loading without damping using normal mode approach. Response of Shear buildings for forced vibration for harmonic loading with damping using normal mode approach, condition of damping uncoupling.
5. Approximate methods: Rayleigh's method Dunkarley's method, Stodola's method. Dynamics of Continuous systems: Free longitudinal vibration of bars, flexural vibration of beams with different end conditions,~~.~~ Stiffness matrix, mass matrix (lumped and consistent); equations of motion for the discretised beam in matrix form.

Books for Reference:

1. **Dynamics of Structures – Theory and Application to Earthquake Engineering"- 2nd ed., Anil K. Chopra, Pearson Education.**
2. **Earthquake Resistant Design of Building Structures, Vinod Hosur, WILEY (india)**
3. **Vibrations, structural dynamics- M. Mukhopadhaya : Oxford IBH**
4. **Structural Dynamics- Mario Paz : CBS publishers.**
5. **Structural Dynamics- Clough & Penzien : TMH**
6. **Vibration Problems in Engineering Timoshenko, S, Van-Nostrand Co.**

ELECTIVE - I

SPECIAL CONCRETE

Subject Code	**: 14CSE152**	IA Marks	: 50
No. of Lecture Hrs./ Week	: 04	Exam Hrs	: 03
Total No. of Lecture Hrs.	: 50	Exam Marks	: 100

The objectives of this course is to make students to learn principles of Concrete mix design, To differentiate between different types of concrrete . To characterize the high Performance concrete.

Course Outcomes: On completion of this course, students are able to

- **Achieve Knowledge of design and development of problem solving skills.**
- **Understand the principles of Concrete mix design**
- **Design and develop analytical skills.**
- **Summerize the Light Weight concrete, Fibre reinforced concrete and High Performance concrete:**
- **Understand the concepts of high Performance concrete.**

1. Components of modern concrete and developments in the process and constituent materials : Role of constituents, Development in cements and cement replacement materials, pozzolona, fly ash, silica fume, rice husk ash, recycled aggregates, chemical admixtures. Mix proportioning of Concrete: Principles and methods.

2. Light Weight concrete: Introduction, classification, properties, strength and durability, mix proportioning and problems. High density concrete: Radiation shielding ability of concrete, materials for high density concrete, mix proportioning, properties in fresh and hardened state, placement methods.

3. Ferro cement: Ferrocement materials, mechanical properties, cracking of ferrocement, strength and behaviour in tension, compression and flexure, Design of ferrocement in tension, ferrocement constructions, durability, and applications.

4. ***Fibre reinforced concrete:*** Fibre materials, mix proportioning, distribution and orientation, interfacial bond, properties in fresh state, strength and behavior in tension, compression and flexure of steel fibre reinforced concrete, mechanical properties, crack arrest and toughening mechanism, applications.

5. High Performance concrete: constituents, mix proportioning, properties in fresh and hardened states, applications and limitations. Ready Mixed Concrete, Self Compacting Concrete, Reactive powder concrete, bacterial concrete.

REFERENCE BOOKS:

1. Neville A.M, “**Properties of Concrete”** Pearson Education Asis, 2000
2. P. Kumar Mehta, Paul J.N.Monterio, CONCRETE, “**Microstructure, Properties and Materials”-** Tata McGraw Hill
3. A.R.Santhakumar, (2007) “**Concrete Technology**”-Oxford University Press, New Delhi, 2007
4. Gambhir “Concrete Technology” TMH.
5. Short A and Kinniburgh.W, “**Light Weight Concrete”**- Asia Publishing House, 1963
6. Aitcin P.C**. “High performance concrete”**-E and FN, Spon London 1998
7. Rixom.R. and Mailvaganam.N., “**Chemical admixtures in concrete”**- E and FN, Spon London 1999
8. Rudnai.G., “**Light Wiehgt concrete”**- Akademiaikiado, Budapest, 1963.

STRUCTURAL ENGINEERING LAB-1

Subject Code	**: 14CSE16**	IA Marks	: 25
No. of Lab Hrs./ Week	: 03	Exam Hrs	: 03
Total No. of Lab Hrs.	**: 48**	Exam Marks	:50

The objectives of this course is to make students to learn principles of design of experiments, To investigate the performance of structural elements . To evaluate the different testing methods and equipments. .

Course Outcomes: On completion of this course, students are able to

- **Achieve Knowledge of design and development of experimenting skills.**
- **Understand the principles of design of experiments**
- **Design and develop analytical skills.**
- **Summerize the testing methods and equipments.**

1. Testing of beams for deflection, flexure and shear 12 Hrs
2. Experiments on Concrete, including Mix design 12 Hrs
3. Experiments on vibration of multi storey frame models for Natural frequency and modes. 12Hrs
4. Use of Non destructive testing (NDT) equipments – Rebound hammer, Ultra sonic pulse velocity meter and Profometer 12 Hrs

EARTHQUAKE RESISTANT STRUCTURES

Subject Code	: **14CSE22**	IA Marks	: 50
No. of Lecture Hrs./ Week	: 04	Exam Hrs	: 03
Total No. of Lecture Hrs.	: 50	Exam Marks	: 100

The objectives of this course is to make students to learn principles of engineering seismology, To design the reinforced concrete buildings for earthquake resistance. To evaluate the seismic response of the structures.

Course Outcomes: On completion of this course, students are able to

- **Achieve Knowledge of design and development of problem solving skills.**
- **Understand the principles of engineering seismology**
- **Design and develop analytical skills.**
- **Summarize the Seismic evaluation and retrofitting of structures.**
- **Understand the concepts of earthquake resistance of reinforced concrete buildings.**

1. Introduction to engineering seismology, Geological and tectonic features of India, Origin and propagation of seismic waves, characteristics of earthquake and its quantification – Magnitude and Intensity scales, seismic instruments. Earthquake Hazards in India, Earthquake Risk Evaluation and Mitigation. Structural behavior under gravity and seismic loads, Lateral load resisting structural systems, Requirements of efficient earthquake resistant structural system, damping devises, base isolation systems.
2. The Response history and strong motion characteristics. Response Spectrum – elastic and inelastic response spectra, tripartite (D-V-A) response spectrum, use of response spectrum in earthquake resistant design.Computation of seismic forces in multi-storeyed buildings – using procedures (Equivalent lateral force and dynamic analysis) as per IS-1893.
3. Structural Configuration for earthquake resistant design, Concept of plan irregularities and vertical irregularities, Soft storey, Torsion in buildings. Design provisions for these in IS-1893. Effect of infill masonry walls on frames, modeling concepts of infill masonry walls. Behaviour of masonry buildings during earthquakes, failure patterns, strength of masonry in shear and flexure, Slenderness concept of masonry walls, concepts for earthquake resistant masonry buildings – codal provisions.
4. Design of Reinforced concrete buildings for earthquake resistance-Load combinations, Ductility and energy absorption in buildings. confinement of concrete for ductility, design of columns and beams for ductility, ductile detailing provisions as per IS-1893. Structural behavior, design and ductile detailing of shear walls.
5. Seismic response control concepts – Seismic demand, seismic capacity, Overview of linear and nonlinear procedures of seismic analysis. Performance Based Seismic Engineering methodology, Seismic evaluation and retrofitting of structures.

Books for Reference:

1. **Dynamics of Structures – Theory and Application to Earthquake Engineering- 2nd ed. – Anil K. Chopra, Pearson Education.**
2. **Earthquake Resistant Design of Building Structures, Vinod Hosur, WILEY (india)**
3. **Earthquake Resistant Design of Structures, Duggal, Oxford University Press**
4. **Earthquake resistant design of structures - Pankaj Agarwal, Manish Shrikande - PHI India**
5. **IS – 1893 (Part I): 2002, IS – 13920: 1993, IS – 4326: 1993, IS-13828: 1993**
6. **Design of Earthquake Resistant Buildings, Minoru Wakabayashi, McGraw Hill Pub.**
7. **Seismic Design of Reinforced Concrete and Masonry Buildings, T Paulay and M J N Priestley, John Wiley and Sons**

FINITE ELEMENT METHOD OF ANALYSIS

Subject Code	**: 14CSE23**	IA Marks	: 50
No. of Lecture Hrs./ Week	: 04	Exam Hrs	: 03
Total No. of Lecture Hrs.	: 50	Exam Marks	: 100

The objectives of this course is to make students to learn principles of Analysis of Stress and Strain, To apply the Finite Element Method for the analysis of one and two dimensional problems. To evaluate the stress and strain parameters and their inter relations of the continuum.

Course Outcomes: On completion of this course, students are able to

- **Achieve Knowledge of design and development of problem solving skills.**
- **Understand the principles of stress-strain behaviour of continuum**
- **Design and develop analytical skills.**
- **Describe the state of stress in a continuum**
- **Understand the concepts of elasticity and plasticity.**

1. Basic concepts of elasticity – Kinematic and Static variables for various types of structural problems – approximate method of structural analysis – Rayleigh – Ritz method – Finite difference method – Finite element method. Variation method and minimization of Energy approach of element formulation.Principles of finite element method – advantages & disadvantages – Finite element procedure. Finite elements used for one, two & three dimensional problems – Element aspect ratio – mesh refinement vs. higher order elements – Numbering of nodes to minimize band width.

2. Nodal displacement parameters – Convergence criterion – Compatibility requirements – Geometric invariance – Shape function – Polynomial form of displacement function. Generalized and Natural coordinates – Lagrangian interpolation function – shape functions for one, two & three dimensional elements.

3. Isoparametric elements - Internal nodes and higher order elements – Serendipity and Lagrangian family of Finite Elements – Sub parametric and Super parametric elements – Condensation of internal nodes – Jacobian transformation Matrix. Development of strain – displacement matrix and stiffness matrix, consistent load vector, numerical integration.

4. Application of Finite Element Method for the analysis of one & two dimensional problems - Analysis of simple beams and plane trusses – Application to plane stress / strain / axisymmetric problems using CST & Quadrilateral Elements.

5. Application to Plates & Shells- Choice of displacement function (C^0, C^1 and C^2 type) – Techniques for Non – linear Analysis.

REFERENCE BOOKS:

1. Krishnamoorthy C S, “**Finite Element Analysis”-** Tata McGraw Hill
2. Desai C and Abel J F, “**Introduction to the Finite Element Method**”- East West Press Pvt. Ltd., 1972
3. Bathe K J, “**Finite Element Procedures in Engineering Analysis**”- Prentice Hall
4. Rajasekaran. S, “**Finite Element Analysis in Engineering Design”-**Wheeler Publishing
5. Cook R D, Malkan D S & Plesta M.E, “**Concepts and Application of Finite Element Analysis” -** 3rd Edition, John Wiley and Sons Inc., 1989
6. Shames I H and Dym C J, “**Energy and Finite Element Methods in Structural Mechanics**”- McGraw Hill, New York, 1985

DESIGN CONCEPTS OF SUBSTRUCTURES

Subject Code	**: 14CSE24**	IA Marks	: 50
No. of Lecture Hrs./ Week	: 04	Exam Hrs	: 03
Total No. of Lecture Hrs.	: 50	Exam Marks	: 100

The objectives of this course is to make students to learn principles of subsoil exploration, To design the sub structures. To evaluate the soil shear strength parameters.

Course Outcomes: On completion of this course, students are able to

- **Achieve Knowledge of design and development of problem solving skills.**
- **Understand the principles of subsoil exploration**
- **Design and develop analytical skills.**
- **Identify and evaluate the soil shear strength parameters .**
- **Understand the concepts of Settlement analysis.**

1. Introduction, Site investigation, In-situ testing of soils, Subsoil exploration, Classification of foundations systems.General requirement of foundations, Selection of foundations, Computations of Loads, Design concepts.
2. Concept of soil shear strength parameters, Settlement analysis of footings, Shallow foundations in clay, Shallow foundation in sand & C-Φ soils, Footings on layered soils and sloping ground, Design for Eccentric or Moment Loads.
3. Types of rafts, bearing capacity & settlements of raft foundation, Rigid methods, Flexible methods, soil-structure interaction, different methods of modeling the soil. Combined footings (rectangular & trapezoidal), strap footings & wall footings, Raft – super structure interaction effects & general concepts of structural design, Basement slabs.
4. Deep Foundations: Load Transfer in Deep Foundations, Types of Deep Foundations, Ultimate bearing capacity of different types of piles in different soil conditions, Laterally loaded piles, tension piles & batter piles, Pile groups: Bearing capacity, settlement, uplift capacity, load distribution between piles, Proportioning and design concepts of piles.
5. Types of caissons, Analysis of well foundations, Design principles, Well construction and sinking. Foundations for tower structures: Introduction, Forces on tower foundations, Selection of foundation type, Stability and design considerations, Ring foundations – general concepts.

IMPORTANT NOTE:
Only design principles of all type footings as per relevant BIS codes are to be covered, design of RC elements need not be covered

REFERENCE BOOKS:

1. Swami Saran – "**Analysis & Design of Substructures**"- Oxford & IBH Pub. Co. Pvt. Ltd., 1998.
2. Nainan P Kurian – "**Design of Foundation Systems**"- Narosa Publishing House, 1992.
3. R.B. Peck, W.E. Hanson & T.H. Thornburn – "**Foundation Engineering"-** Wiley Eastern Ltd.,Second Edition, 1984.
4. J.E. Bowles – "**Foundation Analysis and Design**"- McGraw-Hill Int. Editions, Fifth Ed., 1996.
5. W.C. Teng – "**Foundation Design"-** Prentice Hall of India Pvt. Ltd., 1983.
6. Bureau of Indian Standards:IS-1498, IS-1892, IS-1904, IS-6403, IS-8009, IS-2950, IS-11089, IS-11233, IS-2911 and all other relevant codes.

DESIGN OF TALL STRUCTURES

Subject Code	**: 14CSE252**	IA Marks	: 50
No. of Lecture Hrs./ Week	: 04	Exam Hrs	: 03
Total No. of Lecture Hrs.	: 50	Exam Marks	: 100

The objectives of this course is to make students to learn principles of stability of tall buildings, To design the tall buildings for earthquake and wind resistance. To evaluate the performance of tall structures for strength and stability.

Course Outcomes: On completion of this course, students are able to

- **Achieve Knowledge of design and development of problem solving skills.**
- **Understand the principles of strength and stability**
- **Design and develop analytical skills.**
- **Summarize the behavior of various structural systems.**
- **Understand the concepts of P-Delta analysis.**

1. **Design Criteria:** Design philosophy, loading, sequential loading, and materials – high performance concrete, fiber reinforced concrete, lightweight concrete, design mixes. Loading and Movement: Gravity loading: Dead and live load, methods of live load reduction, Impact, Gravity loading, Construction loads
2. **Wind loading**: static and dynamic approach, Analytical and wind tunnel experimentation method. Earthquake loading: Equivalent lateral force, modal analysis, combinations of loading, working stress design, Limit state design, Plastic design.
3. **Behavior of Various Structural Systems:** Factors affecting growth, Height and structural form; High rise behavior, Rigid frames, braced frames, in-filled frames, shear walls, coupled shear walls, wall-frames, tubular, cores, Futigger – braced and hybrid mega system.
4. **Analysis and Design:** Modeling for approximate analysis, accurate analysis and reduction techniques, analysis of building as total structural system considering overall integrity and major subsystem interaction, analysis for member forces; drift and twist, computerized general three dimensional analyses. .
5. **Stability of Tall Buildings:** Overall buckling analysis of frames, wall frames, approximate methods, second order effects of gravity of loading, P-Delta analysis, simultaneous first order and P-Delta analysis, Transnational, Torsional instability, out of plum effects, stiffness of member in stability, effect of foundation rotation. Structural elements: sectional shapes, properties and resisting capacities, design, deflection, cracking, pre-stressing, shear flow. Design for differential movement, creep and shrinkage effects, temperature effects and fire

REFERENCE BOOKS:

1. Taranath B.S, "**Structural Analysis and Design of Tall Buildings**"- McGraw Hill
2. Wilf gang Schuller, "**High rise building structures**"- John Wiley
3. Bryan Stafford Smith & Alexcoull, "**Tall building structures Analysis and Design**"- John Wiley
4. T.Y Lin & D.Stotes Burry, "**Structural concepts and system for Architects and Engineers"-** John Wiley
5. Lynn S.Beedle, "**Advances in Tall Buildings**"- CBS Publishers and Distributors.
6. Dr. Y.P. Gupta – Editor, "**Proceedings National Seminar on High Rise Structures- Design and Construction practices for middle level cities"-** New Age International Limited.
7.

STRUCTURAL ENGINEERING LAB-2

Subject Code	**: 14CSE26**	IA Marks	: 25
No. of Lab Hrs./ Week	: 03	Exam Hrs	: 03
Total No. of Lab Hrs.	**: 48**	Exam Marks	:50

The objectives of this course is to make students to learn the soft wares for structural analysis and design, To investigate the performance of structures for static and dynamic forces.

Course Outcomes: On completion of this course, students are able to

- **Achieve Knowledge of design and development of programming skills.**
- **Understand the principles of structural analysis and design**
- **Design and develop analytical skills.**
- **Summerize the performance of structures for static and dynamic forces..**

1. Static and Dynamic analysis of Building structure using software (ETABS / STAADPRO)	12 Hrs
2. Design of RCC and Steel structure using software (ETABS / STAADPRO)	12 Hrs
3. Analysis of folded plates and shells using software.	12 Hrs
4. Preparation of EXCEL sheets for structural design.	12 Hrs

SOFTWARE ENGINEERING

Subject Code: 10IS51	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT – 1 **6 Hours**
Overview: Introduction: FAQ's about software engineering, Professional and ethical responsibility.
Socio-Technical systems: Emergent system properties; Systems engineering; Organizations, people and computer systems; Legacy systems.

UNIT – 2 **6 Hours**
Critical Systems, Software Processes: Critical Systems: A simple safety-critical system; System dependability; Availability and reliability.
Software Processes: Models, Process iteration, Process activities; The Rational Unified Process; Computer Aided Software Engineering.

UNIT – 3 **7 Hours**
Requirements: Software Requirements: Functional and Non-functional requirements; User requirements; System requirements; Interface specification; The software requirements document.
Requirements Engineering Processes: Feasibility studies; Requirements elicitation and analysis; Requirements validation; Requirements management.

UNIT – 4 **7 Hours**
System models, Project Management: System Models: Context models; Behavioral models; Data models; Object models; Structured methods.
Project Management: Management activities; Project planning; Project scheduling; Risk management

PART - B

UNIT – 5 **7 Hours**
Software Design: Architectural Design: Architectural design decisions; System organization; Modular decomposition styles; Control styles.

Object-Oriented design: Objects and Object Classes; An Object-Oriented design process; Design evolution.

UNIT – 6 **6 Hours**
Development: Rapid Software Development: Agile methods; Extreme programming; Rapid application development.
Software Evolution: Program evolution dynamics; Software maintenance; Evolution processes; Legacy system evolution.

UNIT – 7 **7 Hours**
Verification and Validation: Verification and Validation: Planning; Software inspections; Automated static analysis; Verification and formal methods.
Software testing: System testing; Component testing; Test case design; Test automation.

UNIT – 8 **6 Hours**
Management: Managing People: Selecting staff; Motivating people; Managing people; The People Capability Maturity Model.
Software Cost Estimation: Productivity; Estimation techniques; Algorithmic cost modeling, Project duration and staffing.

Text Books:

1. Ian Sommerville: Software Engineering, 8th Edition, Pearson Education, 2007.
   (Chapters-: 1, 2, 3, 4, 5, 6, 7, 8, 11, 14, 17, 21, 22, 23, 25, 26)

Reference Books:

1. Roger.S.Pressman: Software Engineering-A Practitioners approach, 7th Edition, Tata McGraw Hill, 2007.
2. Pankaj Jalote: An Integrated Approach to Software Engineering, Wiley India, 2009.

DATABASE MANAGEMENT SYSTEMS

Subject Code: 10CS54	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART - A

UNIT – 1 6 Hours

Introduction: Introduction; An example; Characteristics of Database approach; Actors on the screen; Workers behind the scene; Advantages of using DBMS approach; A brief history of database applications; when not to use a DBMS.

Data models, schemas and instances; Three-schema architecture and data independence; Database languages and interfaces; The database system environment; Centralized and client-server architectures; Classification of Database Management systems.

UNIT – 2 6 Hours

Entity-Relationship Model: Using High-Level Conceptual Data Models for Database Design; An Example Database Application; Entity Types, Entity Sets, Attributes and Keys; Relationship types, Relationship Sets, Roles and Structural Constraints; Weak Entity Types; Refining the ER Design; ER Diagrams, Naming Conventions and Design Issues; Relationship types of degree higher than two.

UNIT – 3 8 Hours

Relational Model and Relational Algebra : Relational Model Concepts; Relational Model Constraints and Relational Database Schemas; Update Operations, Transactions and dealing with constraint violations; Unary Relational Operations: SELECT and PROJECT; Relational Algebra Operations from Set Theory; Binary Relational Operations : JOIN and DIVISION; Additional Relational Operations; Examples of Queries in Relational Algebra; Relational Database Design Using ER- to-Relational Mapping.

UNIT – 4 6 Hours

SQL – 1: SQL Data Definition and Data Types; Specifying basic constraints in SQL; Schema change statements in SQL; Basic queries in SQL; More complex SQL Queries.

PART - B

UNIT – 5 6 Hours

SQL – 2 : Insert, Delete and Update statements in SQL; Specifying constraints as Assertion and Trigger; Views (Virtual Tables) in SQL; Additional features of SQL; Database programming issues and techniques; Embedded SQL, Dynamic SQL; Database stored procedures and SQL / PSM.

UNIT – 6 6 Hours

Database Design – 1: Informal Design Guidelines for Relation Schemas; Functional Dependencies; Normal Forms Based on Primary Keys; General Definitions of Second and Third Normal Forms; Boyce-Codd Normal Form

UNIT – 7 6 Hours

Database Design -2: Properties of Relational Decompositions; Algorithms for Relational Database Schema Design; Multivalued Dependencies and Fourth Normal Form; Join Dependencies and Fifth Normal Form; Inclusion Dependencies; Other Dependencies and Normal Forms

UNIT – 8 **8 Hours**

Transaction Management: The ACID Properties; Transactions and Schedules; Concurrent Execution of Transactions; Lock- Based Concurrency Control; Performance of locking; Transaction support in SQL; Introduction to crash recovery; 2PL, Serializability and Recoverability; Lock Management; Introduction to ARIES; The log; Other recovery-related structures; The write-ahead log protocol; Checkpointing; Recovering from a System Crash; Media Recovery; Other approaches and interaction with concurrency control.

Text Books:

1. Elmasri and Navathe: Fundamentals of Database Systems, 5th Edition, Pearson Education, 2007.

   (Chapters 1, 2, 3 except 3.8, 5, 6.1 to 6.5, 7.1, 8, 9.1, 9.2 except SQLJ, 9.4, 10)
2. Raghu Ramakrishnan and Johannes Gehrke: Database Management Systems, 3rd Edition, McGraw-Hill, 2003. (Chapters 16, 17.1, 17.2, 18)

Reference Books:

1. Silberschatz, Korth and Sudharshan: Data base System Concepts, 6th Edition, Mc-GrawHill, 2010.
2. C.J. Date, A. Kannan, S. Swamynatham: An Introduction to Database Systems, 8th Edition, Pearson Education, 2006.

COMPUTER NETWORKS - I

Subject Code: 10CS55	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT - 1 **7 Hours**

Introduction: Data Communications, Networks, The Internet, Protocols & Standards, Layered Tasks,
The OSI model, Layers in OSI model, TCP/IP Protocol suite, Addressing

UNIT- 2 **7 Hours**

Physical Layer-1: Analog & Digital Signals, Transmission Impairment, Data Rate limits, Performance, Digital-digital conversion (Only Line coding: Polar, Bipolar and Manchester coding), Analog-to-digital conversion (only PCM), Transmission Modes, Digital-to-analog conversion

UNIT- 3 **6 Hours**

Physical Layer-2 and Switching: Multiplexing, Spread Spectrum, Introduction to switching, Circuit Switched Networks, Datagram Networks, Virtual Circuit Networks

UNIT- 4 **6 Hours**

Data Link Layer-1: Error Detection & Correction: Introduction, Block coding, Linear block codes, Cyclic codes, Checksum.

PART - B

UNIT- 5 **6 Hours**

Data Link Layer-2: Framing, Flow and Error Control, Protocols, Noiseless Channels, Noisy channels, HDLC, PPP (Framing, Transition phases only)

UNIT- 6 **7 Hours**

Multiple Access & Ethernet: Random access, Controlled Access, Channelization, Ethernet: IEEE standards, Standard
Ethernet, Changes in the standard, Fast Ethernet, Gigabit Ethernet

UNIT - 7 **6 Hours**

Wireless LANs and Cellular Networks: Introduction, IEEE 802.11, Bluetooth, Connecting devices, Cellular Telephony

UNIT - 8: **7 Hours**

Network Layer: Introduction, Logical addressing, IPv4 addresses, IPv6 addresses, Internetworking basics,
IPv4, IPv6, Comparison of IPv4 and IPv6 Headers.

Text Books:

1. Behrouz A. Forouzan,: Data Communication and Networking, 4^{th} Edition Tata McGraw-Hill, 2006.
   (Chapters 1.1 to 1.4, 2.1 to 2.5, 3.1 To 3.6, 4.1 to 4.3, 5.1, 6.1, 6.2, 8.1 to 8.3, 10.1 to 10.5, 11.1 to 11.7, 12.1 to 12.3, 13.1 to 13.5, 14.1, 14.2, 15.1, 16.1, 19.1, 19.2, 20.1 to 20.3)

Reference Books:

1. Alberto Leon-Garcia and Indra Widjaja: Communication Networks - Fundamental Concepts and Key architectures, 2^{nd} Edition Tata McGraw-Hill, 2004.
2. William Stallings: Data and Computer Communication, 8^{th} Edition, Pearson Education, 2007.
3. Larry L. Peterson and Bruce S. Davie: Computer Networks – A Systems Approach, 4^{th} Edition, Elsevier, 2007.
4. Nader F. Mir: Computer and Communication Networks, Pearson Education, 2007.

DATABASE APPLICATIONS LABORATORY

Subject Code: 10CSL57	**I.A. Marks : 25**
Hours/Week : 03	**Exam Hours: 03**
Total Hours : 42	**Exam Marks: 50**

1. Consider the following relations:

   Student (*snum:* integer, *sname:* string, *major:* string, *level:* string, *age:* integer)

   Class (*name:* string, *meets at:* string, *room:* string, *d:* integer)

   Enrolled (*snum:* integer, *cname:* string)

   Faculty (fi*d*: integer, *fname:* string, *deptid:* integer)

   The meaning of these relations is straightforward; for example, Enrolled has one record per student-class pair such that the student is enrolled in the class. Level is a two character code with 4 different values (example: Junior: JR etc)

   Write the following queries in SQL. No duplicates should be printed in any of the answers.

   i. Find the names of all Juniors (level = JR) who are enrolled in a class taught by Prof. Harshith
   ii. Find the names of all classes that either meet in room R128 or have five or more Students enrolled.
   iii. Find the names of all students who are enrolled in two classes that meet at the same time.
   iv. Find the names of faculty members who teach in every room in which some class is taught.
   v. Find the names of faculty members for whom the combined enrollment of the courses that they teach is less than five.

2. The following relations keep track of airline flight information:

   Flights (*no:* integer, *from:* string, *to:* string, *distance:* integer, *Departs:* time, *arrives:* time, *price:* real)

   Aircraft (*aid:* integer, *aname:* string, *cruisingrange:* integer)

   Certified (*eid:* integer, *aid:* integer)

   Employees (*eid:* integer, *ename:* string, *salary:* integer)

   Note that the Employees relation describes pilots and other kinds of employees as well; Every pilot is certified for some aircraft,

and only pilots are certified to fly.
Write each of the following queries in SQL.

i. Find the names of aircraft such that all pilots certified to operate them have salaries more than Rs.80, 000.
ii. For each pilot who is certified for more than three aircrafts, find the *eid* and the maximum *cruisingrange* of the aircraft for which she or he is certified.
iii. Find the names of pilots whose *salary* is less than the price of the cheapest route from Bengaluru to Frankfurt.
iv. For all aircraft with *cruisingrange* over 1000 Kms, .find the name of the aircraft and the average salary of all pilots certified for this aircraft.
v. Find the names of pilots certified for some Boeing aircraft.
vi. Find the *aid*s of all aircraft that can be used on routes from Bengaluru to New Delhi.

3. Consider the following database of student enrollment in courses & books adopted for each course.
STUDENT (regno: string, name: string, major: string, bdate:date)
COURSE (course #:int, cname:string, dept:string)
ENROLL (regno:string, course#:int, sem:int, marks:int)
BOOK _ ADOPTION (course# :int, sem:int, book-ISBN:int)
TEXT (book-ISBN:int, book-title:string, publisher:string, author:string)

i. Create the above tables by properly specifying the primary keys and the foreign keys.
ii. Enter at least five tuples for each relation.
iii. Demonstrate how you add a new text book to the database and make this book be adopted by some department.
iv. Produce a list of text books (include Course #, Book-ISBN, Book-title) in the alphabetical order for courses offered by the 'CS' department that use more than two books.
v. List any department that has *all* its adopted books published by a specific publisher.
vi. Generate suitable reports.
vii. Create suitable front end for querying and displaying the results.

4. The following tables are maintained by a book dealer.
AUTHOR (author-id:int, name:string, city:string, country:string)
PUBLISHER (publisher-id:int, name:string, city:string, country:string)
CATALOG (book-id:int, title:string, author-id:int, publisher-id:int, category-id:int, year:int, price:int)
CATEGORY (category-id:int, description:string)
ORDER-DETAILS (order-no:int, book-id:int, quantity:int)
i. Create the above tables by properly specifying the primary keys and the foreign keys.
ii. Enter at least five tuples for each relation.
iii. Give the details of the authors who have 2 or more books in the catalog and the price of the books is greater than the average price of the books in the catalog and the year of publication is after 2000.
iv. Find the author of the book which has maximum sales.
v. Demonstrate how you increase the price of books published by a specific publisher by 10%.
vi. Generate suitable reports.
vii. Create suitable front end for querying and displaying the results.

5. Consider the following database for a banking enterprise
BRANCH(branch-name:string, branch-city:string, assets:real)
ACCOUNT(accno:int, branch-name:string, balance:real)
DEPOSITOR(customer-name:string, accno:int)
CUSTOMER(customer-name:string, customer-street:string, customer-city:string)
LOAN(loan-number:int, branch-name:string, amount:real)

BORROWER(customer-name:string, loan-number:int)

i. Create the above tables by properly specifying the primary keys and the foreign keys
ii. Enter at least five tuples for each relation
iii. Find all the customers who have at least two accounts at the *Main* branch.
iv. Find all the customers who have an account at *all* the branches located in a specific city.
v. Demonstrate how you delete all account tuples at every branch located in a specific city.
vi. Generate suitable reports.
vii. Create suitable front end for querying and displaying the results.

Instructions:

1. The exercises are to be solved in an RDBMS environment like Oracle or DB2.
2. Suitable tuples have to be entered so that queries are executed correctly.
3. Front end may be created using either VB or VAJ or any other similar tool.
4. The student need not create the front end in the examination. The results of the queries may be displayed directly.
5. Relevant queries other than the ones listed along with the exercises may also be asked in the examination.
6. Questions must be asked based on lots.

COMPUTER NETWORKS - II

Subject Code: 10CS64	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART - A

UNIT - 1 **6 Hours**

Packet Switching Networks - 1: Network services and internal network operation, Packet network topology, Routing in Packet networks, Shortest path routing: Bellman-Ford algorithm.

UNIT – 2 **6 Hours**

Packet Switching Networks – 2: Shortest path routing (continued), Traffic management at the Packet level, Traffic management at Flow level, Traffic management at flow aggregate level.

UNIT – 3 **6 Hours**

TCP/IP-1: TCP/IP architecture, The Internet Protocol, IPv6, UDP.

UNIT – 4 **8 Hours**

TCP/IP-2: TCP, Internet Routing Protocols, Multicast Routing, DHCP, NAT and Mobile IP.

PART – B

UNIT - 5 **7 Hours**

Applications, Network Management, Network Security: Application layer overview, Domain Name System (DNS), Remote Login Protocols, E-mail, File Transfer and FTP, World Wide Web and HTTP, Network management, Overview of network security, Overview of security methods, Secret-key encryption protocols, Public-key encryption protocols, Authentication, Authentication and digital signature, Firewalls.

UNIT – 6 **6 Hours**

QoS, VPNs, Tunneling, Overlay Networks: Overview of QoS, Integrated Services QoS, Differentiated services QoS, Virtual Private Networks, MPLS, Overlay networks.

UNIT - 7 **7 Hours**

Multimedia Networking: Overview of data compression, Digital voice and compression, JPEG, MPEG, Limits of compression with loss, Compression methods without loss, Overview of IP Telephony, VoIP signaling protocols, Real-Time Media Transport Protocols, Stream control Transmission Protocol (SCTP)

UNIT – 8 **6 Hours**

Mobile AdHoc Networks and Wireless Sensor Neworks: Overview of Wireless Ad-Hoc networks, Routing in AdHOc Networks, Routing protocols for and Security of AdHoc networks, Sensor Networks and protocol structures, Communication Energy model, Clustering protocols, Routing protocols, ZigBee technology and 802.15.4.

Text Books:

1. Communication Networks – Fundamental Concepts & key architectures, Alberto Leon Garcia & Indra Widjaja, 2nd Edition, Tata McGraw-Hill, India
   (7 - excluding 7.6, 8)
2. Computer & Communication Networks, Nadir F Mir, Pearson Education, India
   (9, 10 excluding 10.7, 12.1 to 12.3, 16, 17.1 to 17.6, 18.1 to18.3, 18.5, 19, 20)

Reference Books:

1. Behrouz A. Forouzan: Data Communications and Networking, 4th Edition, Tata McGraw-Hill, 2006.
2. William Stallings: Data and Computer Communication, 8th Edition, Pearson Education, 2007.
3. Larry L. Peterson and Bruce S. Davie: Computer Networks – A Systems Approach, 4th Edition, Elsevier, 2007.
4. Wayne Tomasi: Introduction to Data Communications and Networking, Pearson Education, 2005.

OBJECT-ORIENTED MODELING AND DESIGN

Subject Code: 10CS71	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT – 1 **7 Hours**

Introduction, Modeling Concepts, class Modeling: What is Object Orientation? What is OO development? OO themes; Evidence for usefulness of OO development; OO modeling history

Modeling as Design Technique: Modeling; abstraction; The three models.

Class Modeling: Object and class concepts; Link and associations concepts; Generalization and inheritance; A sample class model; Navigation of class models; Practical tips.

UNIT – 2 **6 Hours**

Advanced Class Modeling, State Modeling: Advanced object and class concepts; Association ends; N-ary associations; Aggregation; Abstract classes; Multiple inheritance; Metadata; Reification; Constraints; Derived data; Packages; Practical tips.

State Modeling: Events, States, Transitions and Conditions; State diagrams; State diagram behavior; Practical tips.

UNIT – 3 **6 Hours**

Advanced State Modeling, Interaction Modeling: Advanced State Modeling: Nested state diagrams; Nested states; Signal generalization; Concurrency; A sample state model; Relation of class and state models; Practical tips.

Interaction Modeling: Use case models; Sequence models; Activity models. Use case relationships; Procedural sequence models; Special constructs for activity models.

UNIT – 4 **7 Hours**

Process Overview, System Conception, Domain Analysis: Process Overview: Development stages; Development life cycle.

System Conception: Devising a system concept; Elaborating a concept; Preparing a problem statement.

Domain Analysis: Overview of analysis; Domain class model; Domain state model; Domain interaction model; Iterating the analysis.

PART – B

UNIT – 5 **7 Hours**

Application Analysis, System Design: Application Analysis: Application interaction model; Application class model; Application state model; Adding operations.

Overview of system design; Estimating performance; Making a reuse plan; Breaking a system in to sub-systems; Identifying concurrency; Allocation of sub-systems; Management of data storage; Handling global resources; Choosing a software control strategy; Handling boundary conditions; Setting the trade-off priorities; Common architectural styles; Architecture of the ATM system as the example.

UNIT – 6 **7 Hours**

Class Design, Implementation Modeling, Legacy Systems: Class Design: Overview of class design; Bridging the gap; Realizing use cases; Designing algorithms; Recursing downwards, Refactoring; Design optimization; Reification of behavior; Adjustment of inheritance; Organizing a class design; ATM example.

Implementation Modeling: Overview of implementation; Fine-tuning classes; Fine-tuning generalizations; Realizing associations; Testing.

Legacy Systems: Reverse engineering; Building the class models; Building the interaction model; Building the state model; Reverse engineering tips; Wrapping; Maintenance.

UNIT – 7 **6 Hours**

Design Patterns – 1: What is a pattern and what makes a pattern? Pattern categories; Relationships between patterns; Pattern description

Communication Patterns: Forwarder-Receiver; Client-Dispatcher-Server; Publisher-Subscriber.

UNIT – 8 **6 Hours**

Design Patterns – 2, Idioms: Management Patterns: Command processor; View handler.

Idioms: Introduction; what can idioms provide? Idioms and style; Where to find idioms; Counted Pointer example

Text Books:

1. Michael Blaha, James Rumbaugh: Object-Oriented Modeling and Design with UML, 2nd Edition, Pearson Education, 2005. (Chapters 1 to 17, 23)
2. Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michael Stal: Pattern-Oriented Software Architecture, A System of Patterns, Volume 1, John Wiley and Sons, 2007. (Chapters 1, 3.5, 3.6, 4)

Reference Books:

1. Grady Booch et al: Object-Oriented Analysis and Design with Applications, 3rd Edition, Pearson Education, 2007.
2. Brahma Dathan, Sarnath Ramnath: Object-Oriented Analysis, Design, and Implementation, Universities Press, 2009.

3. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado: UML 2 Toolkit, Wiley- Dreamtech India, 2004.
4. Simon Bennett, Steve McRobb and Ray Farmer: Object-Oriented Systems Analysis and Design Using UML, 2nd Edition, Tata McGraw-Hill, 2002.

EMBEDDED COMPUTING SYSTEMS

Sub Code: 10CS72	**IA Marks :25**
Hrs/Week: 04	**Exam Hours :03**
Total Hrs: 52	**Exam Marks :100**

PART- A

UNIT – 1 **6 Hours**

Embedded Computing: Introduction, Complex Systems and Microprocessors, Embedded Systems Design Process, Formalism for System design

Design Example: Model Train Controller.

UNIT – 2 **7 Hours**

Instruction Sets, CPUs: Preliminaries, ARM Processor, Programming Input and Output, Supervisor mode, Exceptions, Traps, Coprocessors, Memory Systems Mechanisms, CPU Performance, CPU Power Consumption. Design Example: Data Compressor.

UNIT – 3 **6 Hours**

Bus-Based Computer Systems: CPU Bus, Memory Devices, I/O devices, Component Interfacing, Designing with Microprocessor, Development and Debugging, System-Level Performance Analysis

Design Example: Alarm Clock.

UNIT – 4 **7 Hours**

Program Design and Analysis: Components for embedded programs, Models of programs, Assembly, Linking and Loading, Basic Compilation Techniques, Program optimization, Program-Level performance analysis, Software performance optimization, Program-Level energy and power analysis, Analysis and optimization of program size, Program validation and testing. Design Example: Software modem.

PART- B

UNIT – 5 **6 Hours**

Real Time Operating System (RTOS) Based Design – 1: Basics of OS, Kernel, types of OSs, tasks, processes, Threads, Multitasking and Multiprocessing, Context switching, Scheduling Policies, Task Communication, Task Synchronization.

UNIT – 6 **6 Hours**

RTOS-Based Design - 2: Inter process Communication mechanisms, Evaluating OS performance, Choice of RTOS, Power Optimization. Design Example: Telephone Answering machine

UNIT – 7 **7 Hours**

Distributed Embedded Systems: Distributed Network Architectures, Networks for Embedded Systems: I2C Bus, CAN Bus, SHARC Link Ports, Ethernet, Myrinet, Internet, Network Based Design. Design Example: Elevator Controller.

UNIT – 8 **7 Hours**

Embedded Systems Development Environment: The Integrated Development Environment, Types of File generated on Cross Compilation, Dis-assembler /Decompiler, Simulators, Emulators, and Debugging, Target Hardware Debugging.

Text Books:

1. Wayne Wolf: Computers as Components, Principles of Embedded

Computing Systems Design, 2nd Edition, Elsevier, 2008.
2. Shibu K V: Introduction to Embedded Systems, Tata McGraw Hill, 2009
(Chapters 10, 13)

Reference Books:
1. James K. Peckol: Embedded Systems, A contemporary Design Tool, Wiley India, 2008
2. Tammy Neorgaard: Embedded Systems Architecture, Elsevier, 2005.

PROGRAMMING THE WEB

Subject Code: 10CS73	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

UNIT – 1 **6 Hours**
Fundamentals of Web, XHTML – 1: Internet, WWW, Web Browsers and Web Servers, URLs, MIME, HTTP, Security, The Web Programmers Toolbox.
XHTML: Basic syntax, Standard structure, Basic text markup, Images, Hypertext Links.

UNIT – 2 **7 Hours**
XHTML – 2, CSS: XHTML (continued): Lists, Tables, Forms, Frames
CSS: Introduction, Levels of style sheets, Style specification formats, Selector forms, Property value forms, Font properties, List properties, Color, Alignment of text, The box model, Background images, The <span> and <div> tags, Conflict resolution.

UNIT – 3 **6 Hours**
Javascript: Overview of Javascript, Object orientation and Javascript, Syntactic characteristics, Primitives, operations, and expressions, Screen output and keyboard input, Control statements, Object creation and modification, Arrays, Functions, Constructors, Pattern matching using regular expressions, Errors in scripts, Examples.

UNIT – 4 **7 Hours**
Javascript and HTML Documents, Dynamic Documents with Javascript: The Javascript execution environment, The Document Object Model, Element access in Javascript, Events and event handling, Handling events from the Body elements, Button elements, Text box and Password elements, The DOM 2 event model, The navigator object, DOM tree traversal and modification.
Introduction to dynamic documents, Positioning elements, Moving elements, Element visibility, Changing colors and fonts, Dynamic content, Stacking elements, Locating the mouse cursor, Reacting to a mouse click, Slow movement of elements, Dragging and dropping elements.

PART - B

UNIT – 5 **6 Hours**
XML: Introduction, Syntax, Document structure, Document type definitions, Namespaces, XML schemas, Displaying raw XML documents, Displaying XML documents with CSS, XSLT style sheets, XML processors, Web services.

UNIT – 6 **7 Hours**
Perl, CGI Programming: Origins and uses of Perl, Scalars and their operations, Assignment statements and simple input and output, Control statements, Fundamentals of arrays, Hashes, References, Functions, Pattern matching, File input and output; Examples.
The Common Gateway Interface; CGI linkage; Query string format; CGI.pm module; A survey example; Cookies.
Database access with Perl and MySQL

UNIT – 7 **6 Hours**

PHP: Origins and uses of PHP, Overview of PHP, General syntactic characteristics, Primitives, operations and expressions, Output, Control statements, Arrays, Functions, Pattern matching, Form handling, Files, Cookies, Session tracking, Database access with PHP and MySQL.

UNIT – 8 **7 Hours**

Ruby, Rails: Origins and uses of Ruby, Scalar types and their operations, Simple input and output, Control statements, Arrays, Hashes, Methods, Classes, Code blocks and iterators, Pattern matching.
Overview of Rails, Document requests, Processing forms, Rails applications with Databases, Layouts.

Text Books:

1. Robert W. Sebesta: Programming the World Wide Web, 4th Edition, Pearson Education, 2008.
   (Listed topics only from Chapters 1 to 9, 11 to 15)

Reference Books:

1. M. Deitel, P.J. Deitel, A. B. Goldberg: Internet & World Wide Web How to Program, 4th Edition, Pearson Education, 2004.
2. Chris Bates: Web Programming Building Internet Applications, 3rd Edition, Wiley India, 2007.
3. Xue Bai et al: The web Warrior Guide to Web Programming, Cengage Learning, 2003.

Web Programming Laboratory

Subject Code: 10CSL78	**I.A. Marks : 25**
Hours/Week : 03	**Exam Hours: 03**
Total Hours : 42	**Exam Marks: 50**

1. Develop and demonstrate a XHTML file that includes Javascript script for the following problems:
   a) Input: A number n obtained using prompt
   Output: The first n Fibonacci numbers
   b) Input: A number n obtained using prompt
   Output: A table of numbers from 1 to n and their squares using **alert**
2. a) Develop and demonstrate, using Javascript script, a XHTML document that collects the USN (the valid format is: A digit from 1 to 4 followed by two upper-case characters followed by two digits followed by two upper-case characters followed by three digits; no embedded spaces allowed) of the user. Event handler must be included for the form element that collects this information to validate the input. Messages in the alert windows must be produced when errors are detected.
   b) Modify the above program to get the current semester also (restricted to be a number from 1 to 8)
3. a) Develop and demonstrate, using Javascript script, a XHTML document that contains three short paragraphs of text, stacked on top of each other, with only enough of each showing so that the mouse cursor can be placed over some part of them. When the cursor is placed over the exposed part of any paragraph, it should rise to the top to become completely visible.
   b) Modify the above document so that when a paragraph is moved from the top stacking position, it returns to its original position rather than to the bottom.
4. a) Design an XML document to store information about a student in an engineering college affiliated to VTU. The information must include USN, Name, Name of the College, Brach, Year of Joining, and e-mail id. Make up sample data for 3 students. Create a CSS style sheet and use it to display the document.
   b) Create an XSLT style sheet for one student element of the above document and use it to create a display of that element.
5. a) Write a Perl program to display various Server Information like Server Name, Server Software, Server protocol, CGI Revision etc.
   b) Write a Perl program to accept UNIX command from a HTML form and to display the output of the command executed.

6. a) Write a Perl program to accept the User Name and display a greeting message randomly chosen from a list of 4 greeting messages.
   b) Write a Perl program to keep track of the number of visitors visiting the web page and to display this count of visitors, with proper headings.
7. Write a Perl program to display a digital clock which displays the current time of the server.
8. Write a Perl program to insert name and age information entered by the user into a table created using MySQL and to display the current contents of this table.
9. Write a PHP program to store current date-time in a COOKIE and display the 'Last visited on' date-time on the web page upon reopening of the same page.
10. Write a PHP program to store page views count in SESSION, to increment the count on each refresh, and to show the count on web page.
11. Create a XHTML form with Name, Address Line 1, Address Line 2, and E-mail text fields. On submitting, store the values in MySQL table. Retrieve and display the data based on Name.
12. Build a Rails application to accept book information viz. Accession number, title, authors, edition and publisher from a web page and store the information in a database and to search for a book with the title specified by the user and to display the search results with proper headings.

Note: In the examination *each* student picks one question from the lot of *all* 12 questions.

DATA WAREHOUSING AND DATA MINING

Subject Code: 10CS755	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT – 1 **6 Hours**

Data Warehousing:

Introduction, Operational Data Stores (ODS), Extraction Transformation Loading (ETL), Data Warehouses. Design Issues, Guidelines for Data Warehouse Implementation, Data Warehouse Metadata

UNIT – 2

6 Hours

Online Analytical Processing (OLAP): Introduction, Characteristics of OLAP systems, Multidimensional view and Data cube, Data Cube Implementations, Data Cube operations, Implementation of OLAP and overview on OLAP Softwares.

UNIT – 3 **6 Hours**

Data Mining: Introduction, Challenges, Data Mining Tasks, Types of Data, Data Preprocessing, Measures of Similarity and Dissimilarity, Data Mining Applications

UNIT – 4 **8 Hours**

Association Analysis: Basic Concepts and Algorithms: Frequent Itemset Generation, Rule Generation, Compact Representation of Frequent Itemsets, Alternative methods for generating Frequent Itemsets, FP Growth Algorithm, Evaluation of Association Patterns

PART - B

UNIT – 5 **6 Hours**

Classification -1 : Basics, General approach to solve classification problem, Decision Trees, Rule Based Classifiers, Nearest Neighbor Classifiers.

UNIT – 6 **6 Hours**

Classification - 2 : Bayesian Classifiers, Estimating Predictive accuracy of classification methods, Improving accuracy of clarification methods, Evaluation criteria for classification methods, Multiclass Problem.

UNIT – 7 **8 Hours**

Clustering Techniques: Overview, Features of cluster analysis, Types of Data and Computing Distance, Types of Cluster Analysis Methods, Partitional Methods, Hierarchical Methods, Density Based Methods, Quality and Validity of Cluster Analysis

UNIT – 8 **6 Hours**

Web Mining: Introduction, Web content mining, Text Mining, Unstructured Text, Text clustering, Mining Spatial and Temporal Databases.

Text Books:

1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar: Introduction to Data Mining, Pearson Education, 2005.
2. G. K. Gupta: Introduction to Data Mining with Case Studies, 3rd Edition, PHI, New Delhi, 2009.

Reference Books:

1. Arun K Pujari: Data Mining Techniques 2nd Edition, Universities Press, 2009.
2. Jiawei Han and Micheline Kamber: Data Mining - Concepts and Techniques, 2nd Edition, Morgan Kaufmann Publisher, 2006.
3. Alex Berson and Stephen J. Smith: Data Warehousing, Data Mining, and OLAP Computing, Mc GrawHill Publisher, 1997.

C# PROGRAMMING AND .NET

Subject Code: 10CS761	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT – 1 **6 Hours**

Interfaces and Collections: Defining Interfaces Using C# Invoking Interface Members at the object Level, Exercising the Shapes Hierarchy, Understanding Explicit Interface Implementation, Interfaces As Polymorphic Agents, Building Interface Hierarchies, Implementing, Implementation, Interfaces Using VS .NET, understanding the IConvertible Interface, Building a Custom Enumerator (IEnumerable and Enumerator), Building Cloneable objects (ICloneable), Building Comparable Objects (I Comparable), Exploring the system. Collections Namespace, Building a Custom Container (Retrofitting the Cars Type).

UNIT – 2 **8 Hours**

Callback Interfaces, Delegates, and Events, Advanced Techniques: Understanding Callback Interfaces, Understanding the .NET Delegate Type, Members of System. Multicast Delegate, The Simplest Possible Delegate Example, , Building More a Elaborate Delegate Example, Understanding Asynchronous Delegates, Understanding (and Using)Events.

The Advances Keywords of C#, A Catalog of C# Keywords Building a Custom Indexer, A Variation of the Cars Indexer Internal Representation of Type Indexer . Using C# Indexer from VB .NET. Overloading operators, The Internal Representation of Overloading Operators, interacting with Overload Operator from Overloaded- Operator- Challenged Languages, Creating Custom Conversion Routines, Defining Implicit Conversion Routines, The Internal Representations of Customs Conversion Routines

UNIT – 3 **6 Hours**

Understanding .NET Assembles: Problems with Classic COM Binaries, An Overview of .NET Assembly, Building a Simple File Test Assembly, A C#. Client Application, A Visual Basic .NET Client Application, Cross Language Inheritance, Exploring the CarLibrary's, Manifest, Exploring the CarLibrary's Types, Building the Multifile Assembly ,Using Assembly, Understanding Private Assemblies, Probing for Private Assemblies (The Basics), Private A Assemblies XML Configurations Files, Probing for Private Assemblies (The Details), Understanding Shared Assembly, Understanding Shared Names,

Building a Shared Assembly, Understanding Delay Signing, Installing/Removing Shared Assembly, Using a Shared Assembly

UNIT – 4 **6 Hours**

Object- Oriented Programming with C#: Forms Defining of the C# Class, Definition the "Default Public Interface" of a Type, Recapping the Pillars of OOP, The First Pillars: C#'s Encapsulation Services, Pseudo- Encapsulation: Creating Read-Only Fields, The Second Pillar: C#'s Inheritance Supports, keeping Family Secrets: The " Protected" Keyword, Nested Type Definitions, The Third Pillar: C #'s Polymorphic Support, Casting Between .

PART – B

UNIT – 5 **6 Hours**

Exceptions and Object Lifetime: Ode to Errors, Bugs, and Exceptions, The Role of .NET Exception Handing, the System. Exception Base Class, Throwing a Generic Exception, Catching Exception, CLR System – Level Exception(System. System Exception), Custom Application-Level Exception(System. System Exception), Handling Multiple Exception, The Family Block, the Last Chance Exception Dynamically Identifying Application – and System Level Exception Debugging System Exception Using VS. NET, Understanding Object Lifetime, the CIT of "new', The Basics of Garbage Collection,, Finalization a Type, The Finalization Process, Building an Ad Hoc Destruction Method, Garbage Collection Optimizations, The System. GC Type.

UNIT – 6 **6 Hours**

Interfaces and Collections: Defining Interfaces Using C# Invoking Interface Members at the object Level, Exercising the Shapes Hierarchy, Understanding Explicit Interface Implementation, Interfaces As Polymorphic Agents, Building Interface Hierarchies, Implementing, Implementation, Interfaces Using VS .NET, understanding the IConvertible Interface, Building a Custom Enumerator (IEnumerable and Enumerator), Building Cloneable objects (ICloneable), Building Comparable Objects (I Comparable), Exploring the system. Collections Namespace, Building a Custom Container (Retrofitting the Cars Type).

UNIT – 7 **8 Hours**

Callback Interfaces, Delegates, and Events, Advanced Techniques: Understanding Callback Interfaces, Understanding the .NET Delegate Type, Members of System. Multicast Delegate, The Simplest Possible Delegate Example, Building More a Elaborate Delegate Example, Understanding Asynchronous Delegates, Understanding (and Using)Events.

The Advances Keywords of C#, A Catalog of C# Keywords Building a Custom Indexer, A Variation of the Cars Indexer Internal Representation of Type Indexer . Using C# Indexer from VB .NET. Overloading operators, The Internal Representation of Overloading Operators, interacting with Overload Operator from Overloaded- Operator- Challenged Languages, Creating Custom Conversion Routines, Defining Implicit Conversion Routines, The Internal Representations of Customs Conversion Routines

UNIT – 8 **6 Hours**

Understanding .NET Assembles: Problems with Classic COM Binaries, An Overview of .NET Assembly, Building a Simple File Test Assembly, A C#. Client Application, A Visual Basic .NET Client Application, Cross Language Inheritance, Exploring the CarLibrary's, Manifest, Exploring the CarLibrary's Types, Building the Multifile Assembly, Using Assembly, Understanding Private Assemblies, Probing for Private Assemblies (The Basics), Private A Assemblies XML Configurations Files, Probing for Private Assemblies (The Details), Understanding Shared Assembly, Understanding Shared Names, Building a Shared Assembly, Understanding Delay Signing, Installing/Removing Shared Assembly, Using a Shared Assembly

Text Books:

1. Andrew Troelsen: Pro C# with .NET 3.0, 4th Edition, Wiley India, 2009.
   Chapters: 1 to 11 (up to pp.369)
2. E. Balagurusamy: Programming in C#, 2nd Edition, Tata McGraw

Hill, 2008.

(Programming Examples 3.7, 3.10, 5.5, 6.1, 7.2, 7.4, 7.5, 7.6, 8.1, 8.2, 8.3, 8.5, 8.7, 8.8, 9.1, 9.2, 9.3, 9.4, 10.2, 10.4, 11.2, 11.4, 12.1, 12.4, 12.5, 12.6, 13.1, 13.2, 13.3, 13.6, 14.1, 14.2, 14.4, 15.2, 15.3, 16.1, 16.2, 16.3, 18.3, 18.5.18.6)

Reference Books:

1. Tom Archer: Inside C#, WP Publishers, 2001.
2. Herbert Schildt: C# The Complete Reference, Tata McGraw Hill, 2004.

JAVA AND J2EE

Subject Code:10CS753	**IA Marks: 25**
Hours/Week: 4	**Exam Marks: 100**
Total Hours: 52	**Exam Hours: 3**

PART - A

UNIT – 1 **6 Hours**

Introduction to Java: Java and Java applications; Java Development Kit (JDK); Java is interpreted, Byte Code, JVM; Object-oriented programming; Simple Java programs.

Data types and other tokens: Boolean variables, int, long, char, operators, arrays, white spaces, literals, assigning values; Creating and destroying objects; Access specifiers.

Operators and Expressions: Arithmetic Operators, Bitwise operators, Relational operators, The Assignment Operator, The ? Operator; Operator Precedence; Logical expression; Type casting; Strings

Control Statements: Selection statements, iteration statements, Jump Statements.

UNIT – 2 **6 Hours**

Classes, Inheritance, Exceptions, Applets : Classes: Classes in Java; Declaring a class; Class name; Super classes; Constructors; Creating instances of class; Inner classes.

Inheritance: Simple, multiple, and multilevel inheritance; Overriding, overloading.

Exception handling**:** Exception handling in Java.

The Applet Class: Two types of Applets; Applet basics; Applet Architecture; An Applet skeleton; Simple Applet display methods; Requesting repainting; Using the Status Window; The HTML APPLET tag; Passing parameters to Applets; getDocumentbase() and getCodebase(); ApletContext and showDocument(); The AudioClip Interface; The AppletStub Interface; Output to the Console.

UNIT – 3 **7 Hours**

Multi Threaded Programming, Event Handling: Multi Threaded Programming: What are threads? How to make the classes threadable; Extending threads; Implementing runnable; Synchronization; Changing state of the thread; Bounded buffer problems, read-write problem, producer-consumer problems.

Event Handling: Two event handling mechanisms; The delegation event model; Event classes; Sources of events; Event listener interfaces; Using the delegation event model; Adapter classes; Inner classes.

UNIT – 4 **7 Hours**

Swings: Swings: The origins of Swing; Two key Swing features; Components and Containers; The Swing Packages; A simple Swing Application; Create a Swing Applet; Jlabel and ImageIcon; JTextField;The Swing Buttons; JTabbedpane; JScrollPane; JList; JComboBox; JTable.

PART – B

UNIT – 5 **6 Hours**

Java 2 Enterprise Edition Overview, Database Access: Overview of J2EE and J2SE
The Concept of JDBC; JDBC Driver Types; JDBC Packages; A Brief Overview of the JDBC process; Database Connection; Associating the JDBC/ODBC Bridge with the Database; Statement Objects; ResultSet; Transaction Processing; Metadata, Data types; Exceptions.

UNIT – 6 **7 Hours**
Servlets: Background; The Life Cycle of a Servlet; Using Tomcat for Servlet Development; A simple Servlet; The Servlet API; The Javax.servlet Package; Reading Servlet Parameter; The Javax.servlet.http package; Handling HTTP Requests and Responses; Using Cookies; Session Tracking.

UNIT – 7 **6 Hours**
JSP, RMI: Java Server Pages (JSP): JSP, JSP Tags, Tomcat, Request String, User Sessions, Cookies, Session Objects.
Java Remote Method Invocation: Remote Method Invocation concept; Server side, Client side.

UNIT – 8 **7 Hours**
Enterprise Java Beans: Enterprise java Beans; Deployment Descriptors; Session Java Bean, Entity Java Bean; Message-Driven Bean; The JAR File.

Text Books:

1. Herbert Schildt: Java The Complete Reference, 7th Edition, Tata McGraw Hill, 2007.
   (Chapters 1, 2, 3, 4, 5, 6, 8, 10, 11, 21, 22, 29, 30, 31)
2. Jim Keogh: J2EE - The Complete Reference, Tata McGraw Hill, 2007.
   (Chapters 5, 6, 11, 12, 15)

Reference Books:

1. Y. Daniel Liang: Introduction to JAVA Programming, 7th Edition, Pearson Education, 2007.
2. Stephanie Bodoff et al: The J2EE Tutorial, 2nd Edition, Pearson Education, 2004.

SOFTWARE TESTING

Subject Code: 10CS842	**I.A. Marks: 25**
Hours/Week: 4	**Exam Marks: 100**
Total Hours: 52	**Exam Hours: 3**

PART – A

UNIT 1 **6 Hours**
A Perspective on Testing, Examples: Basic definitions, Test cases, Insights from a Venn diagram, Identifying test cases, Error and fault taxonomies, Levels of testing. Examples: Generalized pseudocode, The triangle problem, The NextDate function, The commission problem, The SATM (Simple Automatic Teller Machine) problem, The currency converter, Saturn windshield wiper.

UNIT 2 **7 Hours**
Boundary Value Testing, Equivalence Class Testing, Decision Table-Based Testing: Boundary value analysis, Robustness testing, Worst-case testing, Special value testing, Examples, Random testing, Equivalence classes, Equivalence test cases for the triangle problem, NextDate function, and the commission problem, Guidelines and observations. Decision tables, Test cases for the triangle problem, NextDate function, and the commission problem, Guidelines and observations.

UNIT 3 **7 Hours**
Path Testing, Data Flow Testing: DD paths, Test coverage metrics, Basis path testing, guidelines and observations. Definition-Use testing, Slice-based testing, Guidelines and observations.

UNIT 4 **6 Hours**

Levels of Testing, Integration Testing: Traditional view of testing levels, Alternative life-cycle models, The SATM system, Separating integration and system testing. A closer look at the SATM system, Decomposition-based, call graph-based, Path-based integrations.

PART – B

UNIT 5 **7 Hours**

System Testing, Interaction Testing: Threads, Basic concepts for requirements specification, Finding threads, Structural strategies and functional strategies for thread testing, SATM test threads, System testing guidelines, ASF (Atomic System Functions) testing example. Context of interaction, A taxonomy of interactions, Interaction, composition, and determinism, Client/Server Testing,.

UNIT 6 **7 Hours**

Process Framework: Validation and verification, Degrees of freedom, Varieties of software. Basic principles: Sensitivity, redundancy, restriction, partition, visibility, Feedback. The quality process, Planning and monitoring, Quality goals, Dependability properties, Analysis, Testing, Improving the process, Organizational factors.

UNIT 7 **6 Hours**

Fault-Based Testing, Test Execution: Overview, Assumptions in fault-based testing, Mutation analysis, Fault-based adequacy criteria, Variations on mutation analysis. Test Execution: Overview, from test case specifications to test cases, Scaffolding, Generic versus specific scaffolding, Test oracles, Self-checks as oracles, Capture and replay.

UNIT 8 **6 Hours**

Planning and Monitoring the Process, Documenting Analysis and Test: Quality and process, Test and analysis strategies and plans, Risk planning, Monitoring the process, Improving the process, The quality team, Organizing documents, Test strategy document, Analysis and test plan, Test design specifications documents, Test and analysis reports.

TEXT BOOKS:

1. Paul C. Jorgensen: Software Testing, A Craftsman's Approach, 3rd Edition, Auerbach Publications, 2008.
   (Listed topics only from Chapters 1, 2, 5, 6, 7, 9, 10, 12, 1314, 15)
2. Mauro Pezze, Michal Young: Software Testing and Analysis – Process, Principles and Techniques, Wiley India, 2009.
   (Listed topics only from Chapters 2, 3, 4, 16, 17, 20, 24)

REFERENCE BOOKS:

1. Aditya P Mathur**:** Foundations of Software Testing, Pearson Education, 2008.
2. Srinivasan Desikan, Gopalaswamy Ramesh: Software Testing Principles and Practices, 2nd Edition, Pearson Education, 2007.
3. Brian Marrick: The Craft of Software Testing, Pearson Education, 1995.

INFORMATION AND NETWORK SECURITY

Subject Code: 10CS835	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT 1 **6 Hours**

Planning for Security: Introduction; Information Security Policy, Standards, and Practices; The Information Security Blue Print; Contingency plan and a model for contingency plan

UNIT 2 **6 Hours**

Security Technology-1: Introduction; Physical design; Firewalls; Protecting Remote Connections

UNIT 3 **6 Hours**

Security Technology – 2: Introduction; Intrusion Detection Systems (IDS); Honey Pots, Honey Nets, and Padded cell systems; Scanning and Analysis Tools

UNIT 4 **8 Hours**

Cryptography: Introduction; A short History of Cryptography; Principles of Cryptography; Cryptography Tools; Attacks on Cryptosystems.

PART - B

UNIT 5 **8 Hours**

Introduction to Network Security, Authentication Applications: Attacks, services, and Mechanisms; Security Attacks; Security Services; A model for Internetwork Security; Internet Standards and RFCs Kerberos, X.509 Directory Authentication Service.

UNIT 6 **6 Hours**

Electronic Mail Security: Pretty Good Privacy (PGP); S/MIME

UNIT 7 **6 Hours**

IP Security: IP Security Overview; IP Security Architecture; Authentication Header; Encapsulating Security Payload; Combining Security Associations; Key Management.

UNIT 8 **6 Hours**

Web Security: Web security requirements; Secure Socket layer (SSL) and Transport layer Security (TLS); Secure Electronic Transaction (SET)

Text Books:

1. Michael E. Whitman and Herbert J. Mattord: Principles of Information Security, 2nd Edition, Cengage Learning, 2005. (Chapters 5, 6, 7, 8; Exclude the topics not mentioned in the syllabus)
2. William Stallings: Network Security Essentials: Applications and Standards, 3rd Edition, Pearson Education, 2007. (Chapters: 1, 4, 5, 6, 7, 8)

Reference Book:

1. Behrouz A. Forouzan: Cryptography and Network Security, Special Indian Edition, Tata McGraw-Hill, 2007.

DIGITAL IMAGE PROCESSING

Subject Code: 10CS762	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT – 1 **6 Hours**

Digitized Image and its properties: Basic concepts, Image digitization, Digital image properties

UNIT – 2 **7 Hours**

Image Preprocessing: Image pre-processing: Brightness and geometric transformations, local preprocessing.

UNIT – 3 **7 Hours**

Segmentation – 1: Thresholding, Edge-based segmentation.

UNIT – 4 **7 Hours**

Segmentation – 2: Region based segmentation, Matching.

PART – B

UNIT – 5 **7 Hours**

Image Enhancement: Image enhancement in the spatial domain: Background, Some basic gray level transformations, Histogram processing, Enhancement using arithmetic/ logic operations, Basics of spatial filtering, Smoothing spatial filters, Sharpening spatial filters. Image enhancement in the frequency domain: Background, Introduction to the Fourier transform and the frequency domain, Smoothing Frequency-Domain filters, Sharpening Frequency Domain filters, Homomorphic filtering.

UNIT – 6 **6 Hours**

Image Compression: Image compression: Fundamentals, Image compression models, Elements of information theory, Error-Free Compression, Lossy compression.

UNIT – 7 **7 Hours**

Shape representation: Region identification, Contour-based shape representation and description, Region based shape representation and description, Shape classes.

UNIT – 8 **6 Hours**

Morphology: Basic morphological concepts, Morphology principles, Binary dilation and erosion, Gray-scale dilation and erosion, Morphological segmentation and watersheds

Text Books:

1. Milan Sonka, Vaclav Hlavac and Roger Boyle: Image Processing, Analysis and Machine Vision, 2nd Edition, Thomoson Learning, 2001.
   (Chapters 2, 4.1 to 4.3, 5.1 to 5.4, 6, 11.1 to 11.4, 11.7)
2. Rafel C Gonzalez and Richard E Woods: Digital Image Processing, 3rd Edition, Pearson Education, 2003.
   (Chapters 3.1 to 3.7, 4.1 to 4.5, 8.1 to 8.5)

Reference Books:

1. Anil K Jain, “Fundamentals of Digital Image Processing”, PHI, 1997, Indian Reprint 2009.
2. B.Chanda, D Dutta Majumder, “Digital Image Processing and Analysis”, PHI, 2002.

MULTI-CORE ARCHITECTURE AND PROGRAMMING

Subject Code: 10CS846	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART - A

UNIT 1 **7 Hours**

Introduction

The power and potential of parallelism, Examining sequential and parallel programs, Parallelism using multiple instruction streams, The Goals: Scalability and performance portability, Balancing machine specifics with portability, A look at six parallel computers: Chip multiprocessors, Symmetric multiprocessor architectures, Heterogeneous chip designs, Clusters, Supercomputers, Observations from the six parallel computers.

UNIT 2 **6 Hours**

Reasoning about Performance

Motivation and basic concepts, Sources of performance loss, Parallel structure, Performance trade-offs, Measuring performance, Scalable performance.

UNIT 3 **6 Hours**

Examples of Multi-Core Architectures

Introduction to Intel Architecture, How an Intel Architecture System works, Basic Components of the Intel Core 2 Duo Processor: The CPU, Memory Controller, I/O Controller; Intel Core i7: Architecture, The Intel Core i7

Processor, Intel QuickPath Interconnect, The SCH; Intel Atom Architecture.

Introduction to Texas Instruments' Multi-Core Multilayer SoC architecture for communications, infrastructure equipment

UNIT 4 7 Hours

Parallel Algorithm Design

Introduction, The Task / Channel model, Foster's design methodology, Examples: Boundary value problem, Finding the maximum, The n-Body problem, Adding data input.

PART – B

UNIT 5 7 Hours

Parallel Programming – 1 (Using OpenMP)

Designing for threads: Task decomposition, Data decomposition, Data flow decomposition, Implications of different decompositions; Challenges in decomposition, Parallel programming patters, A motivating problem: Error diffusion.

Threading and Parallel Programming Constructs: Synchronization, Critical sections, Deadlocks, Synchronization primitives: Semaphores, Locks, Condition variables; Messages, Flow Control-Based concepts: Fence, Barrier; Implementation-Dependent threading issues.

UNIT 6 6 Hours

Parallel Programming – 2 (Using OpenMP)

Introduction, The shared-memory model, Parallel *for* loops, Declaring private variables, Critical sections, Reductions, Performance improvements, More general data parallelism, Functional parallelism.

UNIT 7 7 Hours

Solutions to Common Parallel Programming Problems

Too many threads, Data races, deadlocks, and live locks, Heavily contended locks, Non-blocking algorithms, Thread-safe functions and libraries, Memory issues, Cache-related issues, Avoiding pipeline stalls, Data organization for high performance.

UNIT 8 6 Hours

Threading in the Processor

Single-Core Processors: Processor architecture fundamentals, Comparing Superscalar and EPIC architectures.

Multi-Core Processors: Hardware-based threading, Hyper-threading technology, Multi-Core processors, Multiple processor interactions, Power consumption, Beyond multi-core architecture.

NOTE: In order to acquire a sound understanding of the subject, it is desirable for the students to work in the laboratory using OpenMP. The hands-on experience would reinforce the concepts learnt in theory. Problems similar to the ones solved in the Algorithms Laboratory can be solved and issues like speed-up achieved can be analyzed in depth. Several free tools are available from companies like INTEL to facilitate such a study.

Text Books:

1. Calvin Lin, Lawrence Snyder: Principles of Parallel Programming, Pearson Education, 2009.
   (Listed topics only from Chapters 1, 2, 3)
2. Michael J. Quinn: Parallel Programming in C with MPI and OpenMP, Tata McGraw Hill, 2004.
   (Listed topics only from Chapters 3, 17)
3. Shameem Akhter, Jason Roberts: Multi-Core Programming, Increasing Performance through Software Multithreading, Intel Press, 2006.
   (Listed topics only from Chapters 3, 4, 7, 9, 10)
4. Web resources for Example Architectures of INTEL and Texas Instruments:
   http://download.intel.com/design/intarch/papers/321087.pdf ;
   http://focus.ti.com/lit/wp/spry133/spry133.pdf

Reference Books:

1. Introduction to Parallel Computing – Ananth Grama et. al., Pearson Education, 2009.
2. Reinders : Intel Threading Building Blocks, O'reilly – 2005
3. David Culler et. al.: Parallel Computer Architecture: A Hardware/Software Approach, Elsevier, 2006.
4. Richard Gerber, Aart J.C. Bik, Kevin B. Smith, Xinmin Tian: Software Optimization Cookbook, High-Performance Recipes for IA-32 Platforms, 2^{nd} Edition, Intel Press, 2006.

WIRELESS NETWORKS AND MOBILE COMPUTING

Sub Code: 10CS831	**IA Marks**	**: 25**
Hrs/Week: 04	**Exam Hours**	**: 03**
Total Hrs: 52	**Exam Marks**	**: 100**

PART-A

UNIT – 1 **6 Hours**

Mobile Computing Architecture: Types of Networks, Architecture for Mobile Computing, 3-tier Architecture, Design Considerations for Mobile Computing.

UNIT – 2 **7 Hours**

Wireless Networks – 1: GSM and SMS: Global Systems for Mobile Communication (GSM and Short Service Messages (SMS): GSM Architecture, Entities, Call routing in GSM, PLMN Interface, GSM Addresses and Identities, Network Aspects in GSM, Mobility Management, GSM Frequency allocation. Introduction to SMS, SMS Architecture, SM MT, SM MO, SMS as Information bearer, applications

UNIT – 3 **6 Hours**

Wireless Networks – 2: GPRS : GPRS and Packet Data Network, GPRS Network Architecture, GPRS Network Operations, Data Services in GPRS, Applications for GPRS, Billing and Charging in GPRS

UNIT – 4 **7 Hours**

Wireless Networks – 3: CDMA, 3G and WiMAX: Spread Spectrum technology, IS-95, CDMA versus GSM, Wireless Data, Third Generation Networks, Applications on 3G, Introduction to WiMAX.

PART - B

UNIT – 5 **6 Hours**

Mobile Client: Moving beyond desktop, Mobile handset overview, Mobile phones and their features, PDA, Design Constraints in applications for handheld devices.Mobile IP: Introduction, discovery, Registration, Tunneling, Cellular IP, Mobile IP with IPv6

UNIT – 6 **7 Hours**

Mobile OS and Computing Environment: Smart Client Architecture, The Client: User Interface, Data Storage, Performance, Data Synchronization, Messaging. The Server: Data Synchronization, Enterprise Data Source, Messaging. Mobile Operating Systems: WinCE, Palm OS, Symbian OS, Linux, Proprietary OS Client Development : The development process, Need analysis phase, Design phase, Implementation and Testing phase, Deployment phase, Development Tools, Device Emulators.

UNIT – 7 **6 Hours**

Building, Mobile Internet Applications: Thin client: Architecture, the client, Middleware, messaging Servers, Processing a Wireless request, Wireless Applications Protocol (WAP) Overview, Wireless Languages: Markup Languages, HDML, WML, HTML, cHTML, XHTML, VoiceXML.

UNIT – 8 **7 Hours**

J2ME: Introduction, CDC, CLDC, MIDP; Programming for CLDC, MIDlet model, Provisioning, MIDlet life-cycle, Creating new application, MIDlet

event handling, GUI in MIDP, Low level GUI Components, Multimedia APIs; Communication in MIDP, Security Considerations in MIDP.

Text Books:

1. Dr. Ashok Talukder, Ms Roopa Yavagal, Mr. Hasan Ahmed: Mobile Computing, Technology, Applications and Service Creation, 2d Edition, Tata McGraw Hill, 2010
2. Martyn Mallik: Mobile and Wireless Design Essentials, Wiley, 2003

Reference Books:

1. Raj kamal: Mobile Computing, Oxford University Press, 2007.
2. Iti Saha Misra: Wireless Communications and Networks, 3G and Beyond, Tata McGraw Hill, 2009.

DIGITAL SIGNAL PROCESSING

Subject Code: 10CS752	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART - A

UNIT – 1 **7 Hours**

The Discrete Fourier Transform: Its Properties and Applications : Frequency Domain Sampling: The Discrete Fourier Transform: Frequency Domain Sampling and Reconstruction of Discrete-Time Signals, The Discrete Fourier Transform (DFT), The DFT as a Linear Transformation, Relationship of the DFT to other Transforms. Properties of the DFT: Periodicity, Linearity and Symmetry Properties, Multiplication of Two DFT's and Circular Convolution, Additional DFT Properties; Linear FilteringMethods Based on the DFT: Use of the DFT in Linear Filtering, Filtering of Long Data Sequences; Frequency Analysis of Signals using the DFT.

UNIT – 2 **7 Hours**

Efficient Computation of the DFT: Fast Fourier Transform Algorithms: Efficient Computation of the DFT: FFT Algorithms : Direct Computation of the DFT, Divide-and-Conquer Approach to Computation of the DFT, Radix-2 FFT Algorithms, Radix-4 FFT Algorithms, Split-Radix FFT Algorithms, Implementation of FFT Algorithms.

Applications of FFT Algorithms: Efficient computation of the DFT of Two Real Sequences, Efficient computation of the DFT of a 2N-Point Real Sequence, Use of the FFT Algorithm in Linear filtering and Correlation.

A Linear filtering approach to Computation of the DFT: The Goertzel Algorithm, The Chirp-Z Transform Algorithm.

Quantization Effects in the Computation of the DFT: Quantization Errors in the Direct Computation of the DFT, Quantization Errors in FFT Algorithms.

UNIT – 3 **6 Hours**

Implementation of Discrete-Time Systems – 1: Structures for the Realization of Discrete-Time Systems

Structures for FIR Systems: Direct-Form Structures, Cascade-Form Structures, Frequency-Sampling Structures, Lattice Structure.

Structures for IIR Systems: Direct-Form Structures, Signal Flow Graphs and Transposed Structures, Cascade-Form Structures, Parallel-Form Structures, Lattice and Lattice-Ladder Structures for IIR Systems.

UNIT – 4 **6 Hours**

Implementation of Discrete-Time Systems – 2: State-Space System Analysis and Structures: State-Space Descriptions of Systems Characterized by Difference Equations, Solution of the State-Space Equations, Relationships between Input-Output and State-Space Descriptions, State-Space Analysis in the Z-Domain, Additional State-Space Structures.

Representation of Numbers: Fixed-Point Representation of Numbers, Binary Floating-Point Representation of Numbers, Errors Resulting from Rounding and Truncation.

PART – B

UNIT – 5 **6 Hours**

Implementation of Discrete-Time Systems – 3: Quantization of Filter Coefficients: Analysis of Sensitivity to Quantizatior of Filter Coefficients, Quantization of Coefficients in FIR Filters

Round-Off Effects in Digital Filters: Limit-Cycle Oscillations in Recursive Systems, Scaling to Prevent Overflow, Statistical Characterization of Quantization effects in Fixed-Point Realizations of Digital Filters.

UNIT – 6 **7 Hours**

Design of Digital Filters – 1: General Considerations: Causality and its Implications, Characteristics of Practical Frequency-Selective Filters.
Design of FIR Filters: Symmetric And Antisymetric FIR Filters, Design of Linear-Phase FIR Filters Using Windows, Design of Linear-Phase FIR Filters by the Frequency-Sampling Method, Design of Optimum Equiripple Linear-Phase FIR Filters, Design of FIR Differentiators, Design of Hilbert Transformers, Comparison of Design Methods for Linear-Phase FIR filters.

UNIT – 7 **6 Hours**

Design of Digital Filters – 2: Design of IIR Filters from Analog Filters: IIR Filter Design by Approximation of Derivatives, IIR Filter Design by Impulse Invariance, IIR Filter Design by the Bilinear Transformation, The Matched-Z Transformation, Characteristics of commonly used Analog Filters, Some examples of Digital Filters Designs based on the Bilinear Transformation.

UNIT – 8 **7 Hours**

Design of Digital Filters – 3: Frequency Transformations: Frequency Transformations in the Analog Domain, Frequency Transformations in the Digital Domain.
Design of Digital Filters based on Least-Squares method: Padé Approximations method, Least-Square design methods, FIR least-Squares Inverse (Wiener) Filters, Design of IIR Filters in the Frequency domain.

Text Books:

1. John G. Proakis and Dimitris G. Manolakis: Digital Signal Processing, 3rd Edition, Pearson Education, 2003. (Chapters 5, 6, 7 and 8)

Reference Books:

1. Paulo S. R. Diniz, Eduardo A. B. da Silva And Sergio L. Netto: Digital Signal Processing: System Analysis and Design, Cambridge University Press, 2002.
2. Sanjit K. Mitra: Digital Signal Processing: A Computer Based Approach, Tata Mcgraw-Hill, 2001.
3. Alan V Oppenheim and Ronald W Schafer: Digital Signal Processing, PHI, Indian Reprint, 2008.

DIGITAL SIGNAL PROCESSING

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Hours/Week : 04	**Exam Hours: 03**
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PART - A

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Methods Based on the DFT: Use of the DFT in Linear Filtering, Filtering of Long Data Sequences; Frequency Analysis of Signals using the DFT.

UNIT – 2 **7 Hours**

Efficient Computation of the DFT: Fast Fourier Transform Algorithms: Efficient Computation of the DFT: FFT Algorithms : Direct Computation of the DFT, Divide-and-Conquer Approach to Computation of the DFT, Radix- 2 FFT Algorithms, Radix-4 FFT Algorithms, Split-Radix FFT Algorithms, Implementation of FFT Algorithms.

Applications of FFT Algorithms: Efficient computation of the DFT of Two Real Sequences, Efficient computation of the DFT of a 2N-Point Real Sequence, Use of the FFT Algorithm in Linear filtering and Correlation.

A Linear filtering approach to Computation of the DFT: The Goertzel Algorithm, The Chirp-Z Transform Algorithm.

Quantization Effects in the Computation of the DFT: Quantization Errors in the Direct Computation of the DFT, Quantization Errors in FFT Algorithms.

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Structures for IIR Systems: Direct-Form Structures, Signal Flow Graphs and Transposed Structures, Cascade-Form Structures, Parallel-Form Structures, Lattice and Lattice-Ladder Structures for IIR Systems.

UNIT – 4 **6 Hours**

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Representation of Numbers: Fixed-Point Representation of Numbers, Binary Floating-Point Representation of Numbers, Errors Resulting from Rounding and Truncation.

PART – B

UNIT – 5 **6 Hours**

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UNIT – 7 **6 Hours**

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Designs based on the Bilinear Transformation.

UNIT – 8 **7 Hours**

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Design of Digital Filters based on Least-Squares method: Padé Approximations method, Least-Square design methods, FIR least-Squares Inverse (Wiener) Filters, Design of IIR Filters in the Frequency domain.

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(Chapters 5, 6, 7 and 8)

Reference Books:

4. Paulo S. R. Diniz, Eduardo A. B. da Silva And Sergio L. Netto: Digital Signal Processing: System Analysis and Design, Cambridge University Press, 2002.
5. Sanjit K. Mitra: Digital Signal Processing: A Computer Based Approach, Tata Mcgraw-Hill, 2001.
6. Alan V Oppenheim and Ronald W Schafer: Digital Signal Processing, PHI, Indian Reprint, 2008.

Semester: I **Year: 2014-2015**

Course Title: Cloud Computing	**Course Code: 14SCS12**
Credits(L:T:P):3:0:1	**Core/Elective: Core**
Type of Course: Lecture & Practical	**Total Contact Hours: 50 Hrs**

COURSE OBJECTIVES

-To learn how to use Cloud Services.
-To implement Virtualization
- To implement Task Scheduling algorithms.
-Apply Map-Reduce concept to applications.
-To build Private Cloud.

Topics:

Module I

Introduction, Cloud Infrastructure

Cloud computing, Cloud computing delivery models and services, Ethical issues, Cloud vulnerabilities, Cloud computing at Amazon, Cloud computing the Google perspective, Microsoft Windows Azure and online services, Open-source software platforms for private clouds, Cloud storage diversity and vendor lock-in, Energy use and ecological impact, Service level agreements, User experience and software licensing. Exercises and problems.

10 Hours

Module II

Cloud Computing: Application Paradigms.

Challenges of cloud computing, Architectural styles of cloud computing, Workflows: Coordination of multiple activities, Coordination based on a state machine model: The Zookeeper, The Map Reduce programming model, A case study: The GrepTheWeb application , Cloud for science and engineering, High-performance computing on a cloud, Cloud computing for Biology research, Social computing, digital content and cloud computing.

10 Hours

Module III

Cloud Resource Virtualization.

Virtualization, Layering and virtualization, Virtual machine monitors, Virtual Machines, Performance and Security Isolation, Full virtualization and paravirtualization, Hardware support for virtualization, Case Study: Xen a VMM based paravirtualization, Optimization of network virtualization, vBlades, Performance comparison of virtual machines, The dark side of virtualization, Exercises and problems.

10 Hours

Module IV

Cloud Resource Management and Scheduling.

Policies and mechanisms for resource management, Application of control theory to task scheduling on a cloud, Stability of a two-level resource allocation architecture, Feedback control based on dynamic thresholds, Coordination of specialized autonomic performance managers, A utility-based model for cloud-based Web services, Resourcing bundling: Combinatorial auctions for cloud resources, Scheduling algorithms for computing clouds, Fair queuing, Start-time fair queuing, Borrowed virtual time, Cloud scheduling subject to deadlines, Scheduling Map Reduce applications subject to deadlines, Resource management and dynamic scaling, Exercises and problems.

10 Hours

Module V

Cloud Security, Cloud Application Development.

Cloud security risks, Security: The top concern for cloud users, Privacy and privacy impact assessment, Trust, Operating system security, Virtual machine Security, Security of virtualization, Security risks posed by shared images, Security risks posed by a management OS, A trusted virtual machine monitor, Amazon web services: EC2 instances, Connecting clients to cloud instances through firewalls, Security rules for application and transport layer protocols in EC2, How to launch an EC2 Linux instance and connect to it, How to use S3 in java, Cloud-based simulation of a distributed trust algorithm, A trust management service, A cloud service for adaptive data streaming, Cloud based optimal FPGA synthesis .Exercises and problems.

10 Hours

LAB EXPERIMENTS

NOTE: Simulate using object oriented programming, any available cloud environment **(Eg; Amazon cloud) and VM ware for resource virtualization.**

1. Create a Collaborative learning environment for a particular learning topic using Google Apps. Google Drive, Google Docs and Google Slides must be used for hosting e-books, important articles and presentations respectively. The instructor must use the Google Sheets to convey the timetable for different events and for analyzing the scores for individual assignment submission.

2. Modeling and simulation Cloud computing environments, including Data Centers, Hosts and Cloudlets and perform VM provisioning using CloudSim: Design a host with two CPU cores, which receives request for hosting two VMs, such that each one requires two cores and plans to host four tasks units. More specifically, tasks t1, t2, t3 and t4 to be hosted in VM1, while t5, t6, t7, and t8 to be hosted in VM2. Implement space-shared allocation policy and time-shared allocation policy. Compare the results.

3. Model a Cloud computing environment having Data center that had 100 hosts. The hosts are to be modeled to have a CPU core (1000 MIPS), 2 GB of RAM and 1 TB of storage. Consider the workload model for this evaluation included provisioning requests for 400 VMs, with each request demanding 1 CPU core (250 MIPS), 256 MB of RAM and 1 GB of storage. Each VM hosts a *web-hosting application service*, whose CPU utilization distribution was generated according to the uniform distribution. Each instance of a webhosting service required 150,000 MIPS or about 10 minutes to complete execution assuming 100% utilization. Simulate Energy-conscious model for power consumption and power management techniques such as Dynamic Voltage and Frequency Scaling (DVFS). Initially, VMs are to be allocated according to requested parameters (4 VMs on each host). The Cloud computing architecture that is to be considered for studying energy conscious resource management techniques/policies included a data center, CloudCoordinator, and Sensor component. The CloudCoordinator and Sensor perform their usual roles. Via the attached Sensors (which are connected with every host), CloudCoordinator must periodically monitor the performance status of active VMs such as load conditions, and processing share. This real time information is to be passed to VMM, which can use it for performing appropriate resizing of VMs and application of DVFS and soft scaling. CloudCoordinator continuously1 has to adapt allocation of VMs by issuing VM migration commands and changing power states of nodes according to its policy and current utilization of resources.

4. Model and simulate the environment consisting of a data center with 10,000 hosts where each host was modeled to have a single CPU core (1200MIPS), 4GB of RAM memory and 2TB of storage. Consider the provisioning policy for VMs as space-shared, which allows one VM to be active in a host at a given instance of time. Make a request from the end-user (through the Datacenter Broker) for creation and instantiation of 50 VMs that had following constraints: 1024MB of physical memory, 1 CPU core and 1GB of storage. The application granularity was modeled to be composed of 300 task units, with each task unit requiring 1,440,000 million instructions (20 minutes in the simulated hosts) to be executed on a host. Minimal data transfer (300 KB) overhead can be considered for the task units (to and from the data center). After the creation of VMs, task units were submitted in small groups of 50 (one for each VM) at inter-arrival delay of 10 minutes.

5. Implement Map Reduce concept for

a. Strassen’s Matrix Multiplication for a huge matrix.

b. Computing the average number of citation index a researcher has according to age among some 1 billion journal articles. Consider a network of entities and relationships between them. It is required to calculate a state of each entity on

the basis of properties of the other entities in its neighborhood. This state can represent a distance to other nodes, indication that there is a neighbor
with the certain properties, characteristic of neighborhood density and so on. A network is stored as a set of nodes and each node contains a list of adjacent node IDs. Mapper emits messages for each node using ID of the adjacent node as a key. Reducer must re compute state and rewrite node with the new state. Implement this scenario.

Course Outcomes:

The students should be able to:

-Demonstrate and experiment simple Cloud Applications

-Apply resource allocation, scheduling algorithms.

- Implement Map-Reduce concept.
- Create virtual machines from available physical resources.
- Setup a private cloud.
- Familiarize with Open Stack.

Text Book:

1. Dan C Marinescu: Cloud Computing Theory and Practice. Elsevier(MK) 2013.

REFERENCES:

1. Rajkumar Buyya , James Broberg, Andrzej Goscinski: Cloud Computing Principles and Paradigms, Willey 2014.
2. John W Rittinghouse, James F Ransome:Cloud Computing Implementation, Management and Security, CRC Press 2013.

Semester: I **Year: 2014-2015**

Course Title: Embedded Computing Systems	**Course Code: 14SCS153**
Credits(L:T:P):4:0:0	**Core/Elective: Elective**
Type of Course: Lecture	**Total Contact Hours: 50 Hrs**

COURSE OBJECTIVES

- Provide a general overview of Embedded Systems
- Show current statistics of Embedded Systems
- Design a complete microprocessor-based hardware system
- Design, code, compile, and test real-time software
- Integrate a fully functional system including hardware and software
- Gain the ability to make intelligent choices between hardware/software tradeoffs.

Topics:

MODULE I

Introduction to embedded systems: Embedded systems, Processor embedded into a system, Embedded hardware units and device in a system, Embedded software in a system, Examples of embedded systems, Design process in embedded system, Formalization of system design, Design process and design examples, Classification of embedded systems, skills required for an embedded system designer.

` **7 Hours**

MODULE II

Devices and communication buses for devices network :IO types and example, Serial communication devices, Parallel device ports, Sophisticated interfacing features in device ports, Wireless devices, Timer and counting devices, Watchdog timer, Real time clock, Networked embedded systems, Serial bus communication protocols, Parallel bus device protocols- parallel communication internet using ISA, PCI, PCI-X and advanced buses, Internet enabled systems- network protocols, Wireless and mobile system protocols.

13 Hours

MODULE III

Device drivers and interrupts and service mechanism: Programming-I/O busy-wait approach without interrupt service mechanism, ISR concept, Interrupt sources, Interrupt servicing (Handling) Mechanism, Multiple interrupts, Context and the periods for context switching, interrupt latency and deadline, Classification of processors interrupt service mechanism from Context-saving angle, Direct memory access, Device driver programming.

10 Hours

MODULE IV

Interprocesses communication and synchronization of processes, Threads and tasks: Multiple process in an application, Multiple threads in an application, Tasks, Task states, Task and Data, Clear-cut distinction between functions. ISRS and tasks by their characteristics, concept and semaphores, Shared data, Inter-process communication, Signal function, Semaphore functions, Message Queue functions, Mailbox functions, Pipe functions, Socket functions, RPC functions. **10 Hours**

MODULE V

Real-time operating systems: OS Services, Process management, Timer functions, Event functions, Memory management, Device, file and IO subsystems management, Interrupt routines in RTOS environment and handling of interrupt source calls, Real-time operating systems, Basic design using an RTOS, RTOS task scheduling models, interrupt latency and response of the tasks as performance metrics, OS security issues**. Introduction to embedded**

software development process and tools, Host and target machines, Linking and location software.

10 Hours

Course Outcomes:

The students should be able to:

- Knowledge to distinguish the characteristics of embedded computer systems.
- Ability examines the various vulnerabilities of embedded computer systems.
- Ability to design embedded systems.
- Awareness of the changing landscape in embedded systems

Text Books:

1. **Raj Kamal**, “Embedded Systems: Architecture, Programming, and Design” 2^{nd} edition , Tata McGraw hill-2013

Chapters: Chapter 1.1 to 1.5, 1.8 to 1.12, Chapter 3, 4, 7, 8 and 13.1 to 13.3.

References:

2. **Marilyn Wolf** ,“Computer as Components, Principles of Embedded Computing System Design” 3^{rd} edition , Elsevier-2014 .

Semester: II **Year: 2014-2015**

Course Title: Managing Big Data	**Course Code: 14SCS21**
Credits(L:T:P):3:0:1	**Core/Elective: Core**
Type of Course: Lecture & Practical	**Total Contact Hours: 50 Hrs**

Course Objectives:

- To Understand big data for business intelligence
- To Learn business case studies for big data analytics
- To Understand Nosql big data management
- To manage Big data without SQL
- To understanding map-reduce analytics using Hadoop and related tools

TOPICS:

MODULE I
UNDERSTANDING BIG DATA **10 Hours**

What is big data – why big data –.Data!, Data Storage and Analysis, Comparison with Other Systems, Rational Database Management System , Grid Computing, Volunteer Computing, convergence of key trends – unstructured data – industry examples of big data – web analytics – big data and marketing – fraud and big data – risk and big data – credit risk management – big data and algorithmic trading – big data and healthcare – big data in medicine – advertising and big data – big data technologies – introduction to Hadoop – open source technologies – cloud and big data – mobile business intelligence – Crowd sourcing analytics – inter and trans firewall analytics

MODULE II
NOSQL DATA MANAGEMENT **10 Hours**

Introduction to NoSQL – aggregate data models – aggregates – key-value and document data models – relationships – graph databases – schema less databases – materialized views – distribution models – sharding –– version – Map reduce – partitioning and combining – composing map-reduce calculations

MODULE III
BASICS OF HADOOP **10 Hours**

Data format – analyzing data with Hadoop – scaling out – Hadoop streaming – Hadoop pipes – design of Hadoop distributed file system (HDFS) – HDFS concepts – Java interface – data flow – Hadoop I/O – data integrity – compression – serialization – Avro – file-based data structures

MODULE IV
MAPREDUCE APPLICATIONS **10 Hours**

MapReduce workflows – unit tests with MRUnit – test data and local tests – anatomy of MapReduce job run – classic Map-reduce – YARN – failures in classic Map-reduce and YARN – job scheduling – shuffle and sort – task execution – MapReduce types – input formats – output formats

MODULE V
HADOOP RELATED TOOLS **10 Hours**

Hbase – data model and implementations – Hbase clients – Hbase examples –praxis. Cassandra – Cassandra data model – cassandra examples – cassandra clients –Hadoop integration. Pig – Grunt – pig data model – Pig Latin – developing and testing Pig Latin scripts. Hive – data types and file formats – HiveQL data definition – HiveQL data manipulation – HiveQL queries.

LAB Experiments

Exercise 1 --- HDFS

Start by reviewing HDFS. You will find that its composition is similar to your local Linux file system. You will use the hadoop fs command when interacting with HDFS.

1. Review the commands available for the Hadoop Distributed File System:
2. Copy file foo.txt from local disk to the user's directory in HDFS
3. Get a directory listing of the user's home directory in HDFS
4. Get a directory listing of the HDFS root directory
5. Display the contents of the HDFS file user/fred/bar.txt
6. Move that file to the local disk, named as baz.txt
7. Create a directory called input under the user's home directory
8. Delete the directory input old and all its contents
9. Verify the copy by listing the directory contents in HDFS:

Exercise 2 --- MapReduce

1. Create a JOB and submit to cluster
2. Track the job information
3. Terminate the job
4. Counters in MR Jobs with example
5. Map only Jobs and generic map examples
6. Distributed cache example
7. Combiners, Secondary sorting and Job chain examples

Exercise 3 --- MapReduce (Programs)

Using movie lens data

1. List all the movies and the number of ratings
2. List all the users and the number of ratings they have done for a movie
3. List all the Movie IDs which have been rated (Movie Id with at least one user rating it)
4. List all the Users who have rated the movies (Users who have rated at least one movie)
5. List of all the User with the max, min, average ratings they have given against any movie
6. List all the Movies with the max, min, average ratings given by any user

Exercise4 – Extract facts using Hive

Hive allows for the manipulation of data in HDFS using a variant of SQL. This makes it excellent for transforming and consolidating data for load into a relational database. In this exercise you will use HiveQL to filter and aggregate click data to build facts about user's movie preferences. The query results will be saved in a staging table used to populate the Oracle Database.

The moveapp_log_json table contains an activity column. Activity states are as follows:

1. RATE_MOVIE
2. COMPLETED_MOVIE
3. PAUSE_MOVIE
4. START_MOVIE
5. BROWSE_MOVIE
6. LIST_MOVIE
7. SEARCH_MOVIE
8. LOGIN
9. LOGOUT
10. INCOMPLETE_MOVIE

```
hive> SELECT * FROM movieapp_log_json LIMIT 5;
hive> drop table movieapp_log_json;
hive> CREATE EXTERNAL TABLE movieapp_log_json (
custId INT,
movieId INT,
genreId INT,
time STRING,
recommended STRING,
activity INT,
rating INT,
price FLOAT
)
ROW FORMAT SERDE 'org.apache.hadoop.hive.contrib.serde2.JsonSerde'
LOCATION '/user/oracle/moviework/applog/';

hive> SELECT * FROM movieapp_log_json LIMIT 20;

hive> SELECT MIN(time), MAX(time) FROM movieapp_log_json
```

1. PURCHASE_MOVIE

Hive maps queries into Map Reduce jobs, simplifying the process of querying large datasets in HDFS. HiveQL statements can be mapped to phases of the Map Reduce framework. As illustrated in the following figure, selection and transformation operations occur in map tasks, while aggregation is handled by reducers. Join operations are flexible: they can be performed in the reducer or mappers depending on the size of the leftmost table.

1. Write a query to select only those clicks which correspond to starting, browsing, completing, or purchasing movies. Use a CASE statement to transform the RECOMMENDED column into integers where 'Y' is 1 and 'N' is 0. Also, ensure GENREID is not null. Only include the first 25 rows.

2. Write a query to select the customer ID, movie ID, recommended state and most recent rating for each movie.

3. Load the results of the previous two queries into a staging table. First, create the staging table:

4. Next, load the results of the queries into the staging table.

Exercise 5 Extract sessions using Pig

While the SQL semantics of HiveQL are useful for aggregation and projection, some analysis is better described as the flow of data through a series of sequential operations. For these situations, Pig Latin provides a convenient way of implementing data flows over data stored in HDFS. Pig Latin statements are translated into a sequence of Map Reduce jobs on the execution of any STORE or DUMP command. Job construction is optimized to exploit as much parallelism as possible, and much like Hive, temporary storage is used to hold intermediate results. As with Hive, aggregation occurs largely in the reduce
tasks. Map tasks handle Pig's FOREACH and LOAD, and GENERATE statements. The EXPLAIN command will show the execution plan for any Pig Latin script. As of Pig 0.10, the ILLUSTRATE command will provide sample results for each stage of the execution plan.

In this exercise you will learn basic Pig Latin semantics and about the fundamental types in Pig Latin, Data Bags and Tuples.

1. Start the Grunt shell and execute the following statements to set up a dataflow with the click stream data. Note: Pig Latin statements are assembled into Map Reduce jobs which are launched at execution of a DUMP or STORE statement.

2. Group the log sample by movie and dump the resulting bag.

3. Add a GROUP BY statement to the sessionize.pig script to process the click stream data into user sessions.

Course Outcomes:

The students should be able to:

- Describe big data and use cases from selected business domains
- Explain NoSQL big data management
- Install, configure, and run Hadoop and HDFS
- Perform map-reduce analytics using Hadoop
- Use Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data Analytics

TEXT BOOKS:

1. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012.
2. Eric Sammer, "Hadoop Operations", O'Reilley, 2012.

REFERENCES:

1. Vignesh Prajapati, Big data analytics with R and Hadoop, SPD 2013.
2. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.
3. Lars George, "HBase: The Definitive Guide", O'Reilley, 2011.
4. Alan Gates, "Programming Pig", O'Reilley, 2011.

Semester: II **Year: 2014-2015**

Course Title: Advances in Computer Networks	**Course Code: 14SCS22**
Credits(L:T:P):3:0:1	**Core/Elective: Core**
Type of Course: Lecture & Practical	**Total Contact Hours: 50 Hrs**

Course Objectives:

- To become familiar with the basics of Computer Networks
- To understand various Network architectures
- Concepts of fundamental protocols
- To understand the network traffic, congestion, controlling and resource allocation.

Topics:

MODULE I

Foundation

Building a Network, Requirements, Perspectives, Scalable Connectivity, Cost-Effective Resource sharing, Support for Common Services, Manageability, Protocol layering, Performance, Bandwidth and Latency, Delay X Bandwidth Product, Perspectives on Connecting, Classes of Links, Reliable Transmission, Stop-and-Wait , Sliding Window, Concurrent Logical Channels.

T1: **Chapter 1.1, 1.2, 1.5.1, 1.5.2**., **2.1, 2.5** **T2**: **Chapter 4** **10 Hours**

MODULE II

Internetworking- I

Switching and Bridging, Datagram's, Virtual Circuit Switching, Source Routing, Bridges and LAN Switches, Basic Internetworking (IP), What is an Internetwork ?, Service Model, Global Addresses, Datagram Forwarding in IP, sub netting and classless addressing, Address Translation(ARP), Host Configuration(DHCP), Error Reporting(ICMP), Virtual Networks and Tunnels.

T1: Chapter 3.1, 3.2, **10 Hours**

MODULE III

Internetworking- II

Network as a Graph, Distance Vector(RIP), Link State(OSPF), Metrics, The Global Internet, Routing Areas, Routing among Autonomous systems(BGP), IP Version 6(IPv6), Mobility and Mobile IP

T1: Chapter 3.3, 4.1.1,4.1.3 **T2**:Chapter 13.1 to 13.18 , Ch 18. **10 Hours**

MODULE IV

End-to-End Protocols

Simple Demultiplexer (UDP), Reliable Byte Stream(TCP), End-to-End Issues, Segment Format, Connecting Establishment and Termination, Sliding Window Revisited, Triggering Transmission, Adaptive Retransmission, Record Boundaries, TCP Extensions, Queuing Disciplines, FIFO, Fair Queuing, TCP Congestion Control, Additive Increase/ Multiplicative Decrease, Slow Start, Fast Retransmit and Fast Recovery.

T1: Chapter 5.1, 5.2.1 to 5.2.8, 6.2, 6.3 **10 Hours**

MODULE V

Congestion Control and Resource Allocation

Congestion-Avoidance Mechanisms, DEC bit, Random Early Detection (RED), Source-Based Congestion Avoidance. The Domain Name System(DNS),Electronic Mail(SMTP,POP,IMAP,MIME),World Wide Web(HTTP),Network Management(SNMP) .

T1: Chapter 6.4 **T2**: Chapter 23.1 to 23.16, Chapter 24, Chapter 25, Chapter 27.1 to 27.8 **10 Hours**

Laboratory Work:

PART A: Implement the following using C/C++:

1. Write a program to transfer the contents of a requested file from server to the client using TCP/IP Sockets (using TCP/IP Socket programming).
2. Write a program to archive Traffic management at Flow level by implementing Closed Loop Control technique. (Leaky Bucket Algorithm)
3. Write a program to implement dynamic routing strategy in finding optimal path for data transmission. (Bellman ford algorithm).
4. Write a program to implement Link State Routing (Dijkstra Algorithm).
5. Write a program for implementing the error detection technique while data transfer in unreliable network code using CRC (16-bits) Technique.
6. Write a program for providing security for transfer of data in the network. (RSA Algorithm)
7. Write a program for encrypting 64 bit playing text using DES algorithm.

PART B: Simulation Programs using OPNET /NS2 or any other equivalent software

1. Simulate a 3 node point to point network with duplex links between them. Set the Queue size and vary the bandwidth and find the number of packets dropped.
2. Simulate a four-node point-to-point network, and connect the links as follows: n0->n2, n1->n2 and n2->n3. Apply TCP agent changing the parameters and determine the number of packets sent/received by TCP/UDP
3. Simulate the different types of internet traffic such as FTP and TELNET over network and analyze the throughput.

Course Outcomes:

The students should be able to:

- List and classify network services, protocols and architectures, explain why they are layered.
- Choose key Internet applications and their protocols, and apply to develop their own applications (e.g. Client Server applications, Web Services) using the sockets API.
- Explain develop effective communication mechanisms using techniques like connection establishment, queuing theory, recovery Etc.
- Explain various congestion control techniques.

Text books:

1. **T1: Larry Peterson and Bruce S Davis** "Computer Networks :A System Approach" 5th Edition , Elsevier -2014
2. **T2: Douglas E Comer, "**Internetworking with TCP/IP, Principles, Protocols and Architecture" 6th Edition, PHI - 2014

References:

1. **Uyless Black** "Computer Networks, Protocols , Standards and Interfaces" 2nd Edition - PHI
2. **Behrouz A Forouzan** "TCP/IP Protocol Suite" 4th Edition – Tata McGraw-Hill

Semester: II **Year: 2014-2015**

Course Title: Advanced Algorithms	**Course Code: 14SCS23**
Credits(L:T:P):4:0:0	**Core/Elective: Core**
Type of Course: Lecture	**Total Contact Hours: 50 Hrs**

COURSE OBJECTIVES

- To learn the graph search algorithms.
- To study network flow and linear programming problems.
- To learn the hill climbing and dynamic programming design techniques.
- To develop recursive backtracking algorithms.
- To get an awareness of NP completeness and randomized algorithms.

Topics:

MODULE I

Review of Analysis Techniques: Growth of Functions: Asymptotic notations; Standard notations and common functions; Recurrences and Solution of Recurrence equations- The substitution method, The recurrence – tree method, The master method; Amortized Analysis: Aggregate, Accounting and Potential Methods.

10 Hours

MODULE II

Graph Algorithms: Bellman - Ford Algorithm; Single source shortest paths in a DAG; Johnson's Algorithm for sparse graphs; Flow networks and Ford-Fulkerson method; Maximum bipartite matching.
Polynomials and the FFT: Representation of polynomials; The DFT and FFT; Efficient implementation of FFT.

10 Hours

MODULE III

Number -Theoretic Algorithms: Elementary notions; GCD; Modular Arithmetic; Solving modular linear equations; The Chinese remainder theorem; Powers of an element; RSA cryptosystem; Primality testing; Integer factorization.

10 Hours

MODULE IV

String-Matching Algorithms: Naïve string Matching; Rabin - Karp algorithm; String matching with finite automata; Knuth-Morris-Pratt algorithm; Boyer – Moore algorithms.

10 Hours

MODULE V

Probabilistic and Randomized Algorithms: Probabilistic algorithms; Randomizing deterministic algorithms, Monte Carlo and Las Vegas algorithms; Probabilistic numeric algorithms.

10 Hours

Course Outcomes:

Upon completion of the course, the students will be able to

- Design and apply iterative and recursive algorithms.
- Design and implement optimization algorithms in specific applications.
- Design appropriate shared objects and concurrent objects for applications.

TEXT BOOKS:

1. T. H Cormen, C E Leiserson, R L Rivest and C Stein: Introduction to Algorithms, 3rd Edition, Prentice-Hall of India, 2010.
2. Kenneth A. Berman, Jerome L. Paul: Algorithms, Cengage Learning, 2002.

REFERENCE BOOKS:

1. Ellis Horowitz, Sartaj Sahni, S.Rajasekharan: Fundamentals of Computer Algorithms, 2nd Edition, Universities press, 2007.

Semester: II **Year: 2014-2015**

Course Title: Web Services	**Course Code: 14SCS251**
Credits(L:T:P):4:0:0	**Core/Elective: Elective**
Type of Course: Lecture	**Total Contact Hours: 50 Hrs**

Course objectives:

- To provide an in-depth knowledge of Web Services.
- To understand the fundamental concepts of Web services.
- To understand the fundamental concepts of WSDL Web Services.
- To design Web service Architecture.
- To Study Building Blocks of Web services.

TOPICS:

MODULE I

Middleware: Understanding the middle ware, RPC and Related Middle ware, TP Monitors, Object Brokers, Message-Oriented Middleware. **10 Hours**

MODULE II

Web Services: Web Services Technologies, Web Services Architecture. **10 Hours**

MODULE III

Basic Web Services Technology: WSDL Web Services Description Language, UDDI Universal Description Discovery and Integration, Web Services at work interactions between the Specifications, Related Standards.

10 Hours

MODULE IV

Service Coordination Protocols: Infrastructure for Coordination Protocols, WS- Coordination, WS-Transaction, Rosetta Net and Other Standards Related to Coordination Protocols. **10 Hours**

MODULE V

Service Composition: Basic of Service Composition, A New Chance of Success for Composition, Services Composition Models, Dependencies between Coordination and Composition, BPEL: Business Process Execution Language for Web Services, Outlook, Applicability of the Web Services, Web services as a Problem and a Solution : AN Example.

10 Hours

Course Outcomes:

The students should be able to:

- Bind and unbind services in UDDI.
- Develop WSDL document
- Implement web service client to call public service.
- Implement a service and exposing it as public service.

Text Books:

1. Gustavo Alonso, Fabio Casati, Harumi Kuno, Vijay Machiraju: Web Services(Concepts ,Architectures and Applications), Springer International Edition 2009.

Semester: II **Year: 2014-2015**

Course Title: Information And Network Security	**Course Code: 14SCS252**
Credits(L:T:P):4:0:0	**Core/Elective: Elective**
Type of Course: Lecture	**Total Contact Hours: 50 Hrs**

Course Objectives:

- To understand the fundamentals of Cryptography
- To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity.
- To understand the various key distribution and management schemes.
- To understand how to deploy encryption techniques to secure data in transit across data networks
- To design security applications in the field of Information technology

TOPICS:

MODULE I

Classical Encryption Techniques

Symmetric Cipher Model, Cryptography, Cryptanalysis and Brute-Force Attack, Substitution Techniques, Caesar Cipher, Monoalphabetic Cipher, Playfair Cipher, Hill Cipher, Polyalphabetic Cipher, One Time Pad. **Block Ciphers and the data encryption standard:** Traditional block Cipher structure, stream Ciphers and block Ciphers, Motivation for the feistel Cipher structure, the feistel Cipher, The data encryption standard, DES encryption, DES decryption, A DES example, results, the avalanche effect, the strength of DES, the use of 56-Bit Keys, the nature of the DES algorithm, timing attacks, Block cipher design principles, number of rounds, design of function F, key schedule algorithm.

10 Hours

MODULE II

Public-Key Cryptography and RSA: Principles of public-key cryptosystems. Public-key cryptosystems. Applications for public-key cryptosystems, requirements for public-key cryptosystems. public-key cryptanalysis. The RSA algorithm, description of the algorithm, computational aspects, the security of RSA. **Other Public-Key Cryptosystems:** Diffie-hellman key exchange, The algorithm, key exchange protocols, man in the middle attack, Elgamal Cryptographic systems, Elliptic curve arithmetic, abelian groups, elliptic curves over real numbers, elliptic curves over Zp, elliptic curves overGF(2m), Elliptic curve cryptography, Analog of Diffie-hellman key exchange, Elliptic curve encryption/ decryption, security of Elliptic curve cryptography, Pseudorandom number generation based on an asymmetric cipher, PRNG based on RSA. **10 Hours**

MODULE III

Key Management and Distribution: Symmetric key distribution using Symmetric encryption, A key distribution scenario, Hierarchical key control, session key lifetime, a transparent key control scheme, Decentralized key control, controlling key usage, Symmetric key distribution using asymmetric encryption, simple secret key distribution, secret key distribution with confidentiality and authentication, A hybrid scheme, distribution of public keys, public announcement of public keys, publicly available directory, public key authority, public keys certificates, X-509 certificates. Certificates, X-509 version 3, public key infrastructure .**User Authentication:** Remote user Authentication principles, Mutual Authentication, one way Authentication, remote user Authentication using Symmetric encryption, Mutual Authentication, one way Authentication, Kerberos, Motivation , Kerberos version 4, Kerberos version 5, Remote user Authentication using Asymmetric encryption, Mutual Authentication, one way Authentication, federated identity management, identity management, identity federation, personal identity verification.

10 Hours

MODULE IV

Wireless network security: Wireless security, Wireless network threats, Wireless network measures, mobile device security, security threats, mobile device security strategy, IEEE 802.11 Wireless LAN overview, the Wi-Fi alliance, IEEE 802 protocol architecture. Security, IEEE 802.11i services, IEEE 802.11i phases of operation, discovery phase, Authentication phase, key management phase, protected data transfer phase, the IEEE 802.11i pseudorandom function, .

Web Security Considerations: Web Security Threats, Web Traffic Security Approaches. **Secure Sockets Layer:** SSL Architecture, SSL Record Protocol, Change Cipher Spec Protocol, Alert Protocol, and shake Protocol, Cryptographic

Computations. **Transport Layer Security:** Version Number, Message Authentication Code, Pseudorandom Functions, Alert Codes, Cipher Suites, Client Certificate Types, Certificate Verify And Finished Messages, Cryptographic Computations, Padding. **HTTPS** Connection Initiation, Connection Closure. **Secure Shell (SSH)** Transport Layer Protocol, User Authentication Protocol, Connection Protocol.

10 Hours

MODULE V

Electronic Mail Security: Pretty good privacy, notation, operational; description, S/MIME, RFC5322, Multipurpose internet mail extensions, S/MIME functionality, S/MIME messages, S/MIME certificate processing, enhanced security services, Domain keys identified mail, internet mail architecture, E-Mail threats, DKIM strategy, DKIM functional flow. **IP Security:** IP Security overview, applications of IPsec, benefits of IPsec, Routing applications, IPsec documents, IPsec services, transport and tunnel modes, IP Security policy, Security associations, Security associations database, Security policy database, IP traffic processing, Encapsulating Security payload, ESP format, encryption and authentication algorithms, Padding, Anti replay service, transport and tunnel modes, combining security associations, authentication plus confidentiality, basic combinations of security associations, internet key exchange, key determinations protocol, header and payload formats, cryptographic suits. **10 Hours**

Course Outcomes:

The students be able to

- Analyze the vulnerabilities in any computing system and hence be able to design a
- security solution.
- Identify the security issues in the network and resolve it.
- Evaluate security mechanisms using rigorous approaches, including theoretical.

Text Books:

1. William Stallings: Cryptography and Network Security, Pearson 6th edition. 2013

References

1. V k Pachghare: Cryptography and Information Security, PHE ,2013.

Semester: II **Year: 2014-2015**

Course Title : Pattern Recognition	Course Code: 14SCS253
Credits(L:T:P):4:0:0	Core/Elective: Elective
Type of Course: Lecture	Total Contact Hours: 50 Hrs

Course Objectives:

- To study the mathematical morphology necessary for Pattern recognition.
- To introduce the student to various Pattern recognition techniques.
- To study the Representation and description and feature extraction.
- To study the principles of decision trees and clustering in pattern recognition.

TOPICS:

MODULE I

Introduction: Definition of PR, Applications, Datasets for PR, Different paradigms for PR, Introduction to probability, events, random variables, Joint distributions and densities, moments. Estimation minimum risk estimators, problems.

10 Hours

MODULE II

Representation: Data structures for PR, Representation of clusters, proximity measures, size of patterns, Abstraction of Data set, Feature extraction, Feature selection, Evaluation. **10 Hours**

MODULE III

Nearest Neighbor based classifiers & Bayes classifier: Nearest neighbor algorithm, variants of NN algorithms, use of NN for transaction databases, efficient algorithms, Data reduction, prototype selection, Bayes theorem, minimum error rate classifier, estimation of probabilities, estimation of probabilities, comparison with NNC, Naive Bayes classifier, Basyessian belief network. **10 Hours**

MODULE IV

Decision Trees: Introduction, DT for PR, Construction of DT, Splitting at the nodes, Over-fitting & Pruning, Examples.

10 Hours

MODULE V

Clustering: Hierarchical (Agglomerative, single/complete/average linkage, wards, Partitional (Forgy's, k-means, Iso-data), clustering large data sets, examples. **10 Hours**

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

- Develop and analyze decision tress.
- Design the nearest neighbor classifier.
- Develop algorithms for Pattern Recognition.

Text Books:

1. Pattern Recognition (An Introduction) , V Susheela Devi, M Narsimha Murthy, Universities Press, ISBN 978-81-7371-725-3,2011.
2. Pattern Recognition & Image Analysis, Earl Gose, Richard Johnsonbaugh, Steve Jost. PHI ISBN-81-203-1484-0, 1996.

References

1. Duda R. O., P.E. Hart, D.G. Stork., Pattern Classification, John Wiley and sons, 2000.

Semester: IV **Year: 2014-2015**

Course Title: Machine Learning Techniques	Course Code: 14SCS41
Credits(L:T:P):3:0:1	Core/Elective: Core
Type of Course: Lecture & Practical	Total Contact Hours: 50 Hrs

COURSE OBJECTIVES:

- To understand the basic concepts of learning and decision trees.
- To understand the neural networks and genetic algorithms
- To understand the Bayesian techniques
- To understand the instant based learning
- To understand the analytical learning and reinforced learning

TOPICS:

MODULE I

INTRODUCTION, CONCEPT LEARNING AND DECISION TREES

Learning Problems – Designing Learning systems, Perspectives and Issues – Concept Learning – Version Spaces and Candidate Elimination Algorithm – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search. **10 Hrs**

MODULE II

NEURAL NETWORKS AND GENETIC ALGORITHMS

Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evolution and Learning. **10 Hrs**

MODULE III

BAYESIAN AND COMPUTATIONAL LEARNING

Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network – EM Algorithm – Probably Learning – Sample Complexity for Finite and Infinite Hypothesis Spaces – Mistake Bound Model. **10 Hrs**

MODULE IV

INSTANT BASED LEARNING AND LEARNING SET OF RULES

K- Nearest Neighbor Learning – Locally Weighted Regression – Radial Basis Functions – Case-Based Reasoning – Sequential Covering Algorithms – Learning Rule Sets – Learning First Order Rules – Learning Sets of First Order Rules – Induction as Inverted Deduction – Inverting Resolution **10 Hrs**

MODULE V

ANALYTICAL LEARNING AND REINFORCED LEARNING

Perfect Domain Theories – Explanation Based Learning – Inductive-Analytical Approaches - FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning **10 Hrs**

LABORATORY WORK

(The following tasks can be implemented in a language of your choice or any tools available)

1) Implement the CANDIDATE – ELIMINATION algorithm. Show how it is used to learn from training examples and hypothesize new instances in Version Space.
2) Implement the FIND–S algorithm. Show how it can be used to classify new instances of target concepts. Run the experiments to deduce instances and hypothesis consistently.

3) Implement the ID3 algorithm for learning Boolean–valued functions for classifying the training examples by searching through the space of a Decision Tree.
4) Design and implement the Back-propagation algorithm by applying it to a learning task involving an application like FACE RECOGNITION.
5) Design and implement Naïve Bayes Algorithm for learning and classifying TEXT DOCUMENTS.

COURSE OUTCOMES:

On Completion of the course, the students will be able to

- Choose the learning techniques with this basic knowledge.
- Apply effectively neural networks and genetic algorithms for appropriate applications.
- Apply bayesian techniques and derive effectively learning rules.
- Choose and differentiate reinforcement and analytical learning techniques

TEXT BOOK:

1. Tom M. Mitchell, “Machine Learning”, McGraw-Hill Education (INDIAN EDITION), 2013.

REFERENCES:

2. Ethem Alpaydin, “Introduction to Machine Learning”, 2nd Ed., PHI Learning Pvt. Ltd., 2013.
3. T. Hastie, R. Tibshirani, J. H. Friedman, “The Elements of Statistical Learning”, Springer; 1st edition, 2001.

ANALOG ELECTRONIC CIRCUITS
(Common to EC/TC/EE/IT/BM/ML)

Sub Code	**:**	**10ES32**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:
Diode Circuits: Diode Resistance, Diode equivalent circuits, Transition and diffusion capacitance, Reverse recovery time, Load line analysis, Rectifiers, Clippers and clampers. **6 Hours**

UNIT 2:
Transistor Biasing: Operating point, Fixed bias circuits, Emitter stabilized biased circuits, Voltage divider biased, DC bias with voltage feedback, Miscellaneous bias configurations, Design operations, Transistor switching networks, PNP transistors, Bias stabilization. **6 Hours**

UNIT 3:
Transistor at Low Frequencies: BJT transistor modeling, CE Fixed bias configuration, Voltage divider bias, Emitter follower, CB configuration, Collector feedback configuration, Analysis of circuits r_e model; analysis of CE configuration using h- parameter model; Relationship between h-parameter model of CE,CC and CE configuration. **7 Hours**

UNIT 4:
Transistor Frequency Response: General frequency considerations, low frequency response, Miller effect capacitance, High frequency response, multistage frequency effects. **7 Hours**

PART – B

UNIT 5:
(a) General Amplifiers: Cascade connections, Cascode connections, Darlington connections. **3 Hours**
(b) Feedback Amplifier: Feedback concept, Feedback connections type, Practical feedback circuits. Design procedures for the feedback amplifiers. **4 Hours**

UNIT 6:

Power Amplifiers: Definitions and amplifier types, series fed class A amplifier, Transformer coupled Class A amplifiers, Class B amplifier operations, Class B amplifier circuits, Amplifier distortions. Designing of Power amplifiers. **7 Hours**

UNIT 7:

Oscillators: Oscillator operation, Phase shift Oscillator, Wienbridge Oscillator, Tuned Oscillator circuits, Crystal Oscillator. (BJT Version Only) Simple design methods of Oscillators. **6 Hours**

UNIT 8:

FET Amplifiers: FET small signal model, Biasing of FET, Common drain common gate configurations, MOSFETs, FET amplifier networks.

6 Hours

TEXT BOOK:

1. **"Electronic Devices and Circuit Theory",** Robert L. Boylestad and Louis Nashelsky, PHI/Pearson Eduication. 9TH Edition.

REFERENCE BOOKS:

1. **'Integrated Electronics',** Jacob Millman & Christos C. Halkias, Tata - McGraw Hill, 2nd Edition, 2010
2. **"Electronic Devices and Circuits",** David A. Bell, PHI, 4th Edition, 2004
3. "**Analog Electronics Circuits: A Simplified Approach"**, U.B. Mahadevaswamy, Pearson/Saguine, 2007.

LOGIC DESIGN
(Common to EC/TC/EE/IT/BM/ML)

Sub Code	**:**	**10ES33**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:

Principles of combinational logic-1: Definition of combinational logic, Canonical forms, Generation of switching equations from truth tables,

UNIT 6:
Power Amplifiers: Definitions and amplifier types, series fed class A amplifier, Transformer coupled Class A amplifiers, Class B amplifier operations, Class B amplifier circuits, Amplifier distortions. Designing of Power amplifiers. **7 Hours**

UNIT 7:
Oscillators: Oscillator operation, Phase shift Oscillator, Wienbridge Oscillator, Tuned Oscillator circuits, Crystal Oscillator. (BJT Version Only) Simple design methods of Oscillators. **6 Hours**

UNIT 8:
FET Amplifiers: FET small signal model, Biasing of FET, Common drain common gate configurations, MOSFETs, FET amplifier networks.
6 Hours

TEXT BOOK:

1. **"Electronic Devices and Circuit Theory",** Robert L. Boylestad and Louis Nashelsky, PHI/Pearson Eduication. 9^{TH} Edition.

REFERENCE BOOKS:

1. **'Integrated Electronics',** Jacob Millman & Christos C. Halkias, Tata - McGraw Hill, 2^{nd} Edition, 2010
2. **"Electronic Devices and Circuits",** David A. Bell, PHI, 4^{th} Edition, 2004
3. "**Analog Electronics Circuits: A Simplified Approach"**, U.B. Mahadevaswamy, Pearson/Saguine, 2007.

LOGIC DESIGN
(Common to EC/TC/EE/IT/BM/ML)

Sub Code	**:**	**10ES33**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:
Principles of combinational logic-1: Definition of combinational logic, Canonical forms, Generation of switching equations from truth tables,

Karnaugh maps-3, 4 and 5 variables, Incompletely specified functions (Don't Care terms), Simplifying Max term equations. **6 Hours**

UNIT 2:

Principles of combinational Logic-2: Quine-McCluskey minimization technique- Quine-McCluskey using don't care terms, Reduced Prime Implicant Tables, Map entered variables. **7 Hours**

UNIT 3:

Analysis and design of combinational logic - I: General approach, Decoders-BCD decoders, Encoders. **6 Hours**

UNIT 4:

Analysis and design of combinational logic - II: Digital multiplexers-Using multiplexers as Boolean function generators. Adders and subtractors-Cascading full adders, Look ahead carry, Binary comparators. Design methods of building blocks of combinational logics.

7 Hours

PART – B

UNIT 5:

Sequential Circuits – 1: Basic Bistable Element, Latches, SR Latch, Application of SR Latch, A Switch Debouncer, The $\overline{S}\,\overline{R}$ Latch, The gated SR Latch, The gated D Latch, The Master-Slave Flip-Flops (Pulse-Triggered Flip-Flops): The Master-Slave SR Flip-Flops, The Master-Slave JK Flip-Flop, Edge Triggered Flip-Flop: The Positive Edge-Triggered D Flip-Flop, Negative-Edge Triggered D Flip-Flop. **7 Hours**

UNIT 6:

Sequential Circuits – 2: Characteristic Equations, Registers, Counters - Binary Ripple Counters, Synchronous Binary counters, Counters based on Shift Registers, Design of a Synchronous counters, Design of a Synchronous Mod-6 Counter using clocked JK Flip-Flops Design of a Synchronous Mod-6 Counter using clocked D, T, or SR Flip-Flops **7 Hours**

UNIT 7:

Sequential Design - I: Introduction, Mealy and Moore Models, State Machine Notation, Synchronous Sequential Circuit Analysis and Design.

6 Hours

UNIT 8:
Sequential Design - II: Construction of state Diagrams, Counter Design.
6 Hours

TEXT BOOKS:
1. **"Digital Logic Applications and Design"**, John M Yarbrough, Thomson Learning, 2001.
2. **"Digital Principles and Design ",** Donald D Givone, Tata McGraw Hill Edition, 2002.

REFERENCE BOOKS:
1. **"Fundamentals of logic design",** Charles H Roth, Jr; Thomson Learning, 2004.
2. **"Logic and computer design Fundamentals",** Mono and Kim, Pearson, Second edition, 2001.
3. **"Logic Design",** Sudhakar Samuel, Pearson/Saguine, 2007

NETWORK ANALYSIS
(Common to EC/TC/EE/IT/BM/ML)

Sub Code	**:**	**10ES34**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:
Basic Concepts: Practical sources, Source transformations, Network reduction using Star – Delta transformation, Loop and node analysis With linearly dependent and independent sources for DC and AC networks, Concepts of super node and super mesh. **7 Hours**
UNIT 2:
Network Topology: Graph of a network, Concept of tree and co-tree, incidence matrix, tie-set, tie-set and cut-set schedules, Formulation of equilibrium equations in matrix form, Solution of resistive networks, Principle of duality. **7 Hours**
UNIT 3:
Network Theorems – 1: Superposition, Reciprocity and Millman's theorems. **6 Hours**

transform representation of discrete time signals. Sampling theorm and Nyquist rate. **7 Hours**

UNIT 7:

Z-Transforms – 1: Introduction, Z – transform, properties of ROC, properties of Z – transforms, inversion of Z – transforms.

6 Hours

UNIT 8:

Z-transforms – 2: Transform analysis of LTI Systems, unilateral Z-Transform and its application to solve difference equations. **6 Hours**

TEXT BOOK

1. **Simon Haykin,** "Signals and Systems", John Wiley India Pvt. Ltd., 2nd Edn, 2008.
2. **Michael Roberts,** "Fundamentals of Signals & Systems", 2nd ed, Tata McGraw-Hill, 2010.

REFERENCE BOOKS:

1. **Alan V Oppenheim, Alan S, Willsky and A Hamid Nawab,** "Signals and Systems" Pearson Education Asia / PHI, 2nd edition, 1997. Indian Reprint 2002.
2. **H. P Hsu, R. Ranjan**, "Signals and Systems", Scham's outlines, TMH, 2006.
3. **B. P. Lathi**, "Linear Systems and Signals", Oxford University Press, 2005.
4. **Ganesh Rao and Satish Tunga**, "Signals and Systems", Pearson/Sanguine Technical Publishers, 2004.

FUNDAMENTALS OF HDL
(Common to EC/TC/IT/BM/ML)

Sub Code	**:**	**10EC45**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:

Introduction: Why HDL? , A Brief History of HDL, Structure of HDL Module, Operators, Data types, Types of Descriptions, simulation and synthesis, Brief comparison of VHDL and Verilog

7 Hours

UNIT 2:
Data –Flow Descriptions: Highlights of Data-Flow Descriptions, Structure of Data-Flow Description, Data Type – Vectors. **6 Hours**

UNIT 3:
Behavioral Descriptions: Behavioral Description highlights, structure of HDL behavioral Description, The VHDL variable –Assignment Statement, sequential statements. **6 Hours**

UNIT 4:
Structural Descriptions: Highlights of structural Description, Organization of the structural Descriptions, Binding, state Machines, Generate, Generic, and Parameter statements.

7 Hours

PART – B

UNIT 5:
Procedures, Tasks, and Functions: Highlights of Procedures, tasks, and Functions, Procedures and tasks, Functions.
Advanced HDL Descriptions: File Processing, Examples of File Processing
7 Hours

UNIT 6:
Mixed –Type Descriptions: Why Mixed-Type Description? VHDL User-Defined Types, VHDL Packages, Mixed-Type Description examples
6 Hours

UNIT 7:
Mixed –Language Descriptions: Highlights of Mixed-Language Description, How to invoke One language from the Other, Mixed-language Description Examples, Limitations of Mixed-Language Description.
7 Hours

UNIT 8:
Synthesis Basics: Highlights of Synthesis, Synthesis information from Entity and Module, Mapping Process and Always in the Hardware Domain.
6 Hours

TEXT BOOKS:
1. **HDL Programming (VHDL and Verilog)**- Nazeih M.Botros- John Weily India Pvt. Ltd. 2008.

REFERENCE BOOKS:
1. **Fundamentals of HDL** – Cyril P.R. Pearson/Sanguin 2010.
2. **VHDL** -Douglas perry-Tata McGraw-Hill.
3. **A Verilog HDL Primer**- J.Bhaskar – BS Publications
4. **Circuit Design with VHDL**-Volnei A.Pedroni-PHI.

MICROCONTROLLERS LAB
(Common to EC/TC/EE/IT/BM/ML)

Sub Code	**:**	**10ESL47**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**03**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**42**	**Exam Marks**	**:**	**50**

I. PROGRAMMING

1. Data Transfer - Block move, Exchange, Sorting, Finding largest element in an array.
2. Arithmetic Instructions - Addition/subtraction, multiplication and division, square, Cube – (16 bits Arithmetic operations – bit addressable).
3. Counters.
4. Boolean & Logical Instructions (Bit manipulations).
5. Conditional CALL & RETURN.
6. Code conversion: BCD – ASCII; ASCII – Decimal; Decimal - ASCII; HEX - Decimal and Decimal - HEX .
7. Programs to generate delay, Programs using serial port and on-Chip timer / counter.

Note: Programming exercise is to be done on both 8051 & MSP430.

II. INTERFACING:

Write C programs to interface 8051 chip to Interfacing modules to develop single chip solutions.

8. Simple Calculator using 6 digit seven segment displays and Hex Keyboard interface to 8051.
9. Alphanumeric LCD panel and Hex keypad input interface to 8051.
10. External ADC and Temperature control interface to 8051.
11. Generate different waveforms Sine, Square, Triangular, Ramp etc. using DAC interface to 8051; change the frequency and amplitude.
12. Stepper and DC motor control interface to 8051.
13. Elevator interface to 8051.

HDL LAB
(Common to EC/TC/IT/BM/ML)

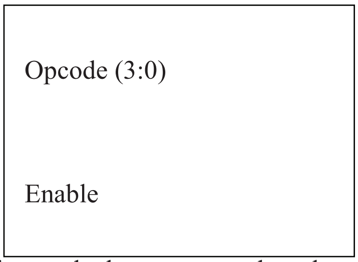
Sub Code	**:**	**10ECL48**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**03**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**42**	**Exam Marks**	**:**	**50**

Note: Programming can be done using any compiler. Download the programs on a FPGA/CPLD boards such as Apex/Acex/Max/Spartan/Sinfi/TK Base or equivalent and performance testing may be done using 32 channel pattern generator and logic analyzer apart from verification by simulation with tools such as Altera/Modelsim or equivalent.

PROGRAMMING (using VHDL /Verilog)

1. Write HDL code to realize all the logic gates
2. Write a HDL program for the following combinational designs
   a. 2 to 4 decoder
   b. 8 to 3 (encoder without priority & with priority)
   c. 8 to 1 multiplexer
   d. 4 bit binary to gray converter
   e. Multiplexer, de-multiplexer, comparator.
2. Write a HDL code to describe the functions of a Full Adder Using three modeling styles.

3. Write a model for 32 bit ALU using the schematic diagram shown below
A (31:0)   B (31:0)



- ALU should use combinational logic to calculate an output based on the four bit op-code input.
- ALU should pass the result to the out bus when enable line in high, and tri-state the out bus when the enable line is low.
- ALU should decode the 4 bit op-code according to the given in example below.

OPCODE	ALU OPERATION
1.	A + B
2.	A – B
3.	A Complement
4.	A * B
5.	A AND B
6.	A OR B
7.	A NAND B
8.	A XOR B

4. Develop the HDL code for the following flip-flops, SR, D, JK, T.
5. Design 4 bit binary, BCD counters (Synchronous reset and Asynchronous reset) and "any sequence" counters

INTERFACING (at least four of the following must be covered using VHDL/Verilog)

1. Write HDL code to display messages on the given seven segment display and LCD and accepting Hex key pad input data.

2. Write HDL code to control speed, direction of DC and Stepper motor.

3. Write HDL code to accept 8 channel Analog signal, Temperature sensors and display the data on LCD panel or Seven segment display.

4. Write HDL code to generate different waveforms (Sine, Square, Triangle, Ramp etc.,) using DAC change the frequency and amplitude.

5. Write HDL code to simulate Elevator operations
6. Write HDL code to control external lights using relays.

DIGITAL SIGNAL PROCESSING

Subject Code	: **10EC52**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

Discrete Fourier Transforms (DFT): Frequency domain sampling and reconstruction of discrete time signals. DFT as a linear transformation, its relationship with other transforms. **6 Hours**

UNIT - 2

Properties of DFT, multiplication of two DFTs- the circular convolution, additional DFT properties. **6 Hours**

UNIT - 3

Use of DFT in linear filtering, overlap-save and overlap-add method. Direct computation of DFT, need for efficient computation of the DFT (FFT algorithms). **7 Hours**

UNIT - 4

Radix-2 FFT algorithm for the computation of DFT and IDFT–decimation-in-time and decimation-in-frequency algorithms. Goertzel algorithm, and chirp-z transform. **7 Hours**

PART – B

UNIT - 5

IIR filter design: Characteristics of commonly used analog filters – Butterworth and Chebysheve filters, analog to analog frequency transformations. **6 Hours**

UNIT - 6

Implementation of discrete-time systems: Structures for IIR and FIR systems-direct form I and direct form II systems, cascade, lattice and parallel realization. **7 Hours**

UNIT - 7

FIR filter design: Introduction to FIR filters, design of FIR filters using - Rectangular, Hamming, Bartlet and Kaiser windows, FIR filter design using frequency sampling technique. **6 Hours**

UNIT - 8

Design of IIR filters from analog filters (Butterworth and Chebyshev) - impulse invariance method. Mapping of transfer functions: Approximation of derivative (backward difference and bilinear transformation) method, Matched z transforms, Verification for stability and linearity during mapping

7 Hours

TEXT BOOK:

1. **Digital signal processing – Principles Algorithms & Applications**, Proakis & Monalakis, Pearson education, 4th Edition, New Delhi, 2007.

REFERENCE BOOKS:

1. **Discrete Time Signal Processing**, Oppenheim & Schaffer, PHI, 2003.
2. **Digital Signal Processing**, S. K. Mitra, Tata Mc-Graw Hill, 3rd Edition, 2010.
3. **Digital Signal Processing**, Lee Tan: Elsivier publications, 2007

ANALOG COMMUNICATION

Subject Code	: **10EC53**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

RANDOM PROCESS: Random variables: Several random variables. Statistical averages: Function of Random variables, moments, Mean, Correlation and Covariance function: Principles of autocorrelation function, cross – correlation functions. Central limit theorem, Properties of Gaussian process. **7 Hours**

UNIT - 2

AMPLITUDE MODULATION: Introduction, AM: Time-Domain description, Frequency – Domain description. Generation of AM wave: square law modulator, switching modulator. Detection of AM waves: square law detector, envelop detector. Double side band suppressed carrier modulation (DSBSC): Time-Domain description, Frequency-Domain representation, Generation of DSBSC waves: balanced modulator, ring modulator. Coherent detection of DSBSC modulated waves. Costas loop.

7 Hours

TEXT BOOKS:

1. **Communication Systems**, Simon Haykins, 5th Edition, John Willey, India Pvt. Ltd, 2009.
2. **An Introduction to Analog and Digital Communication**, Simon Haykins, John Wiley India Pvt. Ltd., 2008

REFERENCE BOOKS:

1. **Modern digital and analog Communication systems** B. P. Lathi, Oxford University Press., 4th ed, 2010,
2. **Communication Systems**, Harold P.E, Stern Samy and A Mahmond, Pearson Edn, 2004.
3. **Communication Systems**: Singh and Sapre**:** Analog and digital TMH 2nd , Ed 2007.

MICROWAVES AND RADAR

Subject Code	: **10EC54**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

MICROWAVE TRANSMISSION LINES: Introduction, transmission lines equations and solutions, reflection and transmission coefficients, standing waves and SWR, line impedance and line admittance. Smith chart, impedance matching using single stubs, Microwave coaxial connectors.

7 Hours

UNIT - 2

MICROWAVE WAVEGUIDES AND COMPONENTS: Introduction, rectangular waveguides, circular waveguides, microwave cavities, microwave hybrid circuits, directional couplers, circulators and isolators.

6 Hours

UNIT - 3

MICROWAVE DIODES,

Transfer electron devices: Introduction, GUNN effect diodes – GaAs diode, RWH theory, Modes of operation, Avalanche transit time devices: READ diode, IMPATT diode, BARITT diode, Parametric amplifiers

Other diodes: PIN diodes, Schottky barrier diodes. **7 Hours**

UNIT - 4

Microwave network theory and passive devices. Symmetrical Z and Y parameters, for reciprocal Networks, S matrix representation of multi port networks. **6 Hours**

PART – B

UNIT - 5

Microwave passive devices, Coaxial connectors and adapters, Phase shifters, Attenuators, Waveguide Tees, Magic tees. **6 Hours**

UNIT - 6

STRIP LINES: Introduction, Microstrip lines, Parallèle strip lines, Coplanar strip lines, Shielded strip Lines. **6 Hours**

UNIT - 7

AN INTRODUCTION TO RADAR: Basic Radar, The simple form of the Radar equation, Radar block diagram, Radar frequencies, application of Radar, the origins of Radar. **7 Hours**

UNIT - 8

MTI AND PULSE DOPPLER RADAR: Introduction to Doppler and MTI Radar, delay line Cancellers, digital MTI processing, Moving target detector, pulse Doppler Radar. **7 Hours**

TEXT BOOKS:

1. **Microwave Devices and circuits**- Liao / Pearson Education.
2. **Introduction to Radar systems**-Merrill I Skolnik, 3rd Ed, TMH, 2001.
3. **Microwave Engineering** – Annapurna Das, Sisir K Das TMH Publication, 2nd , 2010.

REFERENCE BOOK:

1. **Microwave Engineering** – David M Pozar, John Wiley India Pvt. Ltd., 3rd Edn, 2008.

INFORMATION THEORY AND CODING

Subject Code	: **10EC55**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1
INFORMATION THEORY: Introduction, Measure of information, Average information content of symbols in long independent sequences, Average information content of symbols in long dependent sequences. Mark-off statistical model for information source, Entropy and information rate of mark-off source. **7 Hours**

UNIT - 2
SOURCE CODING: Encoding of the source output, Shannon's encoding algorithm. Communication Channels, Discrete communication channels, Continuous channels. **6 Hours**

UNIT - 3
FUNDAMENTAL LIMITS ON PERFORMANCE: Source coding theorem, Huffman coding, Discrete memory less Channels, Mutual information, Channel Capacity. **7 Hours**

UNIT - 4
Channel coding theorem, Differential entropy and mutual information for continuous ensembles, Channel capacity Theorem. **6 Hours**

PART – B

UNIT - 5
INTRODUCTION TO ERROR CONTROL CODING: Introduction, Types of errors, examples, Types of codes Linear Block Codes: Matrix description, Error detection and correction, Standard arrays and table look up for decoding. **7 Hours**

UNIT - 6
Binary Cycle Codes, Algebraic structures of cyclic codes, Encoding using an (n-k) bit shift register, Syndrome calculation. BCH codes. **6 Hours**

UNIT - 7
RS codes, Golay codes, Shortened cyclic codes, Burst error correcting codes. Burst and Random Error correcting codes. **7 Hours**

UNIT - 8
Convolution Codes, Time domain approach. Transform domain approach. **6 Hours**

TEXT BOOKS:
1. **Digital and analog communication systems**, K. Sam Shanmugam, John Wiley India Pvt. Ltd, 1996.
2. **Digital communication**, Simon Haykin, John Wiley India Pvt. Ltd, 2008.

REFERENCE BOOKS:
1. **ITC and Cryptography**, Ranjan Bose, TMH, II edition, 2007
2. **Digital Communications** - Glover and Grant**;** Pearson Ed. 2^{nd} Ed 2008.

FUNDAMENTALS OF CMOS VLSI

Subject Code	: **10EC56**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1
BASIC MOS TECHNOLOGY: Integrated circuit's era. Enhancement and depletion mode MOS transistors. nMOS fabrication. CMOS fabrication. Thermal aspects of processing. BiCMOS technology. Production of E-beam masks. **3 Hours**

MOS TRANSISTOR THEORY: Introduction, MOS Device Design Equations, The Complementary CMOS Inverter – DC Characteristics, Static Load MOS Inverters, The Differential Inverter, The Transmission Gate, Tristate Inverter**.** **4 Hours**

UNIT - 8

TESTABILITY: Performance parameters. Layout issues. I/O pads. Real estate. System delays. Ground rules for design. Test and testability.

7 Hours

TEXT BOOKS:

1. **CMOS VLSI Design – A Circuits and Systems Perspective. 3rd Edition. N.H. Weste and David Harris. Addison-Wesley, 2005. (Refer to** http://www.cmosvlsi.com**).**
2. **Principles of CMOS VLSI Design: A Systems Perspective**, Neil H. E. Weste, K. Eshragian, and ??? 3rd edition, Pearson Education (Asia) Pvt. Ltd., 200?. (Shift to the latest edition.).
3. **Basic VLSI Design** - Douglas A. Pucknell & Kamran Eshraghian, PHI 3rd Edition (original Edition – 1994), 2005.

REFERENCE BOOKS:

1. R. Jacob Baker. CMOS Circuit Design, Layout and Simulation. John Wiley India Pvt. Ltd, 2008.
2. **Fundamentals of Semiconductor Devices**, M. K. Achuthan and K. N. Bhat, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2007.
3. **CMOS Digital Integrated Circuits: Analysis and Design**, Sung-Mo Kang & Yusuf Leblebici, 3rd Edition, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2007.
4. **Analysis and Design of Digital Integrated Circuits** - D.A Hodges, H.G Jackson and R.A Saleh. 3rd Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2007.

DIGITAL SIGNAL PROCESSING LABORATORY

Subject Code	: **10ECL57**	IA Marks	: 25
No. of Practical Hrs/Week	: 03	Exam Hours	: 03
Total no. of Practical Hrs.	: 42	Exam Marks	: 50

A LIST OF EXPERIMENTS USING MATLAB / SCILAB / OCTAVE / WAB

3. Verification of Sampling theorem.
4. Impulse response of a given system
5. Linear convolution of two given sequences.
6. Circular convolution of two given sequences

7. Autocorrelation of a given sequence and verification of its properties.
8. Cross correlation of given sequences and verification of its properties.
9. Solving a given difference equation.
10. Computation of N point DFT of a given sequence and to plot magnitude and phase spectrum.
11. Linear convolution of two sequences using DFT and IDFT.
12. Circular convolution of two given sequences using DFT and IDFT
13. Design and implementation of FIR filter to meet given specifications.
14. Design and implementation of IIR filter to meet given specifications.

B. LIST OF EXPERIMENTS USING DSP PROCESSOR

1.Linear convolution of two given sequences.
2.Circular convolution of two given sequences.
3.Computation of N- Point DFT of a given sequence
4.Realization of an FIR filter (any type) to meet given specifications .The input can be a signal from function generator / speech signal.
5.Audio applications such as to plot time and frequency (Spectrum) display of Microphone output plus a cosine using DSP. Read a wav file and match with their respective spectrograms
6.Noise: Add noise above 3kHz and then remove; Interference suppression using 400 Hz tone.
7.Impulse response of first order and second order system

REFERENCE BOOKS:

1. **Digital signal processing using MATLAB -** Sanjeet Mitra, TMH, 2001
2. **Digital signal processing using MATLAB** - J. G. Proakis & Ingale, MGH, 2000
3. **Digital Signal Processors**, B. Venkataramani and Bhaskar, TMH,2002

ANALOG COMMUNICATION LAB + LIC LAB

Subject Code	: **10ECL58**	IA Marks	: 25
No. of Practical Hrs/Week	: 03	Exam Hours	: 03
Total no. of Practical Hrs.	: 42	Exam Marks	: 50

EXPERIMENTS USING DESCERTE COMPONENTS and LABVIEW - 2009 CAN BE USED FOR VERIFICATION AND TESTING.

1. Second order active LPF and HPF
2. Second order active BPF and BE
3. Schmitt Trigger Design and test a Schmitt trigger circuit for the given values of UTP and LTP

VI SEMESTER

DIGITAL COMMUNICATION

Subject Code	: **10EC61**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

Basic signal processing operations in digital communication. Sampling Principles: Sampling Theorem, Quadrature sampling of Band pass signal, Practical aspects of sampling and signal recovery. **7 Hours**

UNIT - 2

PAM, TDM. Waveform Coding Techniques, PCM, Quantization noise and SNR, robust quantization. **6 Hours**

UNIT - 3

DPCM, DM, applications. Base-Band Shaping for Data Transmission, Discrete PAM signals, power spectra of discrete PAM signals. **7 Hours**

UNIT - 4

ISI, Nyquist's criterion for distortion less base-band binary transmission, correlative coding, eye pattern, base-band M-ary PAM systems, adaptive equalization for data transmission. **6 Hours**

PART – B

UNIT - 5

DIGITAL MODULATION TECHNIQUES: Digital Modulation formats, Coherent binary modulation techniques, Coherent quadrature modulation techniques. Non-coherent binary modulation techniques. **6 Hours**

UNIT - 6

Detection and estimation, Model of DCS, Gram-Schmidt Orthogonalization procedure, geometric interpretation of signals, response of bank of correlators to noisy input. **6 Hours**

UNIT - 7

Detection of known signals in noise, correlation receiver, matched filter receiver, detection of signals with unknown phase in noise. **7 Hours**

UNIT - 8

Spread Spectrum Modulation: Pseudo noise sequences, notion of spread spectrum, direct sequence spread spectrum, coherent binary PSK, frequency hop spread spectrum, applications. **7 Hours**

TEXT BOOK:

1. **Digital communications**, Simon Haykin, John Wiley India Pvt. Ltd, 2008.

REFERENCE BOOKS:

1. **Digital and Analog communication systems,** Simon Haykin, John Wildy India Lts, 2008
2. **An introduction to Analog and Digital Communication**, K. Sam Shanmugam, John Wiley India Pvt. Ltd, 2008.
3. **Digital communications** - Bernard Sklar: Pearson education 2007

MICROPROCESSOR

Subject Code	: **10EC62**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

8086 PROCESSORS: Historical background, The microprocessor-based personal computer system, 8086 CPU Architecture, Machine language instructions, Instruction execution timing. **6 Hours**

UNIT - 2

INSTRUCTION SET OF 8086: Assembler instruction format, data transfer and arithmetic, branch type, loop, NOP & HALT, flag manipulation, logical and shift and rotate instructions. Illustration of these instructions with example programs, Directives and operators. **6 Hours**

UNIT - 3

BYTE AND STRING MANIPULATION: String instructions, REP Prefix, Table translation, Number format conversions, Procedures, Macros, Programming using keyboard and video display. **7 Hours**

UNIT - 4

8086 INTERRUPTS: 8086 Interrupts and interrupt responses, Hardware interrupt applications, Software interrupt applications, Interrupt examples.
7 Hours

Stability problem. Effect of feedback an amplifier poles. Stability study using Bode plots. Frequency compensation. SPICE examples. **7 Hours**

UNIT - 6

Operational Amplifiers: The two stage CMOS Op-amp, folded cascade CMOS op-amp, 741 op-amp circuit, DC analysis of the 741, small signal analysis of 741, gain, frequency response and slew rate of 741. Data Converters. A-D and D-A converters. **6 Hours**

UNIT – 7 & 8

Digital CMOS circuits. Overview. Design and performance analysis of CMOS inverter. Logic Gate Circuits. Pass-transistor logic. Dynamic Logic Circuits. SPICE examples. **12 Hours**

TEXT BOOK:

1. **"Microelectronic Circuits",** Adel Sedra and K.C. Smith, 5th Edition, Oxford University Press, Interantional Version, 2009.

REFERENCE BOOK:

1. "**Fundamentals of Microelectronics**" , Behzad Razavi, John Wiley India Pvt. Ltd, 2008.
2. **"Microelectronics – Analysis and Design"**, Sundaram Natarajan,
3. Tata McGraw-Hill, 2007

ANTENNAS AND PROPAGATION

Subject Code	: **10EC64**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

ANTENNA BASICS: Introduction, basic Antenna parameters, patterns, beam area, radiation intensity, beam efficiency, diversity and gain, antenna apertures, effective height, bandwidth, radiation, efficiency, antenna temperature and antenna filed zones.

7 Hours

UNIT - 2

POINT SOURCES AND ARRAYS: Introduction, point sources, power patterns, power theorem, radiation intensity, filed patterns, phase patterns. Array of two isotropic point sources. Endfire array and Broadside array.

6 Hours

UNIT - 3

ELECTRIC DIPOLES AND THIN LINEAR ANTENNAS: Introduction, short electric dipole, fields of a short dipole(no derivation of field components), radiation resistance of short dipole, radiation resistances of lambda/2 Antenna, thin linear antenna, micro strip arrays, low side lobe arrays, long wire antenna, folded dipole antennas. **7 Hours**

UNIT - 4

LOOP, SLOT, PATCH AND HORN ANTENNA: Introduction, small loop, comparison of far fields of small loop and short dipole, loop antenna general case, far field patterns of circular loop, radiation resistance, directivity, slot antenna, Babinet's principle and complementary antennas, impedance of complementary and slot antennas, patch antennas.

8 Hours

PART – B

UNIT – 5 & 6

ANTENNA TYPES: Horn antennas, rectangular horn antennas, Helical Antenna, Yagi-Uda array, corner reflectors, parabolic reflectors, log periodic antenna, lens antenna, antenna for special applications – sleeve antenna, turnstile antenna, omni directional antennas, antennas for satellite antennas for ground penetrating radars, embedded antennas, ultra wide band antennas, plasma antenna, high-resolution data, intelligent antennas, antenna for remote sensing.

12 Hours

UNIT - 7 & 8

RADIO WAVE PROPAGATION: Introduction, Ground wave propagation, free space propagation, ground reflection, surface wave, diffraction.

TROPOSPHERE WAVE PROPAGATION: Troposcopic scatter, Ionosphere propagation, electrical properties of the ionosphere, effects of earth's magnetic field. **10 Hours**

TEXT BOOKS:

1. **Antennas and Wave Propagation**, John D. Krauss, 4th Edn,McGraw-Hill International edition, 2010.
2. **Antennas and Wave Propagation** - Harish and Sachidananda: Oxford Press 2007.

REFERENCE BOOKS:

1. **Antenna Theory Analysis and Design** - C A Balanis, 3rd Edn, John Wiley India Pvt. Ltd, 2008.
2. **Antennas and Propagation for Wireless Communication Systems** - Sineon R Saunders, John Wiley, 2003.
3. **Antennas and wave propagation -** G S N Raju: Pearson Education 2005.

OPERATING SYSTEMS

Subject Code	: **10EC65**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

INTRODUCTION AND OVERVIEW OF OPERATING SYSTEMS: Operating system, Goals of an O.S, Operation of an O.S, Resource allocation and related functions, User interface related functions, Classes of operating systems, O.S and the computer system, Batch processing system, Multi programming systems, Time sharing systems, Real time operating systems, distributed operating systems. **6 Hours**

UNIT - 2

STRUCTURE OF THE OPERATING SYSTEMS: Operation of an O.S, Structure of the supervisor, Configuring and installing of the supervisor, Operating system with monolithic structure, layered design, Virtual machine operating systems, Kernel based operating systems, and Microkernel based operating systems. **7 Hours**

TEXT BOOKS:

1. **Antennas and Wave Propagation**, John D. Krauss, 4th Edn,McGraw-Hill International edition, 2010.
2. **Antennas and Wave Propagation** - Harish and Sachidananda: Oxford Press 2007.

REFERENCE BOOKS:

1. **Antenna Theory Analysis and Design** - C A Balanis, 3rd Edn, John Wiley India Pvt. Ltd, 2008.
2. **Antennas and Propagation for Wireless Communication Systems** - Sineon R Saunders, John Wiley, 2003.
3. **Antennas and wave propagation -** G S N Raju: Pearson Education 2005.

OPERATING SYSTEMS

Subject Code	: **10EC65**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

INTRODUCTION AND OVERVIEW OF OPERATING SYSTEMS: Operating system, Goals of an O.S, Operation of an O.S, Resource allocation and related functions, User interface related functions, Classes of operating systems, O.S and the computer system, Batch processing system, Multi programming systems, Time sharing systems, Real time operating systems, distributed operating systems. **6 Hours**

UNIT - 2

STRUCTURE OF THE OPERATING SYSTEMS: Operation of an O.S, Structure of the supervisor, Configuring and installing of the supervisor, Operating system with monolithic structure, layered design, Virtual machine operating systems, Kernel based operating systems, and Microkernel based operating systems. **7 Hours**

UNIT - 3
PROCESS MANAGEMENT: Process concept, Programmer view of processes, OS view of processes, Interacting processes, Threads, Processes in UNIX, Threads in Solaris. **6 Hours**

UNIT - 4
MEMORY MANAGEMENT: Memory allocation to programs, Memory allocation preliminaries, Contiguous and noncontiguous allocation to programs, Memory allocation for program controlled data, kernel memory allocation. **7 Hours**

PART – B

UNIT - 5
VIRTUAL MEMORY: Virtual memory basics, Virtual memory using paging, Demand paging, Page replacement, Page replacement policies, Memory allocation to programs, Page sharing, UNIX virtual memory. **6 Hours**

UNIT - 6
FILE SYSTEMS: File system and IOCS, Files and directories, Overview of I/O organization, Fundamental file organizations, Interface between file system and IOCS, Allocation of disk space, Implementing file access, UNIX file system. **7 Hours**

UNIT - 7
SCHEDULING: Fundamentals of scheduling, Long-term scheduling, Medium and short term scheduling, Real time scheduling, Process scheduling in UNIX. **6 Hours**

UNIT - 8
MESSAGE PASSING: Implementing message passing, Mailboxes, Inter process communication in UNIX. 7 Hours

TEXT BOOK:

1. **"Operating Systems - A Concept based Approach"**, D. M. Dhamdhare, TMH, 3rd Ed, 2010.

REFERENCE BOOK:

1. **Operating Systems Concepts**, Silberschatz and Galvin, John Wiley India Pvt. Ltd, 5th Edition, 2001.
2. **Operating System – Internals and Design Systems**, Willaim Stalling, Pearson Education, 4th Ed, 2006.
3. **Design of Operating Systems,** Tennambhaum, TMH, 2001.

POWER ELECTRONICS

Subject Code	: **10EC73**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1
Introduction, Applications of power electronics, Power semiconductor devices, Control characteristics, Types of power electronics circuits, Peripheral effects. **6 Hours**

UNIT - 2
POWER TRANSISTOR: Power BJT's, Switching characteristics, Switching limits, Base derive control, Power MOSFET's, Switching characteristics, Gate drive, IGBT's, Isolation of gate and base drives.
6 Hours

UNIT - 3
INTRODUCTION TO THYRISTORS: Principle of operation states anode-cathode characteristics, Two transistor model. Turn-on Methods, Dynamic Turn-on and turn-off characteristics, Gate characteristics, Gate trigger circuits, di / dt and dv / dt protection, Thyristor firing circuits.
7 Hours

UNIT - 4
CONTROLLED RECTIFIERS: Introduction, Principles of phase controlled converter operation, 1φ fully controlled converters, Duel converters, 1 φ semi converters (all converters with R & RL load).
7 Hours

PART – B

UNIT - 5
Thyristor turn off methods, natural and forced commutation, self commutation, class A and class B types, Complementary commutation, auxiliary commutation, external pulse commutation, AC line commutation, numerical problems. **7 Hours**

UNIT - 6
AC VOLTAGE CONTROLLERS: Introduction, Principles of on and off control, Principles of phase control, Single phase controllers with restive loads and Inductive loads, numerical problems.
6 Hours

UNIT - 7

DC CHOPPERS: Introduction, Principles of step down and step up choppers, Step down chopper with RL loads, Chopper classification, Switch mode regulators – buck, boost and buck – boost regulators. **6 Hours**

UNIT - 8

INVERTORS: Introduction, Principles of operation, Performance parameters, 1φ bridge inverter, voltage control of 1φ invertors, current source invertors, Variable DC link inverter.

7 Hours

TEXT BOOKS:

1. **"Power Electronics" -** M. H. Rashid 3rd edition, PHI / Pearson publisher 2004.
2. **"Power Electronics" -** M. D. Singh and Kanchandani K.B. TMH publisher, 2nd Ed. 2007.

REFERENCE BOOKS:

1. **"Power Electronics, Essentials and Applications", L Umanand,** John Wiley India Pvt. Ltd, 2009.
2. **"Power Electronics"** , Daniel W. Hart, McGraw Hill, 2010.
3. **"Power Electronics**", V Nattarasu and R.S. Anandamurhty, **Pearson/Sanguine Pub. 2006.**

EMBEDED SYSTEM DESIGN

Subject Code	: **10EC74**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT 1:

Introduction to Embedded System: Introducing Embedded Systems, Philosophy, Embedded Systems, Embedded Design and Development Process. **5 Hours**

UNIT 2:

The Hardware Side: An Introduction, The Core Level, Representing Information, Understanding Numbers, Addresses, Instructions, Registers-A

UNIT - 7

DC CHOPPERS: Introduction, Principles of step down and step up choppers, Step down chopper with RL loads, Chopper classification, Switch mode regulators – buck, boost and buck – boost regulators. **6 Hours**

UNIT - 8

INVERTORS: Introduction, Principles of operation, Performance parameters, 1φ bridge inverter, voltage control of 1φ invertors, current source invertors, Variable DC link inverter.

7 Hours

TEXT BOOKS:

1. **"Power Electronics" -** M. H. Rashid 3rd edition, PHI / Pearson publisher 2004.
2. **"Power Electronics" -** M. D. Singh and Kanchandani K.B. TMH publisher, 2nd Ed. 2007.

REFERENCE BOOKS:

1. **"Power Electronics, Essentials and Applications", L Umanand,** John Wiley India Pvt. Ltd, 2009.
2. **"Power Electronics"** , Daniel W. Hart, McGraw Hill, 2010.
3. **"Power Electronics**", V Nattarasu and R.S. Anandamurhty, **Pearson/Sanguine Pub. 2006.**

EMBEDED SYSTEM DESIGN

Subject Code	: **10EC74**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT 1:

Introduction to Embedded System: Introducing Embedded Systems, Philosophy, Embedded Systems, Embedded Design and Development Process. **5 Hours**

UNIT 2:

The Hardware Side: An Introduction, The Core Level, Representing Information, Understanding Numbers, Addresses, Instructions, Registers-A

First Look, Embedded Systems-An Instruction Set View, Embedded Systems-A Register View, Register View of a Microprocessor
The Hardware Side: Storage Elements and Finite-State Machines (2 hour)
The concepts of State and Time, The State Diagram, Finite State Machines-A Theoretical Model.

8 Hours

UNIT 3:
Memories and the Memory Subsystem: Classifying Memory, A General Memory Interface, ROM Overview, Static RAM Overview, Dynamic RAM Overview, Chip Organization, Terminology, A Memory Interface in Detail, SRAM Design, DRAM Design, DRAM Memory Interface, The Memory Map, Memory Subsystem Architecture, Basic Concepts of Caching, Designing a Cache System, Dynamic Memory Allocation.

7 Hours

UNIT 4:
Embedded Systems Design and Development : System Design and Development, Life-cycle Models, Problem Solving-Five Steps to Design, The Design Process, Identifying the Requirements, Formulating the Requirements Specification, The System Design Specification, System Specifications versus System Requirements, Partitioning and Decomposing a System, Functional Design, Architectural Design, Functional Model versus Architectural Model, Prototyping, Other Considerations, Archiving the Project. **6 Hours**

PART – B

UNIT 5 & 6:
Real-Time Kernels and Operating Systems: Tasks and Things, Programs and Processes, The CPU is a resource, Threads – Lightweight and heavyweight, Sharing Resources, Foreground/Background Systems, The operating System, The real time operating system (RTOS), OS architecture, Tasks and Task control blocks, memory management revisited.

12 Hours

UNIT 7 & 8:
Performance Analysis and Optimization: Performance or Efficiency Measures, Complexity Analysis, The methodology, Analyzing code, Instructions in Detail, Time, etc. – A more detailed look, Response Time, Time Loading, Memory Loading, Evaluating Performance, Thoughts on Performance Optimization, Performance Optimization, Tricks of the Trade, Hardware Accelerators, Caches and Performance.

12 Hours

TEXT BOOK:

1. **Embedded Systems – A contemporary Design Tool,** James K. Peckol**,** John Weily India Pvt. Ltd, 2008.

REFERENCE BOOKS:

1. **Embedded Systems: Architecture and Programming,** Raj Kamal, TMH. 2008.
2. **Embedded Systems Architecture – A Comprehensive Guide for Engineers and Programmers**, Tammy Noergaard, Elsevier Publication, 2005.
3. **Programming for Embedded Systems**, Dreamtech Software Team, John Wiley India Pvt. Ltd, 2008.

VLSI LAB

Subject Code	: **10ECL77**	IA Marks	: 25
No. of Practical Hrs/Week	: 03	Exam Hours	: 03
Total no. of Practical Hrs.	: 42	Exam Marks	: 50

(Wherever necessary Cadence/Synopsis/Menta Graphics tools must be used)

PART - A
DIGITAL DESIGN

ASIC-DIGITAL DESIGN FLOW

1. Write Verilog Code for the following circuits and their Test Bench for **verification**, observe the waveform and **synthesize** the code with technological library with given Constraints*. Do the initial timing verification with gate level simulation.

    1. An inverter
    2. A Buffer
    3. Transmission Gate
    4. Basic/universal gates
    5. Flip flop -RS, D, JK, MS, T
    6. Serial & Parallel adder
    7. 4-bit counter [Synchronous and Asynchronous counter]
    8. Successive approximation register [SAR]

** An appropriate constraint should be given*

VIII SEMESTER
WIRELESS COMMUNICATION

Subject Code	: **10EC81**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1
Introduction to wireless telecommunication systems and Networks, History and Evolution Different generations of wireless cellular networks 1G, 2g,3G and 4G networks. **6 Hours**

UNIT - 2
Common Cellular System components, Common cellular network components, Hardware and software, views of cellular networks, 3G cellular systems components, Cellular component identification Call establishment.
7 Hours

UNIT - 3
Wireless network architecture and operation, Cellular concept Cell fundamentals, Capacity expansion techniques, Cellular backbone networks, Mobility management, Radio resources and power management Wireless network security. **7 Hours**

UNIT - 4
GSM and TDMA techniques, GSM system overview, GSM Network and system Architecture, GSM channel concepts, GSM identifiers
6 Hours

PART – B

UNIT - 5
GSM system operation, Traffic cases, Cal handoff, Roaming, GSM protocol architecture. TDMA systems. **6 Hours**

UNIT - 6
CDMA technology, CDMA overview, CDMA channel concept CDMA operations. **6 Hours**

UNIT - 7
Wireless Modulation techniques and Hardware, Characteristics of air interface, Path loss models, wireless coding techniques, Digital modulation

techniques, OFDM, UWB radio techniques, Diversity techniques, Typical GSM Hardware. **7 Hours**

UNIT - 8

Introduction to wireless LAN 802.11X technologies, Evolution of Wireless LAN Introduction to 802.15X technologies in PAN Application and architecture Bluetooth Introduction to Broadband wireless MAN, 802.16X technologies. **7 Hours**

TEXT BOOK:

1. **Wireless Telecom Systems and networks**, Mullet: Thomson Learning 2006.

REFERENCE BOOKS:

1. **Mobile Cellular Telecommunication**, Lee W.C.Y, MGH, 2nd, 2009.
2. **Wireless communication** - D P Agrawal: 2nd Edition Thomson learning 2007.
3. **Fundamentals of Wireless Communication**, David Tse, Pramod Viswanath, Cambridge 2005.
4. S. S. Manvi, M. S. Kakkasageri, "**Wireles and Mobile Network concepts and protocols**", John Wiley India Pvt. Ltd, 1st edition, 2010.
5. "**Wireless Communication – Principles & Practice**" , T.S. Rappaport, PHI 2001.

DIGITAL SWITCHING SYSTEMS

Subject Code	: **10EC82**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

Developments of telecommunications, Network structure, Network services, terminology, Regulation, Standards. Introduction to telecommunications transmission, Power levels, Four wire circuits, Digital transmission, FDM, TDM, PDH and SDH, Transmission performance.

7 Hours

UNIT - 7

DESIGN OF RTSS – GENERAL INTRODUCTION: Introduction, Specification documentation, Preliminary design, Single-program approach, Foreground/background, Multi-tasking approach, Mutual exclusion, Monitors. **6 Hours**

UNIT - 8

RTS DEVELOPMENT METHODOLOGIES: Introduction, Yourdon Methodology, Requirement definition for Drying Oven, Ward and Mellor Method, Hately and Pirbhai Method. **6 Hours**

TEXT BOOKS:

1. **Real - Time Computer Control- An Introduction**, Stuart Bennet, 2nd Edn. Pearson Education. 2005.

REFERENCE BOOKS:

1. **Real-Time Systems Design and Analysis**, Phillip. A. Laplante, second edition, PHI, 2005.
2. **Real-Time Systems Development**, Rob Williams, Elsevier. 2006.
3. **Embedded Systems**, Raj Kamal, Tata Mc Graw Hill, India, 2005.

IMAGE PROCESSING

Subject Code	: **10EC763**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

DIGITAL IMAGE FUNDAMENTALS: What is Digital Image Processing. fundamental Steps in Digital Image Processing, Components of an Image processing system, elements of Visual Perception. **6 Hours**

UNIT - 2

Image Sensing and Acquisition, Image Sampling and Quantization, Some Basic Relationships between Pixels, Linear and Nonlinear Operations.
6 Hours

UNIT - 3

IMAGE TRANSFORMS: Two-dimensional orthogonal & unitary transforms, properties of unitary transforms, two dimensional discrete Fourier transform. **7 Hours**

UNIT - 4

Discrete cosine transform, sine transform, Hadamard transform, Haar transform, Slant transform, KL transform. **7 Hours**

PART – B

UNIT - 5

IMAGE ENHANCEMENT: Image Enhancement in Spatial domain, Some Basic Gray Level Trans -formations, Histogram Processing, Enhancement Using Arithmetic/Logic Operations. **7 Hours**

UNIT - 6

Basics of Spatial Filtering Image enhancement in the Frequency Domain filters, Smoothing Frequency Domain filters, Sharpening Frequency Domain filters, homomorphic filtering. **6 Hours**

UNIT - 7

Model of image degradation/restoration process, noise models, Restoration in the Presence of Noise, Only-Spatial Filtering Periodic Noise Reduction by Frequency Domain Filtering, Linear Position-Invariant Degradations, inverse filtering, minimum mean square error (Weiner) Filtering,

7 Hours

UNIT - 8

Color Fundamentals. Color Models, Pseudo color Image Processing., processing basics of full color image processing

6 Hours

TEXT BOOK:

1. **"Digital Image Processing"**, Rafael C.Gonzalez, Richard E. Woods, etl , TMH , 2nd Edition 2010.

REFERENCE BOOKS:

1. **"Fundamentals of Digital Image Processing"**, Anil K. Jain, Pearson Education, 2001.
2. **"Digital Image Processing and Analysis"**, B. Chanda and D. Dutta Majumdar, PHI, 2003.

UNIT - 7

PROTOCOL PERFORMANCE TESTING: SDL based performance testing of TCP, OSPF, Interoperability testing, SDL based interoperability testing of CSMA/CD and CSMA/CA protocol using bridge, Scalability testing.

7 Hours

UNIT - 8

PROTOCOL SYNTHESIS: Synthesis methods, interactive synthesis algorithms, automatic synthesis algorithm, automatic synthesis of SDL from MSC protocol re synthesis. **6 Hours**

TEXT BOOK:

1. **Communication Protocol Engineering**, P. Venkatarm and S. S. Manvi, PHI, 2004.

REFERENCES BOOKS:

1. **The Internet and its Protocols**, Adrian Farrel, Elsevier, 2006.
2. **TCP/IP Protocol Stack**, B A Forouzan, TMH, 2006.

ELECTIVE –V (GROUP E)
MULTIMEDIA COMMUNICATIONS

Subject Code	: **10EC841**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

MULTIMEDIA COMMUNICATIONS: Introduction, multimedia information representation, multimedia networks, multimedia applications, media types, communication modes, network types, multipoint conferencing, network QoS application QoS. **6 Hours**

UNIT - 2

MULTIMEDIA INFORMATION REPRESENTATION: Introduction, digital principles, text, images, audio, video. **7 Hours**

UNIT - 3

TEXT AND IMAGE COMPRESSION: Introduction, compression principles, text compression, image compression.

6 Hours

UNIT - 4
AUDIO AND VIDEO COMPRESSION: Introduction, audio compression, DPCM, ADPCM, APC, LPC, video compression, video compression principles, H.261, H.263, MPEG, MPEG-1, MPEG-2, and MPEG-4.
7 Hours

PART – B

UNIT - 5
MULTIMEDIA INFORMATION NETWORKS: Introduction, LANs, Ethernet, Token ring, Bridges, FDDI High-speed LANs, LAN protocol.
6 Hours

UNIT - 6
THE INTERNET: Introduction, IP Datagrams, Fragmentation, IP Address, ARP and RARP, QoS Support, IPv8. **7 Hours**

UNIT - 7
BROADBAND ATM NETWORKS: Introduction, Cell format, Switfh and Protocol Architecture ATM LANs. **6 Hours**

UNIT - 8
TRANSPORT PROTOCOL: Introduction, TCP/IP, TCP, UDP, RTP and RTCP. **7 Hours**

TEXT BOOK:

1. **Multimedia Communications: Applications, Networks, Protocols and Standards**, Fred Halsall, Pearson Education, Asia, Second Indian reprint 2002.

REFERENCE BOOKS:

1. **Multimedia Information Networking**, Nalin K. Sharda, PHI, 2003.
2. **"Multimedia Fundamentals: Vol 1 - Media Coding and Content Processing"**, Ralf Steinmetz, Klara Narstedt, Pearson Education, 2004.
3. **"Multimedia Systems Design"**, Prabhat K. Andleigh, Kiran Thakrar, PHI, 2004.

UNIT 6
Embedded System Components:
Firmware components, RTOS system software mechanisms, Software application components.

Debugging Components:
Execptions assert, Checking return codes, Single-step debugging, kernel scheduler traces, Test access ports, Trace ports, Power-On self test and diagnostics, External test equipment, Application-level debugging.

7 Hours

UNIT 7
Performance Tuning:
Basic concepts of drill-down tuning, hardware – supported profiling and tracing, Building performance monitoring into software, Path length, Efficiency, and Call frequency, Fundamental optimizations. **6 Hours**

UNIT 8
High availability and Reliability Design:
Reliability and Availability, Similarities and differences, Reliability, Reliable software, Available software, Design trade offs, Hierarchical applications for Fail-safe design.

Design of RTOS – PIC microcontroller. **(Chap 13 of book Myke Predko)**

7 Hours

REFERENCE BOOKS:

1. "**Real-Time Embedded Systems and Components"** Sam Siewert, Cengage Learning India Edition, 2007.
2. " **Programming and Customizing the PIC microcontroller"** , Myke Predko, 3rd Ed, TMH, 2008

GSM

Subject Code	: **10EC843**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1
GSM ARCHITECTURE AND INTERFACES: Introduction, GSM frequency bands, GSM PLMN, Objectives of a GSM PLMN, GSM PLMN Services, GSM Subsystems, GSM Subsystems entities, GSM interfaces, The radio interface (MS to BSC), A_{bits} interface (BTS to BSC), A interface (BSC

to MSC), Interfaces between other GSM entities, Mapping of GSM layers onto OSI layers. **6 Hours**

UNIT - 2

RADIO LINK FEATURES IN GSM SYSTEMS: Introduction, Radio link measurements, Radio link features of GSM, Dynamic power control, Discontinuous transmission (DTX), SFH, Future techniques to reduce interface in GSM, Channel borrowing, Smart antenna. **7 Hours**

UNIT - 3

GSM LOGICAL CHANNELS AND FRAME STRUCTURE: Introduction, GSM logical channels, Allowed logical channel combinations, TCH multi frame for TCH/H, CCH multi frame, GSM frame structure, GSM bursts, Normal burst, Synchronization burst, Frequency correction channel burst, Access burst, Data encryption in GSM, Mobility management, Location registration, Mobile identification. **7 Hours**

UNIT - 4

SPEECH CODING IN GSM: Introduction, Speech coding methods, Speech code attributes, Transmission bit rate, Delay, Complexity, Quality, LPAS, ITU-T standards, Bit rate, Waveform coding, Time domain waveform coding, Frequency domain waveform coding, Vocoders, Full-rate vocoder, Half-rate vocoder. MESSAGES, SERVICES, AND CALL FLOWS IN GSM: Introduction, GSM PLMN services.

7 Hours

PART – B

UNIT - 5

GSM messages, MS-BS interface, BS to MSC messages on the A interface, MSC to VLR and HLR, GSM call setup by an MS, Mobile-Terminated call, Call release, Handover. Data services, Introduction, Data interworking, GSM data services, Interconnection for switched data, Group 3 fax, Packet data on the signaling channel, User-to-user signaling, SMS, GSM GPRS.

6 Hours

UNIT - 6

PRIVACY AND SECURITY IN GSM: Introduction, Wireless security requirements, Privacy of communications, Authentication requirements, System lifetime requirements, Physical requirements, SIM cards, Security algorithms for GSM, Token-based authentication, Token-based registration, Token-based challenge.

6 Hours

UNIT - 7

PLANNING AND DESIGN OF A GSM WIRELESS NETWORK: Introduction, Tele traffic models, Call model, Topology model, Mobility in

cellular / PCS networks, Application of a fluid flow model, Planning of a wireless network, Radio design for a cellular / PCS network, Radio link design, Coverage planning, Design of a wireless system, Service requirements, Constraints for hardware implementation, Propagation path loss, System requirements, Spectral efficiency of a wireless system, Receiver sensitivity and link budget, Selection of modulation scheme, Design of TDMA frame, Relationship between delay spread and symbol rate, Design example for a GSM system.

7 Hours

UNIT - 8

MANAGEMENT OF GSM NETWORKS: Introduction, Traditional approaches to NM, TMN, TMN layers, TMN nodes, TMN interface, TMN management services, Management requirements for wireless networks, Management of radio resources, Personal mobility management, Terminal mobility, Service mobility management, Platform-centered management, SNMP, OSI systems management, NM interface and functionality, NMS functionality, OMC functionality, Management of GSM network, TMN applications, GSM information model, GSM containment tree, Future work items.

7 Hours

TEXT BOOK:

1. **"Principles of Applications of GSM"**, Vijay K. Garg & Joseph E. Wilkes, Pearson education/ PHI, 1999.

REFERENCE BOOKS:

1. **GSM: Evolution towards 3rd Generation Systems**, (Editor), Z. Zvonar Peter Jung, Karl Kammerlander Springer; 1st edition 1998
2. **GSM & UMTS: The Creation of Global Mobile Communication,** Friedhelm Hillebrand, John Wiley & Sons; 2001.

ADHOC WIRELESS NETWORKS

Subject Code	: **10EC844**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

AD HOC NETWORKS: Introduction, Issues in Ad hoc wireless networks, Ad hoc wireless internet. **6 Hours**

10EE35 ELECTRICAL and ELECTRONIC MEASUREMENTS and INSTRUMENTATION

Subject Code	:	**10EE35**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART – A

UNIT 1:

1-(a) Units and Dimensions: Review of fundamental and derived units. S.I. units. Dimensional equations, problems. **3 Hours**

1-(b) Measurement of Resistance: Wheatstone's bridge, sensitivity, limitations. Kelvin's double bridge. Earth resistance, measurement by fall of potential method and by using Megger. **3 Hours**

UNIT 2:

Measurement of Inductance and Capacitance: Sources and detectors, Maxwell's inductance bridge, Maxwell's inductance &capacitance bridge,Hay's bridge, Anderson's bridge, Desauty's bridge, Schering bridge. Shielding of bridges. Problems. **07 Hours**

UNIT 3:

Extension of Instrument Ranges: Shunts and multipliers. Construction and theory of instrument transformers, Equations for ratio and phase angle errors of C.T. and P.T (derivations excluded). Turns compensation, illustrative examples (excluding problems on turns compensation),Silsbees's method of testing CT. **07 Hours**

UNIT 4:

Measurement of Power and Energy: Dynamometer wattmeter. UPF and LPF wattmeters, Measurement of real and reactive power in three-phase circuits. Induction type energy meter — construction, theory, errors, adjustments and calibration. Principle of working of electronic energy meter. 0**6 Hours**

PART – B

UNIT 5:

(a) Construction and operation of electro-dynamometer single-phase power factor meter. Weston frequency meter and phase sequence indicator. 0**4 Hours**

(b) Electronic Instruments: Introduction. True RMS responding voltmeter. Electronic multimeters. Digital voltmeters. Q meter. 0**4 Hours**

UNIT 6:

Dual trace oscilloscope — front panel details of a typical dual trace oscilloscope. Method of measuring voltage, current, phase, frequency and period. Use of Lissajous patterns. Working of a digital storage oscilloscope. Brief note on current probes. 0**6 Hours**

UNIT 7:

Transducers: Classification and selection of transducers. Strain gauges. LVDT. Measurement of temperature and pressure. Photo-conductive and photo-voltaic cells.

0**6 Hours**

UNIT 8:

(a) Interfacing resistive transducers to electronic circuits. Introduction to data acquisition systems.
2 Hours

(b) Display Devices and Signal Generators: X-Y recorders. Nixie tubes. LCD and LED display. Signal generators and function generators. 0**4 Hours**

Text Books

1. **Electrical and Electronic Measurements and Instrumentation,** A. K. Sawhney, Dhanpatrai and Sons, New Delhi.
2. **Modern Electronic Instrumentation and Measuring Techniques,** Cooper D. and A.D. Heifrick, PHI, 2009 Edition.

References

1. **Electronic Instrumentation and Measurement,** David A. Bell, oxford Publication ,2nd Edition, 2009.
2. **Electrical Measurements and Measuring Instruments,** Golding and Widdies, Pitman

10EE36 ELECTRIC POWER GENERATION

Subject Code	:	**10EE36**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART – A

UNIT 1:

Sources of Electrical Power: Wind, solar, fuel cell, tidal, geo-thermal, hydro-electric, thermal-steam, diesel, gas, nuclear power plants (block diagram approach only). Concept of co-generation. Combined heat and power distributed generation. 06 **Hours**

UNIT 2:

Diesel electric plants. Gas turbine plants. Mini, micro, and bio generation. Concept of distributed generation. 06 **Hours**

UNIT 3:

(a) Hydro Power Generation: Selection of site. Classification of hydro-electric plants. General arrangement and operation. Hydroelectric plant power station structure and control. 5 **Hours**

(b) Thermal Power Generation: Introduction. Main parts of a thermal power plant. Working. Plant layout. **3 Hours**

UNIT 4:

Nuclear Power Station: Introduction. Pros and cons of nuclear power generation. Selection of site, cost, components of reactors. Description of fuel sources. Safety of nuclear power reactor. **6 Hours**

PART – B

UNIT 5 and 6:

(a) Economics Aspects: Introduction. Terms commonly used in system operation. Diversity factor, load factor, plant capacity factor, plant use factor, plant utilization factor and loss factor, load duration curve. Cost of generating station, factors influencing the rate of tariff designing, tariff, types of tariff**.** Power factor improvement.

(b) Substations: Introduction, types, Bus bar arrangement schemes, Location of substation equipment. Reactors and capacitors. Interconnection of power stations. 1**4 Hours**

UNIT 7 and 8 :

Grounding Systems: Introduction, grounding systems. Neutral grounding. Ungrounded system. Resonant grounding. Solid grounding, reactance grounding, resistance grounding. Earthing transformer. Neutral grounding transformer. **12 Hours**

Text Books

1. **Power System Engineering,** A. Chakrabarti, M. L. Soni, and P.V. Gupta, Dhanpat Rai and Co.,NewDelhi.
2. **Electric Power Generation, Transmission and Distribution,** S. N. Singh, PHI, 2nd Edition,2009.

References

1. **Elements of Electrical Power System Design,** M. V. Deshpande, PHI,2010

10ES42 MICROCONTROLLERS
(Common to EC/TC/EE/IT/BM/ML)

Sub Code	**:**	**10ES42**	***IA Marks***	**:**	**25**
Hrs/ Week	**:**	**04**	Exam Hours	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

UNIT 1:
Microprocessors and microcontroller. Introduction, Microprocessors and Microcontrollers, RISC & CISC CPU Architectures, Harvard & Von-Neumann CPU architecture, Computer software.
The 8051 Architecture: Introduction, Architecture of 8051, Pin diagram of 8051, Memory organization, External Memory interfacing, Stacks.

6 Hours

UNIT 2:
Addressing Modes: Introduction, Instruction syntax, Data types, Subroutines, Addressing modes: Immediate addressing , Register addressing, Direct addressing, Indirect addressing, relative addressing, Absolute addressing, Long addressing, Indexed addressing, Bit inherent addressing, bit direct addressing.

Instruction set: Instruction timings, 8051 instructions: Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Subroutine instructions, Bit manipulation instruction.

6H**ours**

UNIT 3:
8051 programming: Assembler directives, Assembly language programs and Time delay calculations.

6 Hours

UNIT 4:
8051 Interfacing and Applications: Basics of I/O concepts, I/O Port Operation, Interfacing 8051 to LCD, Keyboard, parallel and serial ADC, DAC, Stepper motor interfacing and DC motor interfacing and programming

6 Hours

UNIT 5:

8051 Interrupts and Timers/counters: Basics of interrupts, 8051 interrupt structure, Timers and Counters, 8051 timers/counters, programming 8051 timers in assembly and C .

6 Hours

UNIT 6:

8051 Serial Communication: Data communication, Basics of Serial Data Communication, 8051 Serial Communication, connections to RS-232, Serial communication Programming in assembly and C.8255A Programmable Peripheral Interface:, Architecture of 8255A, I/O addressing,, I/O devices interfacing with 8051 using 8255A. **6 Hours**

Course Aim – The MSP430 microcontroller is ideally suited for development of low-power embedded systems that must run on batteries for many years. There are also applications where MSP430 microcontroller must operate on energy harvested from the environment. This is possible due to the ultra- low power operation of MSP430 and the fact that it provides a complete system solution including a RISC CPU, flash memory, on-chip data converters and on-chip peripherals.

UNIT 7:

Motivation for MSP430microcontrollers – Low Power embedded systems, On-chip peripherals (analog and digital), low-power RF capabilities. Target applications (Single-chip, low cost, low power, high performance system design).

2 Hours

MSP430 RISC CPU architecture, Compiler-friendly features, Instruction set, Clock system, Memory subsystem. Key differentiating factors between different MSP430 families.

2 Hours

Introduction to Code Composer Studio (CCS v4). Understanding how to use CCS for Assembly, C, Assembly+C projects for MSP430 microcontrollers. Interrupt programming.

2 **Digital I/O – I/O ports** programming using C and assembly, Understanding the muxing scheme of the MSP430 pins. **2 Hours**

UNIT 8:

On-chip peripherals. Watchdog Timer, Comparator, Op-Amp, Basic Timer, Real Time Clock (RTC), ADC, DAC, SD16, LCD, DMA.

2 Hours

Using the Low-power features of MSP430. Clock system, low-power modes, Clock request feature, Low-power programming and Interrupt.

2 Hours

Interfacing LED, LCD, External memory. Seven segment LED modules interfacing. Example – Real-time clock.

2 Hours

Case Studies of applications of MSP430 - Data acquisition system, Wired Sensor network, Wireless sensor network with Chipcon RF interfaces.

3 Hours

TEXT BOOKS:

1. "The 8051 Microcontroller and Embedded Systems – using assembly and C "-, **Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; PHI, 2006 / Pearson, 2006**

2. "MSP430 Microcontroller Basics", **John Davies, Elsevier, 2010**

REFERENCE BOOKS:

1. "The 8051 Microcontroller Architecture, Programming & Applications", **2e Kenneth J. Ayala ;, Penram International, 1996 / Thomson Learning 2005.**

2. **"**The 8051 Microcontroller", **V.Udayashankar and MalikarjunaSwamy, TMH, 2009**

3. MSP430 Teaching CD-ROM, **Texas Instruments, 2008 (can be requested** http://www.uniti.in **)**

4. Microcontrollers: Architecture, Programming, Interfacing and System Design",**Raj Kamal, "Pearson Education, 2005**

10EE45 POWER ELECTRONICS

Subject Code	:	10EE45	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART – A

UNIT 1:

Power Semiconductor Devices:

Introduction to semiconductors, Power Electronics, Power semiconductor devices, Control Characteristics. Types of power electronic converters and industrial applications-Drives, Electrolysis, Heating, Welding, Static Compensators, SMPS, HVDC power transmission, Thyristorized tap changers and Circuit breakers.

7 hours

UNIT 2:

Power Transistors: Power BJT's – switching characteristics, switching limits, base drive control. Power MOSFET's and IGBT's –characteristics, gate drive , di/dt and dv/dt limitations. Isolation of gate and base drives. Simple design of gate and base drives. **6 Hours**

UNIT 3:

Thyristors

Introduction, Two Transistor Model, characteristics-static and dynamic. di/dt and dv/dt protection. Ratings of thyristors. Thyristor types. Series and parallel operation of Thyristors. Thyristor firing circuits. Design of firing circuits using UJT, R, R-C circuits. Analysis of firing circuits using operational amplifiers and digital IC's. **7 Hours**

UNIT 4:

Commutation Techniques: Introduction. Natural Commutation. Forced commutation- self-commutation, impulse commutation, resonant pulse commutation and complementary commutation. **6 Hours**

PART – B

UNIT 5:

Controlled Rectifiers: Introduction. Principle of phase controlled converter operation. Single- phase semi-converters. Full converters. Three-phase half-wave converters. Three-phase full-wave converters. **7 Hours**

UNIT 6:

Choppers: Introduction. Principle of step-down and step-up chopper with R-L load. Performance parameters. Chopper classification. Analysis of impulse commutated thyristor chopper (only qualitative analysis) **6 Hours**

UNIT 7:

Inverters: Introduction. Principle of operation. Performance parameters. Single-phase bridge inverters. Threephase inverters. Voltage control of single-phase inverters – single pulse width, multiple pulse width, and sinusoidal pulse width modulation. Current source inverters. **7 Hours**

1

UNIT 8:

(a) AC Voltage Controllers: Introduction. Principle of ON-OFF and phase control. Single-phase, bi-directional controllers with resistive and R-L loads.

(b) Electromagnetic Compatibility: Introduction, effect of power electronic converters and remedial measures.

6 Hours

Text Book:

1. **Power Electronics,** M.H.Rashid, , Pearson, 3rd Edition, 2006.
2. **Power Electronics,** M.D. Singh and Khanchandani K.B., T.M.H., 2nd Edition,2001

References

1. **Power Electronics Essentials and Applications**,L.Umanand, Wiley India Pvt Ltd,Reprint,2010
2. **Thyristorised Power Controllers,** G.K. Dubey, S.R. Doradla, A. Joshi and R.M.K. Sinha, New Age International Publishers.
3. **Power Electronics – Converters, Applications and Design,** Ned Mohan, Tore M. Undeland, and William P. Robins, Third Edition, John Wiley and Sons,2008.
4. **Power Electronics: A Simplified Approach,** R.S. Ananda Murthy and V. Nattarasu, pearson/Sanguine Technical Publishers.

MICROCONTROLLERS LAB

(Common to EC/TC/EE/IT/BM/ML)

Sub Code	**:**	**10ESL47**	***IA Marks***	**:**	**25**
Hrs/ Week	**:**	**03**	Exam Hours	**:**	**03**
Total Hrs.	**:**	**42**	**Exam Marks**	**:**	**50**

I. PROGRAMMING

1. Data Transfer - Block move, Exchange, Sorting, Finding largest element in an array.
2. Arithmetic Instructions - Addition/subtraction, multiplication and division, square, Cube – (16 bits Arithmetic operations – bit addressable).
3. Counters.
4. Boolean & Logical Instructions (Bit manipulations).

5. Conditional CALL & RETURN.

6. Code conversion: BCD – ASCII; ASCII – Decimal; Decimal - ASCII; HEX - Decimal and Decimal - HEX .

7. Programs to generate delay, Programs using serial port and on-Chip timer / counter.

Note: Programming exercise is to be done on both 8051 & MSP430.

II. INTERFACING:

Write C programs to interface 8051 chip to Interfacing modules to develop single chip solutions.

8. Simple Calculator using 6 digit seven segment displays and Hex Keyboard interface to 8051.

9. Alphanumeric LCD panel and Hex keypad input interface to 8051.

10. External ADC and Temperature control interface to 8051.

11. Generate different waveforms Sine, Square, Triangular, Ramp etc. using DAC interface to 8051; change the frequency and amplitude.
12. Stepper and DC motor control interface to 8051.
13. Elevator interface to 8051.

10EEL48 POWER ELECTRONICS LAB

Subject Code	:	**10EEL48**	**IA Marks**	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

1. Static characteristics of SCR.
2. Static characteristics of MOSFET and IGBT.
3. SCR turn-on circuit using synchronized UJT relaxation oscillator.
4. SCR Digital triggering circuit for a single-phase controlled rectifier and A.C. voltage controller.
5. Single-phase controlled full-wave rectifier with *R* and *R-L* loads.
6. A.C. voltage controller using TRIAC and DIAC combination connected to *R* and *R-L* loads.
7. Speed control of a separately excited D.C. motor using an IGBT or MOSFET chopper.
8. Speed control of D.C. motor using single semi converter
9. Speed control of a stepper motor.
10. Speed control of universal motor using A.C. voltage controller.
11. MOSFET OR IGBT based single-phase full-bridge inverter connected to R load.
12. Study of commutation using LC circuits and auxiliary circuits.

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10EEL57 MEASUREMENTS AND CIRCUIT SIMULATION LABORATORY

Subject Code	:	**10EEL57**	**IA Marks**	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

1. Measurement of low resistance using Kelvin's double bridge.
2. Measurement of cable insulation and earth resistance using Meggar
3. Measurement of inductance using Maxwell Inductance-Capacitance bridge & determination of Q-factor
4. Measurement of capacitance using De-Sauty's bridge & determination of dissipation factor.
5. M easurement of active and reactive power in balanced 3-phase circuit using two-watt meter method.
6. Adjustment & calibration of 1-phase energy meter
7. Determination of ratio & phase angle error in CT.
8. a) Inverting, non-inverting & scale changing of signals using op -amps
   b) RC phase shift oscillator using op amps (Both using simulation package)
9. RC coupled amplifier-frequency response for variation of bias & coupling using simulation package
10. Rectifier circuits-Bridge rectifier, diode clipping & clamping circuits using simulation package.
11. Schmitt –trigger- inverting and non-inverting.
    12 Signal generator- triangular, saw tooth and rectangular wave generation
    Note: All experiments, except 5,6 and 7, are to be carried out by using components and verify the result by using a simulation package.

10EE61 POWER SYSTEM ANALYSIS AND STABILITY

Subject Code	:	**10EE61**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

REPRESENTATION OF POWER SYSTEM COMPONENTS: Circuit models of Transmission line, Synchronous machines, Transformers and load. Single line diagram, impedance and reactance diagrams. Per unit system, per unit impedance diagram of power system. **8 Hours**

UNIT - 2

SYMMETRICAL 3 - PHASE FAULTS: Analysis of Synchronous machines and Power system. Transients on a transmission line, Short-Circuit currents and the reactance of synchronous machines with and without load . **6 Hours**

UNIT - 3 & 4

SYMMETRICAL COMPONENTS: Introduction, analysis of unbalanced load against balanced Three-phase supply, neutral shift. Resolution of unbalanced phasors into their symmetrical components, Phase shift of symmetrical components in star-delta transformer bank, Power in terms of symmetrical components**,** Analysis of balanced and unbalanced loads against unbalanced 3 phase supply, Sequence impedances and networks of power system elements (alternator, transformer and transmission line) Sequence networks of power systems. Measurement of sequence impedance of synchronous generator.

12 Hours

Part - B

UNIT - 5 & 6

UNSYMMETRICAL FAULTS: L-G, L-L, L-L-G faults on an unbalanced alternator with and without fault impedance. Unsymmetrical faults on a power system with and without fault impedance. Open conductor faults in power system. **14 Hours**

UNIT - 7

STABILITY STUDIES: Introduction**,** Steady state and transient stability. Rotor dynamics and the swing equation. Equal area criterion for transient stability evaluation and its applications. **8 Hours**

UNIT – 8

UNBALANCED OPERATION OF THREE PHASE INDUCTION MOTRORS: Analysis of three phase induction motor with one line open., Analysis of three phase induction motor with unbalanced voltage. **4 Hours**

TEXT BOOKS:

1. **Elements of Power System Analysis**, W.D.Stevenson, TMH,4th Edition
2. **Modern Power System Analysis**,.I. J. Nagrath and D.P.Kothari- TMH, 3rd Edition,2003.
3. **Symmetrical Components and Short Circuit Studies,** Dr.P.N.Reddy, Khanna Publishers

REFERENCE BOOKS:

1. **Power System Analysis**, Hadi Sadat, TMH,2nd Edition.
2. **Power system Analysis**, R.Bergen, and Vijay Vittal, Pearson publications, 2nd edition, 2006.
3. **Computer Aided Power system analysis**, G.L., Kusic, PHI.Indian Edition, 2010 .
4. **Power System Analysis**,W.D.Stevenson & Grainger,TMH, First Edition, 2003.

10EE62 SWITCHGEAR & PROTECTION

Subject Code	:	**10EE62**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

SWITCHES AND FUSES: Introduction, energy management of power system, definition of switchgear, switches - isolating, load breaking and earthing. Introduction to fuse**,** fuse law, cut -off characteristics,: Time current characteristics, fuse material, HRC fuse, liquid fuse, Application of fuse

4 Hours

UNIT - 2

PRINCIPLES OF CIRCUIT BREAKERS: Introduction, requirement of a circuit breakers, difference between an isolator and circuit breaker, basic principle of operation of a circuit breaker, phenomena of arc, properties of arc, initiation and maintenance of arc, arc interruption theories - slepian's theory and energy balance theory**,** Restriking voltage, recovery voltage, Rate of rise of Restriking voltage, DC circuit breaking, AC circuit breaking, current chopping, capacitance switching, resistance switching, Rating of Circuit breakers.

10 Hours

UNIT - 3 & 4

CIRCUITS BREAKERS: Air Circuit breakers – Air break and Air blast Circuit breakers, oil Circuit breakers - Single break, double break, minimum OCB, SF_6 breaker - Preparation of SF_6 gas, Puffer and non Puffer type of SF_6 breakers. Vacuum circuit breakers - principle of operation and constructional details. Advantages and disadvantages of different types of Circuit breakers, Testing of Circuit breakers, Unit testing, synthetic testing, substitution test, compensation test and capacitance test.

LIGHTNING ARRESTERS: Causes of over voltages – internal and external, lightning, working principle of different types of lightning arresters. Shield wires.

12 Hours

PART - B

UNIT - 5

PROTECTIVE RELAYING: Requirement of Protective Relaying, Zones of protection, primary and backup protection, Essential qualities of Protective Relaying, Classification of Protective Relays

4 Hours

UNIT - 6

INDUCTION TYPE RELAY: Non-directional and directional over current relays, IDMT and Directional characteristics. Differential relay – Principle of operation, percentage differential relay, bias characteristics, distance relay – Three stepped distance protection, Impedance relay, Reactance relay, Mho relay, Buchholz relay, Negative Sequence relay, Microprocessor based over current relay – block diagram approach.

10 Hours

UNIT - 7 & 8

PROTECTION SCHEMES: Generator Protection - Merz price protection, prime mover faults, stator and rotor faults, protection against abnormal conditions – unbalanced loading, loss of excitation, over speeding. Transformer Protection - Differential protection, differential relay with harmonic restraint, Inter turn faults Induction motor protection - protection against electrical faults such as phase fault, ground fault, and abnormal operating conditions such as single phasing, phase reversal, over load. **12 Hours**

TEXT BOOKS:

1. **Switchgear & Protection** Sunil S.Rao,,Khanna Publishers,13th Edition,2008.
2. **Power System Protection & Switchgear,** Badriram & Viswa Kharma ,TMH,1st edition, 2001.
3. **Fundamentals of Power System protection,** Y G. Painthankar and S R Bhide,PHI, 2009.

REFERENCE BOOKS:

1. **A Course in Electrical Power,** Soni, Gupta & Bhatnagar, Dhanapatirai.
2. **Power System Protection & Switchgear,** Ravindarnath & Chandra -New age Publications.
3 **Electrical Power,** Dr S. L. Uppal, Khanna Publishers.
4. **Handbook of Switchgears**, BHEL,TMH, 5th reprint,2008.

10EE664 OBJECT ORIENTED PROGRAMMING USING C ++

Subject Code	:	10EE664	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
PRINCIPLES OF OBJECT-ORIENTED PROGRAMMING: Review of Procedure Oriented Programming, Basic concepts of Object Oriented Programming – Object, Class, Encapsulation, Inheritance, Polymorphism; Benefits of OOPs, Applications of OOP's. **4 Hours**

UNIT - 2
THE BASIC LANGUAGE C++: A comparison of C and C++, Structure of C++ program with Class, Preprocessor directives, C++ Statements – Input/Output, Comments, Tokens, Keywords, Identifiers, Constants, Data types – string, pointer, reference, boole, enumeration, array, complex number; typedef names, type compatibility, type conversion, qualifier – const, volatile; Operators in C++, Operator Precedence and Operator Overloading; C++ expressions – New and Delete. **6 Hours**

UNIT - 3
FUNCTIONS IN C++: Introduction, The main() function, Function prototype, Call by reference, Return by reference, Inline functions, Default arguments, const Arguments, Function Overloading, Friend and Virtual functions, pointer to functions. **8 hours**

UNIT - 4
CLASSES AND OBJECTS: Introduction – declaration and definition of a Class, defining member functions, C++ program with a Class, Making an outside function Inline, Nesting of member functions, Arrays within a class, Static data members, static member functions, Objects – global & local objects, scope & lifetime, memory allocation for objects, dynamically allocated objects, pointers to objects, arrays of objects, function arguments with objects, returning objects; const member functions. **8 Hours**

PART - B

UNIT - 5
CONSTRUCTORS AND DESTRUCTORS: Introduction, Constructors, Parameterized Constructors, Multiple constructors in a class, Constructors with default arguments, Dynamic initialization of objects, Copy constructor, Constructing two-dimensional arrays, const Objects, Destructors. **4 Hours**

UNIT - 6
OPERATOR OVERLOADING AND TYPE CONVERSION: Introduction, Defining operator overloading, Overloading unary operators, Overloading binary operators, Overloading binary operators using Friends, Rules for overloading operators, overloading a comma operator, overloading the output operator , Type conversion. **7 Hours**

UNIT - 7
INHERITANCE: Introduction, Defining derived classes, Single inheritance, Making a private member Inheritable, Multilevel inheritance, Multiple inheritance, Hierarchical inheritance, Hybrid inheritance, Virtual base classes, Abstract classes, Constructors & Destructors in base & derived classes. **6 Hours**

UNIT - 8
POINTER, VIRTUAL FUNCTIONS AND POLYMORPHISM: Introduction, Pointers, Pointers to Objects, this pointer, Pointers to derived classes, type-checking pointers, pointers to members, Virtual functions, Pure virtual functions.

MANAGING CONSOLE I/O AND FILE I/O: C++ streams, C++ stream classes, examples of formatted and unformatted I/O operations, Classes for file stream operations, Methods of Opening and Closing a File, Examples of Opening file using constructor open(), file modes (simple programming exercises). **9 Hours**

TEXT BOOKS:

1. **Object Oriented Programming with C++-** Balagurusamy, E, TMH,4th edition, 2008.
2. **C++, The Complete Reference -**Herbert Schildt**,** , TMH, 4th edition
3. **Object Oriented Programming with C++**, Farrell,Cengage Learning,First Edition,2008.

REFERENCE BOOKS:

1. **The C++ programming language,**Bjarne Stroustrup, Pearson Education, 3rd edition,2006.
2. **Objected oriented programming with C++,**Bhave, Pearson Education, First Edition,2006.

10EE72 ELECTRICAL POWER UTILIZATION

Subject Code	:	**10EE72**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

HEATING AND WELDING: Advantages and methods of electric of heating, resistance ovens, induction heating, dielectric heating, the arc furnace, heating of building. Electric welding, resistance and arc welding, control devices and welding equipment. **10 Hours**

UNIT - 2

ELECTROLYTIC PROCESS: Fundamental principles, extraction, refining of metals and electroplating. Factors affecting electro deposition process, power supply for electrolytic process. **6 Hours**

UNIT - 3 & 4

ILLUMINATION: Laws of illumination, lighting calculation, factory lighting, flood lighting, street lighting, different types of lamps-incandescent, fluorescent, vapor, CFL and LED lamps and their working, comparision, Glare and its remedy. **10 Hours**

PART - B

UNIT - 5, 6 & 7

ELECTRIC TRACTION: Introduction, requirements of an ideal traction,systems of traction, speed time curve, tractive effort,co-efficient of adhesion, selection of traction motors, method of speed control, energy saving by series parallel control, ac traction equipment. AC series motor, characteristics, regenerative braking, linear induction motor and their use. AC traction, diesel electric equipment, trains lighting system, specific energy, factors affecting specific energy consumption. **20 Hours**

UNIT - 8

INTRODUCTION TO ELECTRIC AND HYBRID VEHICLES: Configuration and performance of electrical vehicles, traction motor characteristics, tractive effort, transmission requirement, vehicle performance and energy consumption. **6 Hours**

TEXT BOOKS:

1. **Utilization Of Electric Energy,**E Openshaw Taylor, 12th Impression,2009,Universities Press.
2. **Modern Electric, Hybrid Electric and Fuel Cell Vehicles**, Mehrdad, Ehsani, Yimin Gao, Sabastien. E. Gay, Ali Emadi- CRC Press.

REFERENCE BOOKS:

1. **A Course in Electrical Power**, Soni Gupta and Bhatnager-Dhanapat Rai & sons.
3. **Electrical Power,** Dr. S.L.Uppal, Khanna Publications

10EE73 HIGH VOLTAGE ENGINEERING

Subject Code	:	**10EE73**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION: Introduction to HV technology, need for generating high voltages in laboratory. Industrial applications of high voltage, Electrostatic precipitation, separation, painting and printing.

6Hours

UNIT - 2 & 3

BREAKDOWN PHENOMENA: Classification of HV insulating media. Properties of important HV insulating media under each category. Gaseous dielectrics,Ionization: primary and secondary ionization processes. Criteria for gaseous insulation breakdown based on Townsend's theory. Limitations of Townsend's theory. Streamer's theory breakdown in non uniform fields. Corona discharges. Breakdown in electro negative gases. Paschen's law and its significance. Time lags of Breakdown. Breakdown in solid dielectrics: Intrinsic Breakdown, avalanche breakdown, thermal breakdown, and electro mechanic breakdown. Breakdown of liquid dielectrics: Suspended particle theory, electronic Breakdown, cavity breakdown (bubble's theory), electro convection breakdown. **12 Hours**

UNIT - 4

GENERATION OF HV AC AND DC VOLTAGE: HV AC-HV transformer; Need for cascade connection and working of transformers units connected in cascade. Series resonant circuit- principle of operation and advantages. Tesla coil. HV DC- voltage doubler circuit, cock croft- Walton type high voltage DC set. Calculation of high voltage regulation, ripple and optimum number of stages for minimum voltage drop. **8 Hours**

Part - B

UNIT - 5

GENERATION OF IMPULSE VOLTAGE AND CURRENT: Introduction to standard lightning and switching impulse voltages. Analysis of single stage impulse generator-expression for Output impulse voltage. Multistage impulse generator working of Marx impulse. Rating of impulse generator. Components of multistage impulse generator. Triggering of impulse generator by three electrode gap arrangement. Trigatron gap and oscillograph time sweep circuits. Generation of switching impulse voltage. Generation of high impulse current. **6 Hours**

UNIT - 6

MEASUREMENT OF HIGH VOLTAGES: Electrostatic voltmeter-principle, construction and limitation. Chubb and Fortescue method for HV AC measurement. Generating voltmeter- Principle, construction. Series resistance micro ammeter for HV DC measurements. Standard sphere gap measurements of HV AC, HV DC, and impulse voltages; Factors affecting the measurements. Potential dividers-resistance dividers capacitance dividers mixed RC potential dividers. Measurement of high impulse currents-Rogogowsky coil and Magnetic Links. **10 Hours**

UNIT - 7

NON-DESTRUCTIVE INSULATION TESTING TECHNIQUES: Dielectric loss and loss angle measurements using Schering Bridge, Transformer ratio Arms Bridge. Need for discharge detection and PD measurements aspects. Factor affecting the discharge detection. Discharge detection methods-straight and balanced methods. **6 Hours**

UNIT - 8

HIGH VOLTAGE TESTS ON ELECTRICAL APPARATUS: Definitions of terminologies, tests on isolators, circuit breakers, cables insulators and transformers. **4 Hours**

TEXT BOOKS:

1. **High Voltage Engineering**, M.S.Naidu and Kamaraju- 4th Edition, THM, 2008.
2. **High Voltage Engineering Fundamentals**, E.Kuffel and W.S. Zaengl, 2nd Edition, Elsevier Press, 2005.
3. **High Voltage Engineering** ,C.L.Wadhwa, New Age International Private limited, 1995.

REFERENCE BOOKS:

1.**High Voltage Engineering Theory and Practice,** Mazen Abdel-Salam, Hussein Anis, Ahdab El-Morshedy, Roshdy Radwan, 2nd Edn(Revised & Expanded) Marcel-Dekker Publishers(Special Indian Edn.).

10EE752 PROGRAMMABLE LOGIC CONTROLLERS

Subject Code	:	**10EE752**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
INTRODUTION: Introduction to Programmable logic controller (PLC), role in automation (SCADA), advantages and disadvantages, hardware, internal architecture, sourcing and sinking, characteristics of I/O devices, list of input and output devices, examples of applications. I/O processing, input/output units, signal conditioning, remote connections, networks, processing inputs I/O addresses. **7 Hours**

UNIT - 2
ROGRAMMING: Ladder programming- ladder diagrams, logic functions, latching, multiple outputs, entering programs, functional blocks, programme examples like location of stop and emergency switches
8 Hours

UNIT - 3 & 4
PROGRAMMING LANGUAGES: Instruction list, sequential functions charts & structured text, jump and call subroutines**.** **10 Hours**

PART - B

UNIT - 5
INTERNAL RELAYS: ladder programmes, battery- backed relays, one - shot operation, set and reset, master control relay. **5 Hours**

UNIT - 6 & 7
Timers and counters: Types of timers, programming timers, ON and OFF- delay timers, pulse timers, forms of counter, programming, up and down counters, timers with counters, sequencer. **12 Hours**

UNIT - 8
Shift register and data handling: shift registers, ladder programs, registers and bits, data handling, arithmetic functions, temperature control and bottle packing applications. **10 Hours**

Note: Programming is to be with reference to only Mitsubhish PLC

TEXT BOOKS:

1. **Programmable Logic controllers-**W Bolton, 5th edition, Elsevier- newness, 2009.
2. **Programmable logic controllers - principles and applications”-**John W Webb, Ronald A Reis, Pearson education, 5th edition, 2nd impression, 2007.

REFERENCE BOOKS:

1. **Programmable Controller Theory and Applications**,L. A Bryan, E. A Bryan, An industrial text company publication, 2nd edition, 1997.
2. **Programmable Controllers, An Engineers Guide**-E. A Paar, newness, 3rd edition, 2003.

10EE836 RENEWABLE ENERGY SOURCES

Subject Code	:	**10EE836**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

UNIT - 1

ENERGY SOURCES: Introduction, Importance of Energy Consumption as Measure of Prosperity, Per Capita Energy Consumption, Classification of Energy Resources; Conventional Energy Resources - Availability and their limitations; Non-Conventional Energy Resources – Classification, Advantages, Limitations; Comparison of Conventional and Non-Conventional Energy Resources; World Energy Scenario; Indian Energy Scenario. **4 Hours**

UNIT - 2

SOLAR ENERGY BASICS: Introduction, Solar Constant, Basic Sun-Earth Angles – definitions and their representation, Solar Radiation Geometry (numerical problems), Estimation of Solar Radiation of Horizontal and Tilted Surfaces (numerical problems); Measurement of Solar Radiation Data – Pyranometer and Pyrheliometer. **6 Hours**

UNIT - 3

SOLAR THERMAL SYSTEMS: Principle of Conversion of Solar Radiation into Heat, Solar Water Heaters (Flat Plate Collectors), Solar Cookers – Box type, concentrating dish type, Solar driers, Solar Still, Solar Furnaces, Solar Green Houses. **6 Hours**

UNIT - 4

SOLAR ELECTRIC SYSTEMS: Solar Thermal Electric Power Generation – Solar Pond and Concentrating Solar Collector (parabolic trough, parabolic dish, Central Tower Collector). Advantages and Disadvantages; Solar Photovoltaic – Solar Cell fundamentals, characteristics, classification, construction of module, panel and array. Solar PV Systems – stand-alone and grid connected; Applications – Street lighting, Domestic lighting and Solar Water pumping systems. **7 Hours**

ENERGY STORAGE: Introduction, Necessity of Energy Storage, and Methods of Energy Storage (classification and brief description using block diagram representation only). **3 Hours**

PART - B

UNIT - 5

WIND ENERGY: Introduction, Wind and its Properties, History of Wind Energy, Wind Energy Scenario – World and India. Basic principles of Wind Energy Conversion Systems (WECS), Classification of WECS, Parts of WECS, Derivation for Power in the wind, Electrical Power Output and Capacity Factor of WECS, Wind site selection consideration, Advantages and Disadvantages of WECS. **8 Hours**

UNIT - 6

BIOMASS ENERGY: Introduction, Photosynthesis process, Biomass fuels, Biomass conversion technologies, Urban waste to Energy Conversion, Biomass Gasification, Biomass to Ethanol Production, Biogas production from waste biomass, factors affecting biogas generation, types of biogas plants – KVIC and Janata model; Biomass program in India. **6 Hours**

UNIT - 7

ENERGY FROM OCEAN: Tidal Energy – Principle of Tidal Power, Components of Tidal Power Plant (TPP), Classification of Tidal Power Plants, Estimation of Energy – Single basin and Double basin type TPP (no derivations. Simple numerical problems), Advantages and Limitations of TPP. Ocean Thermal Energy Conversion (OTEC): Principle of OTEC system, Methods of OTEC power generation – Open Cycle (Claude cycle), Closed Cycle (Anderson cycle) and Hybrid cycle (block diagram description of OTEC); Site-selection criteria, Biofouling, Advantages & Limitations of OTEC. **6 Hours**

UNIT - 8

EMERGING TECHNOLOGIES: Fuel Cell, Small Hydro Resources, Hydrogen Energy, and Wave Energy. (Principle of Energy generation using block diagrams, advantages and limitations). **6 Hours**

TEXT BOOKS:

1. **Non-Conventional Sources of Energy,**Rai, G. D, Khanna Publishers, 4th Edition, 2007
2. **Non-Conventional Energy Resources,** Khan, B. H., TMH, 2nd Edition.

REFERENCE BOOK:

1. **Fundamentals of Renewable Energy Systems,** Mukherjee, D and Chakrabarti, S., New Age International Publishers, 2005.

MATERIAL SCIENCE AND METALLURGY

Subject Code	**: 10ME32A /42A**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Crystal Structure: BCC, FCC and HCP Structures, coordination number and atomic packing factors, crystal imperfections -point line and surface imperfections. Atomic Diffusion: Phenomenon, Ficks laws of diffusion, factors affecting diffusion.

06 Hours

UNIT - 2

Mechanical Behaviour: Stress-strain diagram showing ductile and brittle behaviour of materials, linear and non linear elastic behaviour and properties, mechanical properties in plastic range, yield strength offset yield strength, ductility, ultimate tensile strength, toughness. Plastic deformation of single crystal by slip and twinning.

06 Hours

UNIT - 3

Fracture: Type I, Type II and Type III.

Creep: Description of the phenomenon with examples. three stages of creep, creep properties, stress relaxation.

Fatigue: Types of fatigue loading with examples, Mechanism of fatigue, fatigue properties, fatigue testing and S-N diagram.

07 Hours

UNIT - 4

Solidification: Mechanism of solidification, Homogenous and Heterogeneous nucleation, crystal growth, cast metal structures.

Phase Diagram I: Solid solutions Hume Rothary rule substitutional, and interstitial solid solutions, intermediate phases, Gibbs phase rule.

07 Hours

PART - B

UNIT - 5

Phase Diagram II: Construction of equilibrium diagrams involving complete and partial solubility, lever rule. Iron carbon equilibrium diagram description of phases, solidification of steels and cast irons, invariant reactions.

06 Hours

UNIT - 6

Heat treating of metals: TTT curves, continuous cooling curves, annealing and its types. normalizing, hardening, tempering, martempering, austempering, hardenability, surface hardening methods like carburizing, cyaniding, nitriding, flame hardening and induction hardening, age hardening of aluminium-copper alloys.

07 Hours

UNIT - 7

Ferrous and non ferrous materials: Properties, Composition and uses of

- Grey cast iron, malleable iron, SG iron and steel
- Copper alloys-brasses and bronzes.
  Aluminium alloys-Al-Cu,Al-Si,Al-Zn alloys.

06 Hours

UNIT - 8

Composite Materials: Definition, classification, types of matrix materials & reinforcements, fundamentals of production of FRP's and MMC's advantages and application of composites.

07 Hours

TEXT BOOKS:

1. **Foundations of Materials Science and Engineering,** Smith, 4th Edition McGraw Hill, 2009
2. **Materials Science, Shackleford., & M. K. Muralidhara,** Pearson Publication – 2007.

REFERENCE BOOKS:

1. **An Introduction to Metallurgy; Alan Cottrell**, Universities Press India Oriental Longman Pvt. Ltd., 1974.
2. **Engineering Materials Science**, W.C.Richards, PHI, 1965
3. **Physical Metallurgy**; Lakhtin, Mir Publications
4. **Materials Science and Engineering,** V.Raghavan , PHI, 2002
5. **Elements of Materials Science and Engineering,** H. VanVlack, Addison-Wesley Edn., 1998
6. **Materials Science and Engineering,**William D. Callister Jr., John Wiley & Sons. Inc, 5th Edition, 2001.
7. **The Science and Engineering of Materials,** Donald R. Askland and Pradeep.P. Phule, Cengage Learning, 4lh Ed., 2003.

MECHANICAL MEASUREMENTS AND METROLOGY

Subject Code	**: 10ME32B /42B**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART- A

UNIT-1

Standards of measurement: Definition and Objectives of metrology, Standards of length-International prototype meter, Imperial standard yard, Wave length standard, subdivision of standards, line and

end standard, calibration of end bars (Numerical), Slip gauges, Wringing phenomena, Indian Standards (M-81, M-12), Numerical problems on building of slip gauges.

06 Hours

UNIT-2

System of Limits, Fits, Tolerance and Gauging: Definition of tolerance, Specification in assembly, Principle of interchangeability and selective assembly limits of size, Indian standards, concept of limits of size and tolerances, compound tolerances, accumulation of tolerances, definition of fits, types of fits and their designation (IS 919-1963), geometrical tolerance, positional-tolerances, hole basis system, shaft basis system, classification of gauges, brief concept of design of gauges (Taylor's principles), Wear allowance on gauges, Types of gauges-plain plug gauge, ring gauge, snap gauge, limit gauge and gauge materials.

07 Hours

UNIT-3

Comparators and Angular measurement: Introduction to comparators, characteristics, classification of comparators, mechanical comparators-Johnson Mikrokator, sigma comparators, dial indicator, optical comparators-principles, Zeiss ultra optimeter, electric and electronic comparators-principles, LVDT, pneumatic comparators, back pressure gauges, solex comparators. Angular measurements, bevel protractor, sine principle and use of sine bars, sine centre, use of angle gauges (numericals on building of angles), clinometers.

07 Hours

UNIT-4:

Interferometer and screw thread, gear measurement: Interferometer, interferometry, autocollimator. Optical flats. Terminology of screw threads, measurement of major diameter, minor diameter, pitch, angle and effective diameter of screw threads by 2 - wire and 3 -wire methods, best size wire. Tool maker's microscope, gear tooth terminology, use of gear tooth vernier caliper and micrometer.

06 Hours

PART-B

UNIT-5:

Measurements and measurement systems: Definition, significance of measurement, generalized measurement system, definitions and concept of accuracy, precision, calibration, threshold, sensitivity, hysterisis, repeatability, linearity, loading effect, system response-times delay. Errors in measurement, classification of errors. Transducers, transfer efficiency, primary and secondary transducers, electrical, mechanical, electronic transducers, advantages of each type transducers.

07 Hours

UNIT-6

Intermediate modifying and terminating devices: Mechanical systems, inherent problems, electrical intermediate modifying devices, input circuitry, ballast circuit, electronic amplifiers and telemetry. Terminating devices, mechanical, cathode ray oscilloscope, oscillographs, X-Y plotters.

06 Hours

UNIT-7

Measurement of force, torque and pressure: Principle, analytical balance, platform balance, proving ring. Torque measurement, Prony brake, hydraulic dynamometer. Pressure measurements, principle, use of elastic members, Bridgeman gauge, McLeod gauge, Pirani gauge. **06 Hours**

UNIT-8

Temperature and strain measurement: Resistance thermometers, thermocouple, law of thermo couple, materials used for construction, pyrometer, optical pyrometer. Strain measurements, strain gauge, preparation and mounting of strain gauges, gauge factor, methods of strain measurement.

07 Hours

TEXT BOOKS:

1. **Mechanical Measurements,** Beckwith Marangoni and Lienhard, Pearson Education, 6th Ed., 2006.
2. **Engineering Metrology,** R.K. Jain, Khanna Publishers, 1994.

REFERENCE BOOKS:

1. **Engineering Metrology,** I.C. Gupta, Dhanpat Rai Publications, Delhi.
2. **Mechanical Measurements,** R.K. Jain Khanna Publishers, 1994
3. **Industrial Instrumentation,** Alsutko, Jerry. D. Faulk, Cengage Asia Pvt. Ltd. 2002.
4. **Measurement Systems Applications and Design,** Ernest O. Doebelin, 5th Ed., McGraw Hill Book Co.
5. **Metrology & Measurement,** Anand K. Bewoor & Vinay A. Kulkarni, Tata McGraw Hill Pvt. Ltd., New-Delhi

MANUFACTURING PROCESS – I
(FUNDAMENTALS OF FOUNDRY & WELDING)

Subject Code	**: 10ME35**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

CASTING PROCESS

UNIT - 1

Introduction: Concept of Manufacturing process, its importance. Classification of Manufacturing processes. Introduction to Casting process & steps involved. Varieties of components produced by casting process. Advantages & Limitations of casting process.

Patterns: Definition, functions, Materials used for pattern, various pattern allowances and their importance. Classification of patterns, BIS color coding of Patterns.

Binder: Definition, Types of binder used in moulding sand.

Additives: Need, Types of additives used and their properties..

06 Hours

UNIT - 2

Sand Moulding : Types of base sand, requirement of base sand. Moulding sand mixture ingredients for different sand mixtures. Method used for sand moulding, such as Green sand, dry sand and skin dried moulds.

Cores: Definition, Need, Types. Method of making cores, Binders used, core sand moulding.

Concept of Gating & Risers. Principle and types.

Fettling and cleaning of castings. Basic steps, Casting defects, Causes, features and remedies.

Moulding Machines : Jolt type, Squeeze type, Jolt & Squeeze type and Sand slinger.

07 Hours

UNIT - 3

Special moulding Process: Study of important moulding processes, No bake moulds, Flaskless moulds, Sweep mould, CO_2 mould, Shell mould, Investment mould.

Metal moulds: Gravity die-casting, Pressure die casting, Centrifugal casting, Squeeze Casting, Slush casting, Thixo-casting and Continuous Casting Processes.

07 Hours

UNIT - 4

Melting Furnaces: Classification of furnaces. Constructional features & working principle of coke fired, oil fired and Gas fired pit furnace, Resistance furnace, Coreless Induction furnace, Electric Arc Furnace, Cupola furnace.

06 Hours

PART – B

WELDING

UNIT - 5

Welding process: Definition, Principles, Classification, Application, Advantages & limitations of welding.

Arc Welding: Principle, Metal Arc welding **(MAW)**, Flux Shielded Metal Arc Welding **(FSMAW)**, Inert Gas Welding **(TIG & MIG)** Submerged Arc Welding **(SAW)** and Atomic Hydrogen Welding processes. **(AHW)**

Gas Welding: Principle, Oxy – Acetylene welding, Chemical Reaction in Gas welding, Flame characteristics. Gas torch construction & working. Forward and backward welding.

07 Hours

UNIT - 6

Special types of welding: Resistance welding **-** principles, Seam welding, Butt welding, Spot welding and projection welding.

Friction welding, Explosive welding, Thermit welding, Laser welding and Electron beam welding.

07 Hours

UNIT - 7

Metallurgical aspect, in welding : Structure of welds, Formation of different zones during welding. Heat affected zone **(HAZ).** Parameters affecting **HAZ**. Effect of carbon content on structure and properties of steel. Shrinkage in welds & Residual stresses.

Concept of electrodes, Filler rod and fluxes. Welding defects – Detection causes & remedy.

06 Hours

UNIT - 8

Principles of soldering & brazing: Parameters involved & Mechanism. Different Types of Soldering & Brazing Methods.

Inspection Methods – Methods used for Inspection of casting and welding. Visual, Magnetic particle, Fluorescent particle, Ultrasonic, Radiography, Eddy current, Holography methods of Inspection.

06 Hours

TEXT BOOKS:

1. **"Manufacturing Process-I",** Dr.K.Radhakrishna, Sapna Book House, 5th Revised Edition 2009.
2. **"Manufacturing & Technology**: Foundry Forming and Welding", P.N.Rao, 3rd Ed., Tata McGraw Hill, 2003.

REFERENCE BOOKS:

1. **"Process and Materials of Manufacturing**", Roy A Lindberg, 4th Ed. Pearson Edu. 2006.
2. **"Manufacturing Technology**", Serope Kalpakjian, Steuen. R. Sechmid, Pearson Education Asia, 5th Ed. 2006.

COMPUTER AIDED MACHINE DRAWING

Subject Code	**:10ME36A/10ME46A**	**IA Marks**	**25**
Hours/Week	**: 04(1 Hrs. Theory & 3 Hrs Practical)**	**Exam Hours**	**03**
Total Hours	**: 52**	**Exam Marks**	**100**

Introduction:
Review of graphic interface of the software. Review of basic sketching commands and navigational commands. Starting a new drawing sheet. Sheet sizes. Naming a drawing, Drawing units, grid and snap.

02 Hours

PART-A

UNIT - 1
Sections of Solids: Sections of Pyramids, Prisms, Cubes, Tetrahedrons, Cones and Cylinders resting only on their bases (No problems on axis inclinations, spheres and hollow solids). True shape of sections.
Orthographic Views: Conversion of pictorial views into orthographic projections. of **simple machine parts** with or without section. (Bureau of Indian Standards conventions are to be followed for the drawings) Hidden line conventions. Precedence of lines.

08 Hours

UNIT - 2
Thread Forms: Thread terminology, sectional views of threads. ISO Metric (Internal & External) BSW (Internal & External) square and Acme. Sellers thread, American Standard thread.
Fasteners: Hexagonal headed bolt and nut with washer (assembly), square headed bolt and nut with washer (assembly) simple assembly using stud bolts with nut and lock nut. Flanged nut, slotted nut, taper and split pin for locking, counter sunk head screw, grub screw, Allen screw.

08 Hours

PART-B

UNIT - 3

Keys & Joints :

Parallel key, Taper key, Feather key, Gibhead key and Woodruff key

Riveted Joints: Single and double riveted lap joints, butt joints with single/double cover straps (Chain and Zigzag, using snap head rivets). cotter joint (socket and spigot), knuckle joint (pin joint) for two rods.

08 Hours

UNIT - 4

Couplings:

Split Muff coupling, Protected type flanged coupling, pin (bush) type flexible coupling, Oldham's coupling and universal coupling (Hooks' Joint)

08 Hours

PART - C

Assembly Drawings

(Part drawings should be given)

1. Plummer block (Pedestal Bearing)
2. Rams Bottom Safety Valve
3. I.C. Engine connecting rod
4. Screw jack (Bottle type)
5. Tailstock of lathe
6. Machine vice
7. Tool Head of a shaper

18 Hours

TEXT BOOKS:

1. **'A Primer on Computer Aided Machine Drawing-2007'**, Published by VTU, Belgaum.
2. **'Machine Drawing'**, N.D.Bhat & V.M.Panchal

REFERENCE BOOKS:

1. **'A Text Book of Computer Aided Machine Drawing'**, S. Trymbaka Murthy, CBS Publishers, New Delhi, 2007
2. **'Machine Drawing'**, K.R. Gopala Krishna, Subhash Publication.

3. **'Machine Drawing with Auto CAD'**, Goutam Pohit & Goutham Ghosh, 1st Indian print Pearson Education, 2005
4. **'Auto CAD 2006, for engineers and designers'**, Sham Tickoo. Dream tech 2005
5. **'Machine Drawing'**, N. Siddeshwar, P. Kanniah, V.V.S. Sastri, published by Tata McGraw Hill,2006

NOTE:

Internal assessment: 25 Marks

All the sheets should be drawn in the class using software. Sheet sizes should be A3/A4. All sheets must be submitted at the end of the class by taking printouts.

Scheme of Examination:

Two questions to be set from each Part-A, Part-B and Part-C
Student has to answer one question each from Part-A and Part-B for 20 marks each. And one question from Part-C for 60 marks.

i.e. PART-A 1 x 20 = 20 Marks
PART-B 1 x 20 = 20 Marks
PART-C 1 x 60 = 60 Marks

Total = 100 Marks

FLUID MECHANICS

Subject Code	**: 10ME36B / 46B**	**IA Marks**	**25**
Hours/Week	**: 04**	**Exam Hours**	**03**
Total Hours	**: 52**	**Exam Marks**	**100**

PART – A

UNIT-1

Properties of Fluids: Introduction, Types of fluid, Properties of fluids, viscosity, thermodynamic properties, surface tension, capillarity, vapour pressure and cavitation

06 Hours

UNIT-2

Fluid Statistics: Fluid pressure at a point, Pascal's law, pressure variation in a static fluid, absolute, gauge, atmospheric and vacuum pressures, simple manometers and differential manometers. Total pressure and center of pressure on submerged plane surfaces; horizontal, vertical and inclined plane surfaces, curved surface submerged in liquid.

07 Hours

UNIT-3

Buoyancy and Fluid Kinematics:

Buoyancy, center of buoyancy, metacentre and metacentric height, conditions of equilibrium of floating and submerged bodies, determination of Metacentric height experimentally and theoretically.

<u>Kinematics</u>: Types of fluid flow, continuity equation in 2D and 3D (Cartesian Co-ordinates only), velocity and acceleration, velocity potential function and stream function.

07 Hours

UNIT-4

Fluid Dynamics: Introduction equation of motion, Euler's equation of motion, Bernoulli's equation from first principles and also from Euler's equation, limitations of Bernoulli's equation.

06 Hours

PART-B

UNIT-5

Fluid Flow Measurements : Venturimeter, orificemeter, pitot-tube, vertical orifice, V-Notch and rectangular notches.

<u>Dimensional Analysis</u> : Introduction, derived quantities, dimensions of physical quantities, dimensional homogeneity, Rayleigh's method, Buckingham π theorem, dimensionless numbers, similitude, types of similitudes.

07 Hours

UNIT-6

Flow through pipes : Minor losses through pipes. Darey's and Chezy's equation for loss of head due to friction in pipes. HGL and TEL.

06 Hours

UNIT-7

Laminar flow and viscous effects : Reyonold's number, critical Reynold's number, laminar flow through circular pipe-Hagen Poiseille's equation, laminar flow between parallel and stationary plates.

06 Hours

UNIT-8

Flow past immersed bodies : Drag, Lift, expression for lift and drag, boundary layer concept, displacement, momentum and energy thickness. Introduction to compressible flow : Velocity of sound in a fluid, Mach number, Mach cone, propagation of pressure waves in a compressible fluid.

07 Hours

TEXT BOOKS:

1. **Fluid Mechanics,** Oijush.K.Kundu, IRAM COCHEN, ELSEVIER, 3rd Ed. 2005.
2. **Fluid Mechanics**, Dr. Bansal, R.K.Lakshmi Publications, 2004.

REFERENCE BOOKS:

1. **Fluid Mechanics and hydraulics,** Dr.Jagadishlal: Metropolitan Book Co-Ltd., 1997.
2. **Fluid Mechanics (SI Units),** Yunus A. Cengel John M.Oimbala, 2nd Ed., Tata McGraw Hill, 2006.
3. **Fluid Mechanics,** John F.Douglas, Janul and M.Gasiosek and john A.Swaffield, Pearson Education Asia, 5th ed., 2006
4. **Fluid Mechanics and Fluid Power Engineering**, Kumar.D.S, Kataria and Sons., 2004
5. **Fluid Mechanics** -. Merle C. Potter, Elaine P.Scott. Cengage learning

METALLOGRAPHY AND MATERIAL TESTING LABORATORY

Subject Code	**: 10MEL37A / 47A**	**IA Marks**	**: 25**
Hours/Week	**: 03**	**Exam Hours**	**: 03**
Total Hours	**: 48**	**Exam Marks**	**: 50**

PART – A

1. Preparation of specimen for Metallograpic examination of different engineering materials. Identification of microstructures of plain carbon steel, tool steel, gray C.I, SG iron, Brass, Bronze & composites.
2. Heat treatment: Annealing, normalizing, hardening and tempering of steel. Hardness studies of heat-treated samples.
3. To study the wear characteristics of ferrous, non-ferrous and composite materials for different parameters.
4. Non-destructive test experiments like,
   (a). Ultrasonic flaw detection
   (b). Magnetic crack detection
   (c). Dye penetration testing. To study the defects of Cast and Welded specimens

PART – B

1. Tensile, shear and compression tests of metallic and non metallic specimens using Universal Testing Machine
2. Torsion Test
3. Bending Test on metallic and nonmetallic specimens.
4. Izod and Charpy Tests on M.S, C.I Specimen.
5. Brinell, Rockwell and Vickers's Hardness test.
6. Fatigue Test.

Scheme of Examination:

ONE question from part -A: **20** Marks
ONE question from part -B: 20 Marks
Viva -Voice: 10 Marks

Total : 50 Marks

MECHANICAL MEASUREMENTS AND METROLOGY LABORATORY

Subject Code	**: 10MEL37B / 47B**	**IA Marks**	**: 25**
Hours/Week	**: 03**	**Exam Hours**	**: 03**
Total Hours	**: 48**	**Exam Marks**	**: 50**

PART-A: MECHANICAL MEASUREMENTS

1. Calibration of Pressure Gauge
2. Calibration of Thermocouple
3. Calibration of LVDT
4. Calibration of Load cell
5. Determination of modulus of elasticity of a mild steel specimen using strain gauges.

PART-B: METROLOGY

1. Measurements using Optical Projector / Toolmaker Microscope.
2. Measurement of angle using Sine Center / Sine bar / bevel protractor
3. Measurement of alignment using Autocollimator / Roller set
4. Measurement of cutting tool forces using
    a) Lathe tool Dynamometer
    b) Drill tool Dynamometer.
5. Measurement of Screw thread Parameters using Two wire or Three-wire method.
6. Measurements of Surface roughness, Using Tally Surf/Mechanical Comparator
7. Measurement of gear tooth profile using gear tooth vernier /Gear tooth micrometer
8. Calibration of Micrometer using slip gauges
9. Measurement using Optical Flats

Scheme of Examination:

ONE question from part -A:	**20** Marks
ONE question from part -B:	**20** Marks
Viva -Voice:	**10** Marks
Total :	**50** Marks

FOUNDRY AND FORGING LABORATORY

Subject Code	**: 10MEL38A / 48A**	**IA Marks**	**: 25**
Hours/Week	**: 03**	**Exam Hours**	**: 03**
Total Hours	**: 48**	**Exam Marks**	**: 50**

PART – A

1. Testing of Moulding sand and Core sand

Preparation of sand specimens and conduction of the following tests:

1 Compression, Shear and Tensile tests on Universal Sand Testing Machine.
2 Permeability test
3 Core hardness & Mould hardness tests.
4 Sieve Analysis to find Grain Fineness number of Base Sand
5 Clay content determination in Base Sand

PART – B

2. Foundry Practice

Use of foundry tools and other equipments.

Preparation of moulds using two moulding boxes using patterns or without patterns. (Split pattern, Match plate pattern and Core boxes).

Preparation of one casting (Aluminum or cast iron-Demonstration only)

PART – C

3. Forging Operations :

- Calculation of length of the raw material required to do the model.
- Preparing minimum three forged models involving upsetting, drawing and bending operations.
- Out of these three models, at least one model is to be prepared by using Power Hammer.

Scheme of Examination:

One question is to be set from Part-A: 10 marks
One question is to be set from either
Part-B or Part-C: 30 marks
Calculation part in case of forging is made compulsory

Calculation (Forging)	+ Foundry Model = 05 +25 = 30 Marks
Calculation (Forging)	+ Forging Model = 05 +25 = 30 Marks

Viva-Voce	:	**10** marks.
Total	:	**50** Marks**.**

MACHINE SHOP

Subject Code	**: 10MEL38B / 48B**	**IA Marks**	**: 25**
Hours/Week	**: 03**	**Exam Hours**	**: 03**
Total Hours	**: 48**	**Exam Marks**	**: 50**

PART – A

Preparation of three models on lathe involving Plain turning, Taper turning, Step turning, Thread cutting, Facing, Knurling, Drilling, Boring, Internal Thread cutting and Eccentric turning.

PART – B

Cutting of V Groove/ dovetail / Rectangular groove using a shaper.
Cutting of Gear Teeth using Milling Machine.

<u>Scheme of Examination:</u>

ONE question from part -A: **30** Marks
ONE question from part -B: 10 Marks
Viva -Voice: **10** Marks

Total : 50 Marks

APPLIED THERMODYNAMICS

Subject Code	**: 10ME43**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART-A

UNIT - 1

Combustion thermodynamics: Theoretical (Stoichiometric) air and excess air for combustion of fuels. Mass balance, actual combustion. Exhaust gas analysis. A./ F ratio, Energy balance for a chemical reaction, enthalpy of formation, enthalpy and internal energy of combustion, Combustion efficiency, adiabatic flow temperature.

07 Hours

UNIT- 2

Gas power cycle: Air Standard cycles: Carnot, Otto, Diesel, Dual and Stirling cycles, P-V and T-S diagrams, description, efficiencies and mean effective pressures, Comparison of Otto, Diesel and dual cycles.

06 Hours

UNIT - 3

I.C. Engine: Testing of two stroke and four stroke SI and CI engines for performance Related numerical problems, heat balance, Motoring Method, Willian's line method, swinging field dynamometer, Morse test.

06 Hours

UNIT - 4

Vapour Power Cycles: Carnot vapour power cycles, drawbacks as a reference cycle, Simple Rankine cycle, description, T- S diagram, analysis for performance , comparison of Carnot and Rankine cycles. Effects of pressure and temperature on Rankine cycle performance. Actual vapour power cycles. Ideal and practical regenerative Rankine cycle, open and closed feed water heaters, Reheat Rankine cycle.

07 Hours

PART-B

UNIT - 5

Reciprocating Compressors: Operation of a single stage reciprocating compressors, work input through P-V diagram and steady state steady flow analysis. Effect of clearance and volumetric efficiency. Adiabatic, isothermal and mechanical efficiencies. Multistage compressor, saving in work, optimum intermediate pressure, inter- cooling, minimum work for compression.

06 Hours

UNIT - 6

Gas turbine and Jet propulsion: Classification of Gas turbines, Analysis of open cycle gas turbine cycle. Advantages and disadvantages of closed cycle. Methods to improve thermal efficiency, Jet propulsion and Rocket propulsion.

07 Hours

UNIT - 7

Refrigeration: Vapour compression refrigeration system ; description, analysis, refrigerating effect, capacity , power required, units of refrigeration, COP , Refrigerants and their desirable properties. Air cycle refrigeration;

reversed Carnot cycle, reversed Brayton cycle, Vapour absorption refrigeration system, steam jet refrigeration.

06 Hours

UNIT - 8

Psychometry: Atmospheric air and psychometric properties; Dry bulb temperature, wet bulb temperature, dew point temperature; partial pressures, specific and relative humidities and the relation between the two enthalpy and adiabatic saturation temperature. Construction and use of psychometric chart . Analysis of various processes; heating, cooling , dehumidifying and humidifying. Adiabatic mixing of moist air. Summer and winter air conditioning.

07 Hours

Data Hand Book :

1. **Thermodynamic data hand book,** B.T. Nijaguna.
2. **Properties of Refrigerant & Psychometric** (tables & Charts in SI Units), Dr. S.S. Banwait, Dr. S.C. Laroiya, Birla Pub. Pvt. Ltd., Delhi, 2008

TEXT BOOKS:

1. **Basic and applied Thermodynamics**, P.K. Nag, 2nd Ed., Tata McGraw Hill Pub.Co,2002
2. **Applied Thermodynamics**, Rajput, Laxmi Publication
3. **Applied Thermodynamics**, B.K. Venkanna, Swati B. Wadavadagi, PHI, New Delhi, 2010

REFERENCE BOOKS:

1. **Thermodynamics , An engineering approach**, Yunus, A. Cengel and Michael A.Boies, 6th Ed., Tata McGraw Hill pub. Co., 2002,
2. **Fundamental of Classical Thermodynamics,** G.J. Van Wylen and R.E. Sontang Wiley eastern.

KINEMATICS OF MACHINES

Subject Code	**: 10ME44**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Introduction: Definitions Link or element, kinematic pairs, Degrees of freedom, Grubler's criterion (without derivation), Kinematic chain, Mechanism, Structure, Mobility of Mechanism, Inversion, Machine.

Kinematic Chains and Inversions: Inversions of Four bar chain; Single slider crank chain and Double slider crank chain.

07 Hours

UNIT - 2

Mechanisms: Quick return motion mechanisms-Drag link mechanism, Whitworth mechanism and Crank and slotted lever Mechanism.

Straight line motion mechanisms Peaucellier's mechanism and Robert's mechanism. Intermittent Motion mechanisms -Geneva wheel mechanism and Ratchet and Pawl mechanism. Toggle mechanism, Pantograph, Ackerman steering gear mechanism.

06 Hours

UNIT - 3

Velocity and Acceleration Analysis of Mechanisms (Graphical Methods)

Velocity and acceleration analysis of Four Bar mechanism, slider crank mechanism and Simple Mechanisms by vector polygons: Relative velocity and acceleration of particles .in a common link, relative velocity and accelerations of coincident Particles on separate links- Coriolis component of acceleration. Angular velocity and angular acceleration of links, velocity of rubbing.

07 Hours

UNIT - 4

Velocity Analysis by Instantaneous Center Method: Definition, Kennedy's Theorem, Determination of linear and angular velocity using instantaneous center method

Klein's Construction: Analysis of velocity and acceleration of single slider crank mechanism.

06 Hours

PART – B

UNIT - 5

Velocity and Acceleration Analysis of Mechanisms (Analytical Methods): Analysis of four bar chain and slider crank chain using analytical expressions. (Use of complex algebra and vector algebra)

06 Hours

UNIT - 6

Spur Gears: Gear terminology, law of gearing, Characteristics of involute action, Path of contact. Arc of contact, Contact ratio of spur, helical, bevel and worm gears, Interference in involute gears. Methods of avoiding interference, Back lash. Comparison of involute and cycloidal teeth. Profile Modification.

07 Hours

UNIT - 7

Gear Trains: Simple gear trains, Compound gear trains for large speed. reduction, Epicyclic gear trains, Algebraic and tabular methods of finding velocity ratio of epicyclic gear trains. Tooth load and torque calculations in epicyclic gear trains.

07 Hours

UNIT - 8

Cams: Types of cams, Types of followers. Displacement, Velocity and, Acceleration time curves for cam profiles. Disc cam with reciprocating follower having knife-edge, roller and flat-face follower, Disc cam with oscillating roller follower. Follower motions including SHM, Uniform velocity, uniform acceleration and retardation and Cycloidal motion.

06 Hours

TEXT BOOKS:

1. **"Theory of Machines",** Rattan S.S, Tata McGraw-Hill Publishing Company Ltd., New Delhi, and 3rd edition -2009.
2. **"Theory of Machines",** Sadhu Singh, Pearson Education (Singapore) Pvt. Ltd, Indian Branch New Delhi, 2nd Edi. 2006

REFERENCE BOOKS:

1. **"Theory of Machines & Mechanisms**", J.J. Uicker, , G.R. Pennock, J.E. Shigley. OXFORD 3rd Ed. 2009.
2. **Mechanism and Machine theory**, Ambekar, PHI, 2007

Graphical Solutions may be obtained either on the Graph Sheets or on the Answer Book itself.

MANUFACTURING PROCESS – II
(Metal Removing Process)

Subject Code	**: 10ME45**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Theory of Metal Cutting: Single point cutting tool nomenclature, geometry. Mechanics of Chip Formation, Types of Chips. Merchants circle diagram and analysis, Ernst Merchant's solution, shear angle relationship, problems of Merchant's analysis. Tool Wear and Tool failure, tool life. Effects of cutting parameters on tool life. Tool Failure Criteria, Taylor's Tool Life equation. Problems on tool life evaluation.

07 Hours

UNIT - 2

Cutting Tool Materials: Desired properties and types of cutting tool materials – HSS, carbides coated carbides, ceramics. Cutting fluids. Desired properties, types and selection. Heat generation in metal cutting, factors

affecting heat generation. Heat distribution in tool and work piece and chip. Measurement of tool tip temperature.

07 Hours

UNIT - 3

Turning (Lathe), Shaping and Planing Machines: Classification, constructional features of Turret and Capstan Lathe. Tool Layout, shaping Machine, Planing Machine, Driving mechanisms of lathe, shaping and planing machines, Different operations on lathe, shaping machine and planing machine. Simple problems on machining time calculations

07 Hours

UNIT - 4

Drilling machines: Classification, constructional features, drilling & related operations. Types of drill & drill bit nomenclature, drill materials.
Introduction to CNC machines**-** Principles of operation. Axes of NC machine-Coordinate systems. Basics of Manual part programming methods.

06 Hours

PART – B

UNIT - 5

Milling machines: Classification, constructional features, milling cutters nomenclature, milling operations, up milling and down milling concepts. Various milling operations.
Indexing: Simple, compound, differential and angular indexing calculations. Simple problems on simple and compound indexing.

06 Hours

UNIT - 6

Grinding machines: Types of abrasives, Grain size, bonding process, grade and structure of grinding wheels, grinding wheel types. Classification, constructional features of grinding machines (Centerless, cylindrical and surface grinding). Selection of grinding wheel. Grinding process parameters. Dressing and truing of grinding wheels.

07 Hours

UNIT - 7:

Broaching process - Principle of broaching. Details of a broach. Types of broaching machines-constructional details. Applications. Advantages and Limitations.

Finishing and other Processes Lapping and Honing operations – Principles, arrangement of set up and application. Super finishing process, polishing, buffing operation and application.

06 Hours

UNIT - 8

Non-traditional machining processes: Need for non traditional machining, Principle, equipment & operation of Laser Beam, Plasma Arc Machining, Electro Chemical Machining, Ultrasonic Machining, Abrasive Jet Machining, Water Jet Machining, Electron Beam Machining, Electron Discharge Machining and Plasma Arc Machining.

06 Hours

TEXT BOOKS:

1. **Workshop Technology,** Hazara Choudhry, Vol-II, Media Promoters & Publishers Pvt. Ltd. 2004
2. **Production Technology,** R.K.Jain, Khanna Publications, 2003.
3. **Production Technology,** HMT, Tata Mc Graw Hill, 2001.

REFERENCE BOOKS:

1. **Manufacturing Science**, Amitabha Ghosh and Mallik, affiliated East West Press, 2003.
2. **Fundamentals of Metal Machining and Machine Tools,** G. Boothroyd, McGraw Hill, 2000.

DESIGN OF MACHINE ELEMENTS-I

Subject Code	**: 10ME52**	**IA Marks**	**25**
Hours/Week	**: 04**	**Exam Hours**	**03**
Total Hours	**: 52**	**Exam Marks**	**100**

PART – A

UNIT- 1

Introduction: Definitions: normal, shear, biaxial and tri axial stresses, Stress tensor, Principal Stresses. Engineering Materials and their mechanical properties, Stress-Strain diagrams, Stress Analysis, Design considerations: Codes and Standards.

05 Hours

UNIT- 2

Design For Static & Impact Strength:

Static Strength: Static loads and factor of safety, Theories of failure: Maximum normal stress theory, Maximum shear stress theory, Maximum strain theory, Strain energy theory, Distortion energy theory. Failure of brittle and ductile materials, Stress concentration, Determination of Stress concentration factor.

Impact Strength: Introduction, Impact stresses due to axial, bending and torsional loads, effect of inertia.

07 Hours

UNIT - 3

Design For Fatigue Strength: Introduction- S-N Diagram, Low cycle fatigue, High cycle fatigue, Endurance limit, Modifying factors: size effect, surface effect, Stress concentration effects, Fluctuating stresses, Goodman and Soderberg relationship, stresses due to combined loading, cumulative fatigue damage.

08 Hours

UNIT - 4

Threaded Fasteners: Stresses in threaded fasteners, Effect of initial tension, Design of threaded fasteners under static, dynamic and impact loads, Design of eccentrically loaded bolted joints.

06 Hours

PART – B

UNIT - 5

Design Of Shafts: Torsion of shafts, design for strength and rigidity with steady loading, ASME codes for power transmission shafting, shafts under fluctuating loads and combined loads.

07 Hours

UNIT - 6

Cotter And Knuckle Joints, Keys And Couplings: Design of Cotter and Knuckle joints, Keys: Types of keys, Design of keys, Couplings: Rigid and flexible couplings, Flange coupling, Bush and Pin type coupling and Oldham's coupling.

07 Hours

UNIT - 7

Riveted and Welded Joints – Types, rivet materials, failures of riveted joints, Joint Efficiency, Boiler Joints, Lozanze Joints, Riveted Brackets. Welded Joints – Types, Strength of butt and fillet welds, eccentrically loaded welded joints.

07 Hours

UNIT - 8

Power Screws: Mechanics of power screw, Stresses in power screws, efficiency and self-locking, Design of Power Screw, Design of Screw Jack: (Complete Design).

05 Hours

TEXT BOOKS:

1. **Mechanical Engineering Design,** Joseph E Shigley and Charles R. Mischke. McGraw Hill International edition, 6th Edition 2009.
2. **Design of Machine Elements,** V.B. Bhandari, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2nd Edition 2007.

DESIGN DATA HANDBOOK:

1. **Design Data Hand Book,** K. Lingaiah, McGraw Hill, 2nd Ed.
2. **Data Hand Book,** K. Mahadevan and Balaveera Reddy, CBS Publication
3. **Design Data Hand Book,** H.G. Patil, I. K. International Publisher, 2010.

REFERENCE BOOKS:

1. **Machine Design,** Robert L. Norton, Pearson Education Asia, 2001.
2. **Design of Machine Elements,** M. F. Spotts, T. E. Shoup, L. E. Hornberger, S. R. Jayram and C. V. Venkatesh, Pearson Education, 2006.
3. **Machine Design,** Hall, Holowenko, Laughlin (Schaum's Outlines series) Adapted by S.K. Somani, Tata McGraw Hill Publishing Company Ltd., New Delhi, Special Indian Edition, 2008.
4. **Fundamentals of Machine Component Design,** Robert C. Juvinall and Kurt M Marshek, Wiley India Pvt. Ltd., New Delhi, 3rd Edition, 2007.

ENERGY ENGINEERING

Subject Code	**: 10ME53**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Steam Power Plant: Different Types of Fuels used for steam generation, Equipment for burning coal in lump form, strokers, different types, Oil burners, Advantages and Disadvantages of using pulverized fuel, Equipment for preparation and burning of pulverized coal, unit system and bin system. Pulverized fuel furnaces, cyclone furnace, Coal and ash handling, Generation of steam using forced circulation, high and supercritical pressures.

07 Hours

UNIT - 2

A Brief Account Of Benson, Velox Schmidt Steam Generators. Chimneys: Natural, forced, induced and balanced draft, Calculations and numericals involving height of chimney to produce a given draft. Cooling towers and Ponds. Accessories for the Steam generators such as Superheaters, De-superheater, control of superheaters, Economizers, Air pre-heaters and re-heaters.

07 Hours

UNIT - 3

Diesel Engine Power Plant: Applications of Diesel Engines in Power field. Method of starting Diesel engines. Auxiliaries like cooling and lubrication system, filters, centrifuges, Oil heaters, intake and exhaust system, Layout of diesel power plant.

06 Hours

UNIT - 4

Hydro-Electric Plants: Hydrographs, flow duration and mass curves, unit hydrograph and numericals. Storage and pondage, pumped storage plants,

low, medium and high head plants, Penstock, water hammer, surge tanks, gates and valves. General layout of hydel power plants.

06 Hours

PART – B

UNIT - 5

Nuclear Power Plant: Principles of release of nuclear energy; Fusion and fission reactions. Nuclear fuels used in the reactors. Multiplication and thermal utilization factors. Elements of the nuclear reactor; moderator, control rod, fuel rods, coolants. Brief description of reactors of the following types-Pressurized water reactor, Boiling water reactor, Sodium graphite reactor, Fast Breeder reactor, Homogeneous graphite reactor and gas cooled reactor, Radiation hazards, Shieldings, Radio active waste disposal.

06 Hours

UNIT - 6

Solar Energy: Solar Extra terrestrial radiation and radiation at the earth surface, radiation-measuring instruments, working principles of solar flat plate collectors, solar pond and photovoltaic conversion (Numerical Examples).

Wind Energy: Properties of wind, availability of wind energy in India, wind velocity and power from wind; major problems associated with wind power, wind machines; Types of wind machines and their characteristics, horizontal and vertical axis wind mills, coefficient of performance of a wind mill rotor (Numerical Examples).

08 Hours

UNIT - 7

Tidal Power: Tides and waves as energy suppliers and their mechanics; fundamental characteristics of tidal power, harnessing tidal energy, limitations.

Ocean Thermal Energy Conversion: Principle of working, Rankine cycle, problems associated with OTEC.

Geothermal Energy Conversion: Principle of working, types of geothermal station with schematic diagram, problems associated with geothermal conversion, scope of geothermal energy.

06 Hours

UNIT - 8

Energy From Bio Mass: Photosynthesis, photosynthetic oxygen production, energy plantation.

Bio Chemical Route: Biogas production from organic wastes by anaerobic fermentation, classification of bio gas plants, factors affecting bio gas generation.

Thermo Chemical Route: Thermo chemical conversion on bio mass, types of gasifiers.

06 Hours

TEXT BOOKS:

1. **Power Plant Engineering**, P. K. Nag Tata McGraw Hill 2nd edn 2001.
2. **Power Plant Engineering,** Domakundawar, Dhanpath Rai sons. 2003

REFERENCE BOOKS:

1. **Power Plant Engineering,** R. K. Rajput, Laxmi publication, New Delhi.
2. **Principles of Energy conversion**, A. W. Culp Jr., McGraw Hill. 1996
3. **Non conventional Energy sources**, G D Rai Khanna Publishers.
4. **Non conventional resources,** B H Khan TMH - 2007

1.

MANUFACTURING PROCESS – III

(METAL FORMING PROCESS)

Subject Code	**: 10ME55**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Introduction And Concepts: Classification of metal working processes, characteristics of wrought products, advantages and limitations of metal working processes.Concepts of true stress, true strain, triaxial & biaxial

stresses. Determination of flow stress. Principal stresses, Tresca & Von-Mises yield criteria, concepts of plane stress & plane strain.

06 Hours

UNIT - 2

Effects Of Parameters: Temperature, strain rate, friction and lubrication, hydrostatic pressure in metalworking, Deformation zone geometry, workability of materials, Residual stresses in wrought products.

06 Hours

UNIT - 3

Forging: Classification of forging processes. Forging machines & equipment. Expressions for forging pressures & load in open die forging and closed die forging by slab analysis, concepts of friction hill and factors affecting it. Die-design parameters. Material flow lines in forging. Forging defects, Residual stresses in forging. Simple problems.

07 Hours

UNIT - 4

Rolling: Classification of Rolling processes. Types of rolling mills, expression for RoIling load. Roll separating force. Frictional losses in bearing, power required in rolling, Effects of front & back tensions, friction, friction hill. Maximum possible reduction. Defects in rolled products. Rolling variables, simple problems.

06 Hours

PART - B

UNIT - 5

Drawing: Drawing equipment & dies, expression for drawing load by slab analysis, power requirement. Redundant work and its estimation, optimal cone angle & dead zone formation, drawing variables, Tube drawing, classification of tube drawing, simple problems.

07 Hours

UNIT - 6

Extrusion: Types of extrusion processes, extrusion equipment & dies, deformation, lubrication & defects in extrusion. Extrusion dies, Extrusion of seamless tubes. Extrusion variables, simple problem

06 Hours

UNIT - 7

Sheet & Metal Forming: Forming methods, dies & punches, progressive die, compound die, combination die. Rubber forming. Open back inclinable press (OBI press), piercing, blanking, bending, deep drawing, LDR in drawing, Forming limit criterion, defects of drawn products, stretch forming. Roll bending & contouring, Simple problems

06 Hours

UNIT - 8

High Energy Rate Forming Methods: Principles, advantages and applications, explosive forming, electro hydraulic forming, Electromagnetic forming.

Powder Metallurgy: Basic steps in Powder metallurgy brief description of methods of production of metal powders, conditioning and blending powders, compaction and sintering application of powder metallurgy components, advantages and limitations.

07 Hours

TEXT BOOKS:

1. **Mechanical metallurgy (SI units),** G.E. Dieter, Mc Graw Hill pub.2001
2. **Manufacturing Process – III,** Dr. K.Radhakrishna, Sapna Book House, 2009.

REFERENCE BOOKS:

1. **Materials and Processes in Manufacturing,** E.paul, Degramo, J.T. Black, Ronald, A.K. Prentice -hall of India 2002
2. **Principles of Industrial metal working process,** G.W. Rowe, CBSpub. 2002
3. **Manufacturing Science,** Amitabha Ghosh & A.K. Malik - East - Westpress 2001
4. **Technology of Metal Forming Process**, Surendra kumar, PHI – 2008

FLUID MECHANICS AND MACHINES LABORATORY

Subject Code	**: 10MEL57**	**IA Marks**	**: 25**
Hours/Week	**: 03**	**Exam Hours**	**: 03**
Total Hours	**: 42**	**Exam Marks**	**: 50**

PART - A

1. Determination of coefficient of friction of flow in a pipe.

2. Determination of minor losses in flow through pipes.

3. Determination of force developed by impact of jets on vanes.

4. Calibration of flow measuring devices

a. Orifice Plate meter
b. Nozzle
c. Venturimeter
d. V-notch

18 Hours

PART - B

5. Performance testing of Turbines
   a. Pelton wheel
   b. Francis Turbine
   c. Kaplan Turbines

6. Performance testing of Pumps
   a. Single stage / Multi stage centrifugal pumps
   b. Reciprocating pump

7. Performance test of a two stage Reciprocating Air Compressor

8. Performance test on an Air Blower

24 Hours

<u>Scheme for Examination:</u>

One Question from Part A	-	15 Marks (05 Writeup + 10)
One Question from Part B	-	25 Marks (05 Writeup + 20)
Viva-Voce	-	10 Marks

Total		**50 Marks**

ENERGY CONVERSION ENGINEERING LABORATORY

Subject Code	**: 10MEL58**	**IA Marks**	**: 25**
Hours/Week	**: 03**	**Exam Hours**	**: 03**
Total Hours	**: 42**	**Exam Marks**	**: 50**

PART - A

1. Determination of Flash point and Fire point of lubricating oil using Abel Pensky and Marten's (closed) / Cleavland's (Open Cup) Apparatus.

2. Determination of Calorific value of solid, liquid and gaseous fuels.

3. Determination of Viscosity of a lubricating oil using Redwoods, Saybolt and Torsion Viscometers.

4. Valve Timing/port opening diagram of an I.C. engine (4 stroke/2 stroke).

5. Use of planimeter

21 Hours

PART - B

1. Performance Tests on I.C. Engines, Calculations of IP, BP, Thermal efficiencies, Volumetric efficiency, Mechanical efficiency, SFC, FP, A:F Ratio heat balance sheet for

    (a) Four stroke Diesel Engine

    (b) Four stroke Petrol Engine

    (c) Multi Cylinder Diesel/Petrol Engine, (Morse test)

    (d) Two stroke Petrol Engine

    (e) Variable Compression Ratio I.C. Engine.

21 Hours

<u>Scheme for Examination:</u>

One Question from Part A	**-**	15 Marks (05 Writeup+10)
One Question from Part B	**-**	25 Marks (05 Writeup+20)
Viva-Voce	**-**	10 Marks

Total		**50 Marks**

COMPUTER INTEGRATED MANUFACTURING

Subject Code	**: 10ME61**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART-A

UNIT - 1

Computer Integrated Manufacturing Systems: Introduction, Automation definition, Types of automation, CIM, processing in manufacturing, Production concepts, Mathematical Models-Manufacturing lead time, production rate, components of operation time, capacity, Utilization and availability, Work-in-process, WIP ratio, TIP ratio, Problems using mathematical model equations.

8 Hours

UNIT - 2

High Volume Production System: Introduction Automated flow line-symbols, objectives, Work part transport-continuous, Intermittent, synchronous, Pallet fixtures, Transfer Mechanism-Linear-Walking beam,. roller chain drive, Rotary-rack and pinion, Rachet & Pawl, Geneva wheel, Buffer storage, control functions-sequence, safety, Quality, Automation for machining operation.

6 Hours

UNIT - 3

Analysis Of Automated Flow Line & Line Balancing: General terminology and analysis, Analysis of Tranfer Line without storage upper bound approach, lower bound approach and problems, Analysis of Transfer lines with storage buffer, Effect of storage, buffer capacity with simple problem, Partial automation-with numerical problems, flow lines with more than two stages, Manual Assembly lines, line balancing problem.

6 Hours

UNIT - 4

Minimum Rational Work Element: Work station process time, Cycle time, precedence constraints. Precedence diagram, Balance delay methods of line balancing-largest Candidate rule, Kilbridge and Westers method, Ranked positional weight method, Numerical problems covering all above methods and computerized line balancing.

6 Hours

PART-B

UNIT - 5

Automated Assembly Systems: Design for automated assembly systems, types of automated assembly system, Parts feeding devices-elements of parts delivery system-hopper, part feeder, Selectors, feed back, escapement and placement analysis of Multistation Assembly Machine analysis of single station assembly. **Automated Guided Vehicle System:** Introduction, Vehicle guidance and routing, System management, Quantitative analysis of AGV's with numerical problems and application.

8 Hours

UNIT - 6

Computerized Manufacturing Planning System: Introduction, Computer Aided Process Planning, Retrieval types of process planning, Generative type of process planning, Material requirement planning, Fundamental concepts of MRP inputs to MRP, Capacity planning.

6 Hours

UNIT - 7

Cnc Machining Centers: Introduction to CNC, elements of CNC, CNC machining centers, part programming, fundamental steps involved in development of part programming for milling and turning.

6 Hours

UNIT - 8

Robotics: Introduction to Robot configuration, Robot motion, programming of Robots end effectors, Robot sensors and Robot applications.

6 Hours

TEXT BOOKS:

2. **Automation, Production system & Computer Integrated manufacturing,** M. P. Groover Person India, 2007 2nd edition.
3. **Principles of Computer Integrated Manufacturing**, S. Kant Vajpayee, Prentice Hall India.

REFERENCE BOOKS:

1. **Computer Integrated Manufacturing**, J. A. Rehg & Henry. W. Kraebber.
2. **CADlCAM** by Zeid, Tata McGraw Hill.

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DESIGN OF MACHINE ELEMENTS – II

Subject Code	**: 10ME62**	**IA Marks**	**25**
Hours/Week	**: 04**	**Exam Hours**	**03**
Total Hours	**: 52**	**Exam Marks**	**100**

PART – A

UNIT - 1

Curved Beams: Stresses in curved beams of standard cross sections used in crane hook, punching presses & clamps, closed rings and links

Cylinders & Cylinder Heads: Review of Lame's Equations; compound cylinders, stresses due to different types of fits, cylinder heads, flats.

08 Hours

UNIT - 2

Belts Ropes and Chains: Flat belts: Length & cross section, Selection of V-belts, ropes and chains for different applications.

05 Hours

UNIT - 3

Springs: Types of springs - stresses in Helical coil springs of circular and non-circular cross sections. Tension and compression springs, springs under fluctuating loads, Leaf Springs: Stresses in leaf springs.

Equalized stresses, Energy stored in springs, Torsion, Belleville and Rubber springs.

08 Hours

UNIT - 4

Spur & Helical Gears: Spur Gears: Definitions, stresses in gear tooth: Lewis equation and form factor, Design for strength, Dynamic load and wear load. Helical Gears: Definitions, formative number of teeth, Design based on strength, dynamic and wear loads.

07 Hours

PART – B

UNIT - 5

Bevel and Worm Gears: Bevel Gears: Definitions, formative number of teeth, Design based on strength, dynamic and wear loads. Worm Gears: Definitions, Design based on strength, dynamic, wear loads and efficiency of worm gear drives.

07 Hours

UNIT - 6

Clutches & Brakes: Design of Clutches: Single plate, multi plate and cone clutches. Design of Brakes: Block and Band brakes: Self locking of brakes: Heat generation in Brakes.

05 Hours

UNIT - 7

Lubrication and Bearings: Lubricants and their properties, Mechanisms of Lubrication bearing modulus, coefficient of friction, minimum oil film thickness, Heat Generated, Heat dissipated, Bearing Materials, Examples of journal bearing and thrust bearing design.

07 Hours

UNIT - 8

IC Engine Parts: Design of piston, connecting rod and crank shaft.

05 Hours

DESIGN DATA HANDBOOK:

1. **Design Data Hand Book** , K. Lingaiah, McGraw Hill, 2nd Ed.
2. **Data Hand Book,** K. Mahadevan and Balaveera Reddy, CBS Publication
3. **Design Data Hand Book,** H.G. Patil, I. K. International Publisher, 2010.

TEXT BOOKS:

1. **Mechanical Engineering Design,** Joseph E Shigley and Charles R. Mischke. McGraw Hill International edition, 6th Edition 2003.
2. **Design of Machine Elements,** V. B Bhandari, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2nd Edition 2007

REFERNCE BOOKS:

1. **Machine Design,** Robert L. Norton, Pearson Education Asia, 2001.
2. **Design of Machine Elements,** M. F. Spotts, T. E. Shoup, L. E. Hornberger, S. R. Jayram and C. V. Venkatesh, Pearson Education, 2006.
3. **Machine Design,** Hall, Holowenko, Laughlin (Schaum's Outlines series) Adapted by S.K. Somani, Tata McGraw Hill Publishing Company Ltd., New Delhi, Special Indian Edition, 2008.
4. **Machine Design,** A CAD Approach: Andrew D DIMAROGONAS, John Wiley Sons, Inc, 2001.

HEAT AND MASS TRANSFER

Subject Code	**: 10ME63**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Introductory Concepts And Definitions: Modes of heat transfer: Basic laws governing conduction, convection, and radiation heat transfer; Thermal conductivity; convective heat transfer coefficient; radiation heat transfer;

combined heat transfer mechanism. Boundary conditions of 1st, 2nd and 3rd kind

Conduction: Derivation of general three dimensional conduction equation in Cartesian coordinate, special cases, discussion on 3-D conduction in cylindrical and spherical coordinate systems (No derivation). One dimensional conduction equations in rectangular, cylindrical and spherical coordinates for plane and composite walls. Overall heat transfer coefficient. Thermal contact resistance.

07 Hours

UNIT - 2

Variable Thermal Conductivity: Derivation for heat flow and temperature distribution in plane wall. Critical thickness of insulation without heat generation, Thermal resistance concept & its importance. Heat transfer in extended surfaces of uniform cross-section without heat generation, Long fin, short fin with insulated tip and without insulated tip and fin connected between two heat sources. Fin efficiency and effectiveness. Numerical problems.

06 Hours

UNIT - 3

One-Dimensional Transient Conduction: Conduction in solids with negligible internal temperature gradient (Lumped system analysis), Use of Transient temperature charts (Heisler's charts) for transient conduction in slab, long cylinder and sphere; use of transient temperature charts for transient conduction in semi-infinite solids. Numerical Problems.

06 Hours

UNIT - 4

Concepts And Basic Relations In Boundary Layers: Flow over a body velocity boundary layer; critical Reynolds number; general expressions for drag coefficient and drag force; thermal boundary layer; general expression for local heat transfer coefficient; Average heat transfer coefficient; Nusselt number. Flow inside a duct- velocity boundary layer, hydrodynamic entrance length and hydro dynamically developed flow; flow through tubes (internal flow discussion only). Numericals based on empirical relation given in data handbook.

Free Or Natural Convection: Application of dimensional analysis for free convection- physical significance of Grashoff number; use of correlations of free convection in vertical, horizontal and inclined flat plates, vertical and horizontal cylinders and spheres, Numerical problems.

07 Hours

PART – B

UNIT - 5

Forced Convections: Applications of dimensional analysis for forced convection. Physical significance of Reynolds, Prandtl, Nusselt and Stanton numbers. Use of various correlations for hydro dynamically and thermally developed flows inside a duct, use of correlations for flow over a flat plate, over a cylinder and sphere. Numerical problems.

06 Hours

UNIT - 6

Heat Exchangers: Classification of heat exchangers; overall heat transfer coefficient, fouling and fouling factor; LMTD, Effectiveness-NTU methods of analysis of heat exchangers. Numerical problems.

06 Hours

UNIT - 7

Condensation And Boiling: Types of condensation (discussion only) Nusselt's theory for laminar condensation on a vertical flat surface; use of correlations for condensation on vertical flat surfaces, horizontal tube and horizontal tube banks; Reynolds number for condensate flow; regimes of pool boiling, pool boiling correlations. Numerical problems. Mass transfer definition and terms used in mass transfer analysis, Ficks First law of diffusion (no numericals).

07 Hours

UNIT - 8

Radiation Heat Transfer: Thermal radiation; definitions of various terms used in radiation heat transfer; Stefan-Boltzman law, Kirchoff's law, Planck's law and Wein's displacement law. Radiation heat exchange between two parallel infinite black surfaces, between two parallel infinite gray surfaces; effect of radiation shield; intensity of radiation and solid angle;

Lambert's law; radiation heat exchange between two finite surfaces-configuration factor or view factor. Numerical problems.

07 Hours

TEXT BOOKS:

1. **Heat & Mass transfer,** Tirumaleshwar, Pearson education 2006
2. **Heat transfer-A basic approach,** Ozisik, Tata McGraw Hill 2002

REFERENCE BOOKS:

1. **Heat transfer, a practical approach,** Yunus A- Cengel Tata Mc Graw Hill
2. **Principles of heat transfer,** Kreith Thomas Learning 2001
3. **Fundamentals of heat and mass transfer,** Frenk P. Incropera and David P. Dewitt, John Wiley and son's.
4. **Heat transfer,** P.K. Nag, Tata McGraw Hill 2002.

FINITE ELEMENT METHODS

Subject Code	**: 10ME64**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART-A

UNIT-1

Introduction: Equilibrium equations in elasticity subjected to body force, traction forces, and stress-strain relations for plane stress and plane strains. General description of Finite Element Method, Application and limitations. Types of elements based on geometry. Node numbering, Half band width.

07 Hours

UNIT-2

Basic Procedure: Euler - Lagrange equation for bar, beam (cantilever / simply supported fixed) Principle of virtual work, principle of minimum potential energy, Raleigh's Ritz method. Direct approach for stiffness matrix formulation of bar element. Galerkin's method.

07 Hours

UNIT-3

Interpolation Models: Interpolation polynomials- Linear, quadratic and cubic. Simplex complex and multiplex elements. 2D PASCAL's triangle. CST elements-Shape functions and Nodal load vector, Strain displacement matrix and Jacobian for triangular and rectangular element.

07 Hours

UNIT-4

Solution of 1-D Bars: Solutions of bars and stepped bars for displacements, reactions and stresses by using penalty approach and elimination approach. Guass-elimination technique.

06 Hours

PART-B

UNIT-5

Higher Order Elements: Langrange's interpolation, Higher order one dimensional elements-Quadratic and cubic element and their shape functions. Shape function of 2-D quadrilateral element-linear, quadric element Iso-parametric, Sub parametric and Super parametric elements. numerical integration : 1, 2 and 3 gauge point for 1D and 2D cases.

06 Hours

UNIT-6

Trusses: Stiffness matrix of Truss element. Numerical problems.

06 Hours

UNIT-7

Beams: Hermite shape functions for beam element, Derivation of stiffness matrix. Numerical problems of beams carrying concentrated, UDL and linearly varying loads.

06 Hours

UNIT-8

Heat Transfer: Steady state heat transfer, 1D heat conduction governing equations. Functional approach for heat conduction. Galerkin's approach for heat conduction. 1D heat transfer in thin fins.

07 Hours

TEXT BOOKS:

1. **Finite Elements in Engineering**, T.R.Chandrupatla, A.D Belegunde, 3rd Ed PHI.
2. **Finite Element Method in Engineering**, S.S. Rao, 4th Edition, Elsevier, 2006.

REFERENCE BOOKS:

1. **"Finite Element Methods for Engineers"** U.S. Dixit, Cengage Learning, 2009
2. **Concepts and applications of Finite Element Analysis**, R.D. Cook D.S Maltus, M.E Plesha, R.J.Witt, Wiley 4th Ed, 2009
3. **Finite Element Methods**, Daryl. L. Logon, Thomson Learning 3rd edition, 2001.
4. **Finite Element Method**, J.N.Reddy, McGraw -Hill International Edition.

MECHATRONICS & MICROPROCESSOR

Subject Code	**: 10ME65**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART - A

UNIT - 1

Introduction to Mechatronic Systems: Measurement and control systems Their elements and functions, Microprocessor based controllers.

06 Hours

UNIT - 2

Review of Transducers and Sensors: Definition and classification of transducers. Definition and classification of sensors. Principle of working and applications of light sensors, proximity sensors and Hall effect sensors.

07 Hours

UNIT - 3

Electrical Actuation Systems: Electrical systems, Mechanical switches, solid-state switches, solenoids, DC & AC motors, Stepper motors and their merits and demerits.

06 Hours

UNIT - 4

Signal Conditioning: Introduction to signal conditioning. The operational amplifier, Protection, Filtering, Wheatstone bridge, Digital signals Multiplexers, Data acquisition, Introduction to Digital system. Processing Pulse-modulation.

07 Hours

PART – B

UNIT - 5

Introduction to Microprocessors: Evolution of Microprocessor, Organization of Microprocessors (Preliminary concepts), basic concepts of programming of microprocessors.

Review of concepts - Boolean algebra, Logic Gates and Gate Networks, Binary & Decimal number systems, memory representation of positive and negative integers, maximum and minimum integers. Conversion of real, numbers, floating point notation, representation of floating point numbers, accuracy and range in floating point representation, overflow and underflow, addition of floating point numbers, character representation.

07 Hours

UNIT - 6

Logic Function: Data word representation. Basic elements of control systems 8085A processor architecture terminology such as CPU, memory and address, ALU, assembler data registers, Fetch cycle, write cycle, state, bus, interrupts. Micro Controllers. Difference between microprocessor and micro controllers. Requirements for control and their implementation in microcontrollers. Classification of micro controllers.

07 Hours

UNIT - 7

Organization & Programming of Microprocessors: Introduction to organization of INTEL 8085-Data and Address buses, Instruction set of 8085, programming the 8085, assembly language programming.

06 Hours

UNIT - 8

Central Processing Unit of Microprocessors: Introduction, timing and control unit basic concepts, Instruction and data flow, system timing, examples of INTEL 8085 and INTEL 4004 register organization.

06 Hours

TEXT BOOKS:

1. **Mechatronics,** W.Bolton, Longman, 2Ed, Pearson Publications, 2007.
2. **Microprocessor Architecture, Programming And Applications With 8085/8085A,** R.S. Ganokar, Wiley Eastern.

REFERENCE BOOKS:

1. **Mechatronics and Microprocessors,** K.P.Ramchandran, G.K.Vijayraghavan, M.S.Balasundran, Wiley, 1st Ed, 2009
2. **Mechatronics - Principles, Concepts and applications** – Nitaigour and Premchand Mahilik - Tata McGraw Hill- 2003.
3. **Mechatronics Principles & applications**, Godfrey C. Onwubolu, Elsevier..
4. **Introduction Mechatronics & Measurement systems**, David.G. Aliciatore & Michael. B. Bihistaned, Tata McGraw Hill, 2000.

HEAT & MASS TRANSFER LABORATORY

Subject Code	**: 10MEL67**	**IA Marks**	**: 25**
Hours/Week	**: 03**	**Exam Hours**	**: 03**
Total Hours	**: 42**	**Exam Marks**	**: 50**

PART - A

1. Determination of Thermal Conductivity of a Metal Rod.
2. Determination of Overall Heat Transfer Coefficient of a Composite wall.
3. Determination of Effectiveness on a Metallic fin.
4. Determination of Heat Transfer Coefficient in a free Convection on a vertical tube.

5. Determination of Heat Transfer Coefficient in a Forced Convention Flow through a Pipe.
6. Determination of Emissivity of a Surface.

21 Hours

PART – B

1. Determination of Steffan Boltzman Constant.
2. Determination of LMDT and Effectiveness in a Parallel Flow and Counter Flow Heat Exchangers
3. Experiments on Boiling of Liquid and Condensation of Vapour
4. Performance Test on a Vapour Compression Refrigeration.
5. Performance Test on a Vapour Compression Air - Conditioner
6. Experiment on Transient Conduction Heat Transfer

21 Hours

<u>Scheme for Examination:</u>

One Question from Part A	-	20 Marks (05 Write up +15)
One Question from Part B	-	20 Marks (05 Write up +15)
Viva-Voce	-	10 Marks

Total		**50 Marks**

COMPUTER AIDED MODELING AND ANALYSIS LABORATORY

Subject Code	**: 10MEL68**	**IA Marks**	**: 25**
Hours/Week	**: 03**	**Exam Hours**	**: 03**
Total Hours	**: 42**	**Exam Marks**	**: 50**

PART - A

Study of a FEA package and modeling stress analysis of

a. Bars of constant cross section area, tapered cross section area and stepped bar

6 Hours

b. Trusses – (Minimum 2 exercises)

3 Hours

c. Beams – Simply supported, cantilever, beams with UDL, beams with varying load etc (Minimum 6 exercises)

12 Hours

PART - B

a) Stress analysis of a rectangular plate with a circular hole

3 Hours

b) Thermal Analysis – 1D & 2D problem with conduction and convection boundary conditions(Minimum 4 exercises)

9 Hours

c) Dynamic Analysis
   1) Fixed – fixed beam for natural frequency determination
   2) Bar subjected to forcing function
   3) Fixed – fixed beam subjected to forcing function

9 Hours

REFERENCE BOOKS:

1. **A first course in the Finite element method,** Daryl L Logan, Thomason, Third Edition
2. **Fundaments of FEM,** Hutton – McGraw Hill, 2004
3. **Finite Element Analysis,** George R. Buchanan, Schaum Series

<u>Scheme for Examination:</u>

One Question from Part A	-	20 Marks (05 Write up +15)
One Question from Part B	-	20 Marks (05 Write up +15)
Viva-Voce	-	10 Marks

Total		**50 Marks**

HYDRAULICS AND PNEUMATICS

Subject Code	**: 10ME73**	**IA Marks**	**25**
Hours/Week	**: 04**	**Exam Hours**	**03**
Total Hours	**: 52**	**Exam Marks**	**100**

PART – A

UNIT -1

Introduction to Hydraulic Power: Definition of hydraulic system, advantages, limitations, applications, Pascal's law, structure of hydraulic control system, problems on Pascal's law.

The source of Hydraulic Power: Pumps Classification of pumps, Pumping theory of positive displacement pumps, construction and working of Gear pumps, Vane pumps, Piston pumps, fixed and variable displacement pumps, Pump performance characteristics, pump Selection factors, problems on pumps.

07 Hours

UNIT -2

Hydraulic Actuators and Motors: Classification cylinder and hydraulic motors, Linear Hydraulic Actuators [cylinders], single and double acting cylinder, Mechanics of Hydraulic Cylinder Loading, mounting arrangements, cushioning, special types of cylinders, problems on cylinders, construction and working of rotary actuators such as gear, vane, piston motors, Hydraulic Motor Theoretical Torque, Power and Flow Rate, Hydraulic Motor

Performance, problems, symbolic representation of hydraulic actuators (cylinders and motors).

06 Hours

UNIT - 3

Control Components in Hydraulic Systems: Classification of control valves, Directional Control Valves- Symbolic representation, constructional features of poppet, sliding spool, rotary type valves solenoid and pilot operated DCV, shuttle valve, check valves, Pressure control valves - types, direct operated types and pilot operated types. Flow Control Valves - compensated and non-compensated FCV, needle valve, temperature compensated, pressure compensated, pressure and temperature compensated FCV, symbolic representation.

07 Hours

UNIT - 4

Hydraulic Circuit Design And Analysis: Control of Single and Double - Acting Hydraulic Cylinder, Regenerative circuit, Pump Unloading Circuit, Double Pump Hydraulic System, Counter balance Valve Application, Hydraulic Cylinder Sequencing Circuits, Automatic cylinder reciprocating system, Locked Cylinder using Pilot check Valve, Cylinder synchronizing circuit using different methods, factors affecting synchronization, Hydraulic circuit for force multiplication, Speed Control of Hydraulic Cylinder, Speed Control of Hydraulic Motors, Safety circuit, Accumulators, types, construction and applications with circuits.

06 Hours

PART – B

UNIT - 5

Maintenance of Hydraulic System: Hydraulic Oils - Desirable properties, general type of Fluids, Sealing Devices, Reservoir System, Filters and Strainers, wear of Moving Parts due to solid -particle Contamination, temperature control (heat exchangers), Pressure switches, trouble shooting.

06 Hours

UNIT - 6

Introduction to Pneumatic Control: Definition of pneumatic system, advantages, limitations, applications, Choice of working medium. Characteristic of compressed air. Structure of Pneumatic control System, fluid conditioners and FRL unit.

Pneumatic Actuators: Linear cylinder - Types, Conventional type of cylinder- working, End position cushioning, seals, mounting arrangements- Applications. Rod - Less cylinders types, working, advantages, Rotary cylinders- types construction and application, symbols.

07 Hours

UNIT-7

Pneumatic Control Valves: DCV such as poppet, spool, suspended seat type slide valve, pressure control valves, flow control valves, types and construction, use of memory valve, Quick exhaust valve, time delay valve, shuttle valve, twin pressure valve, symbols. Simple Pneumatic Control: Direct and indirect actuation pneumatic cylinders, speed control of cylinders - supply air throttling and Exhaust air throttling and Exhaust air throttling.

Signal Processing Elements: Use of Logic gates - OR and AND gates in pneumatic applications. Practical Examples involving the use of logic gates, Pressure dependant controls- types - construction - practical applications, Time dependent controls principle. Construction, practical applications.

07 Hours

UNIT-8

Multi- Cylinder Application: Coordinated and sequential motion control, Motion and control diagrams. Signal elimination methods, Cascading method- principle, Practical application examples (up to two cylinders) using cascading method (using reversing valves).

Electro- Pneumatic Control: Principles - signal input and out put, pilot assisted solenoid control of directional control valves, Use of relay and contactors. Control circuitry for simple signal cylinder application.

Compressed Air: Production of compressed air- Compressors Preparation of compressed air-Driers, Filters, Regulators, Lubricators, Distribution of compressed air Piping layout.

06 Hours

TEXT BOOKS:

1. **"Fluid Power with Applications",** Anthony Esposito**,** Sixth edition, Pearson Education, Inc, 2000.
2. **'Pneumatics and Hydraulics',** Andrew Parr, Jaico Publishing Co

REFERENCE BOOKS:

1. **'Oil Hydraulic systems', Principles and Maintenance** S. R. Majurr, Tata McGraw Hill Publishing Company Ltd. - 2001
2. **'Industrial Hydraulics', Pippenger, Hicks"** McGraw Hill, New York
3. **'Hydraulic & Pneumatic Power for Production'**, Harry L. Stewart
4. **'Pneumatic Systems',** S. R. Majumdar, Tata McGraw Hill Publish 1995
5. **Power Hydraulics'** Michael J Pinches & John G Ashby, Prentice Hall

OPERATION RESEARCH

Subject Code	**: 10ME74**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART- A

UNIT -1

Introduction: Evolution of OR, definition of OR, scope of OR, application areas of OR, steps (phases) in OR study, characteristics and limitations of OR, models used in OR, linear programming (LP) problem-formulation and solution by graphical method.

04 Hours

UNIT -2

Solution Of Linear Programming Problems: The simplex method-canonical and standard form of an LP problem, slack, surplus and artificial variables, big M method and concept of duality, dual simplex method.

08 Hours

UNIT -3

Transportation Problem: Formulation of transportation problem, types, initial basic feasible solution using different methods, optimal solution by MODI method, degeneracy in transportation problems, application of transportation problem concept for maximization cases. Assignment Problem-formulation, types, application to maximization cases and travelling salesman problem.

08 Hours

UNIT -4

Integer Programming: Pure and mixed integer programming problems, solution of Integer programming problems-Gomory's all integer cutting plane method and mixed integer method, branch and bound method, Zero-One programming.

06 Hours

PART- B

UNIT -5

Pert-CPM Techniques: Introduction, network construction **-** rules, Fulkerson's rule for numbering the events, AON and AOA diagrams; Critical path method to find the expected completion time of a project, floats; PERT for finding expected duration of an activity and project, determining the probability of completing a project, predicting the completion time of project; crashing of simple projects.

08 Hours

UNIT -6

Queuing Theory: Queuing systems and their characteristics, Pure-birth and Pure-death models (only equations), empirical queuing models – M/M/1 and M/M/C models and their steady state performance analysis.

06 Hours

UNIT -7

Game Theory: Formulation of games, types, solution of games with saddle point, graphical method of solving mixed strategy games, dominance rule for solving mixed strategy games.

06 Hours

UNIT -8

Sequencing: Basic assumptions, sequencing 'n' jobs on single machine using priority rules, sequencing using Johnson's rule-'n' jobs on 2 machines, 'n' jobs on 3 machines, 'n' jobs on 'm' machines. Sequencing 2 jobs on 'm' machines using graphical method.

06 Hours

TEXT BOOKS:

1. **Operations Research,** P K Gupta and D S Hira, Chand Publications, New Delhi - 2007
2. **Operations Research,** Taha H A, Pearson Education

REFERNCE BOOKS:

1. **Operations Research,** A P Verma, S K Kataria &Sons, 2008
2. **Operations Research,** Paneerselvan, PHI
3. **Operations Research,** A M Natarajan, P Balasubramani, Pearson Education, 2005
4. **Introduction to Operations Research,** Hillier and Liberman,8th Ed., McGraw Hill
5. **Operations Research** S.D. Sharma, Ledarnath Ramanath & Co, 2002

NON-CONVENTIONAL ENERGY SOURCES

Subject Code	**: 10ME754**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART A

UNIT – 1

Introduction : Energy source, India's production and reserves of commercial energy sources, need for non-conventional energy sources, energy alternatives, solar, thermal, photovoltaic. Water power, wind bio-mass, ocean temperature difference, tidal and waves, geothermal, tarsands and oil shale, nuclear (Brief descriptions); advantages and disadvantages, comparison (Qualitative and Quantitative).

6 Hours

UNIT – 2

Solar Radiation : Extra-Terrestrial radiation, spectral distribution of extra terrestrial radiation, solar constant, solar radiation at the earth's surface, beam, diffuse and global radiation, solar radiation data.

Measurement of Solar Radiation : Pyrometer, shading ring pyrheliometer, sunshine recorder, schematic diagrams and principle of working.

Solar Radiation Geometry : Flux on a plane surface, latitude, declination angle, surface azimuth angle, hour angle, zenith angle, solar altitude angle expression for the angle between the incident beam and the normal to a plane surface (No derivation) local apparent time. Apparent motion of sum, day length, numerical examples.

9 Hours

UNIT – 3

Radiation Flux on a Tilted Surface : Beam, diffuse and reflected radiation, expression for flux on a tilted surface (no derivations) numerical examples.

Solar Thermal Conversion : Collection and storage, thermal collection devices, liquid flat plate collectors, solar air heaters concentrating collectors (cylindrical, parabolic, paraboloid) (Quantitative analysis); sensible heat storage, latent heat storage, application of solar energy water heating. Space heating and cooling, active and passive systems, power generation, refrigeration. Distillation (Qualitative analysis) solar pond, principle of working, operational problems.

9 Hours

UNIT – 4

Performance Analysis of Liquid Flat Plate Collectors : General description, collector geometry, selective surface (qualitative discussion) basic energy-balance equation, stagnation temperature, transmissivity of the cover system, transmissivity – absorptivity product, numerical examples. The overall loss coefficient, correlation for the top loss coefficient, bottom and side loss coefficient, problems (all correlations to be provided). Temperature distribution between the collector tubes, collector heat removal factor, collector efficiency factor and collector flow factor, mean plate temperature, instantaneous efficiency (all expressions to be provided). Effect of various parameters on the collector performance; collector orientation, selective surface, fluid inlet temperature, number covers, dust.

4 Hours

PART B

UNIT – 5

Photovoltaic Conversion : Description, principle of working and characteristics, applications.

Wind Energy : Properties of wind, availability of wind energy in India, wind velocity and power from wind; major problems associated with wind power, wind machines; Types of wind machines and their characteristics, horizontal and vertical axis wind mills, elementary design principles; coefficient of performance of a wind mill rotor, aerodynamic considerations of wind mill design, numerical examples.

8 Hours

UNIT – 6

Tidal Power : Tides and waves as energy suppliers and their mechanics; fundamental characteristics of tidal power, harnessing tidal energy, limitations.

Ocean Thermal Energy Conversion : Principle of working, Rankine cycle, OTEC power stations in the world, problems associated with OTEC.

Geothermal Energy Conversion : Principle of working, types of geothermal station with schematic diagram, geothermal plants in the world, problems associated with geothermal conversion, scope of geothermal energy.

7 Hours

UNIT – 7

Energy from Bio Mass : Photosynthesis, photosynthetic oxygen production, energy plantation, bio gas production from organic wastes by anaerobic fermentation, description of bio-gas plants, transportation of bio-gas, problems involved with bio-gas production, application of bio-gas, application of bio-gas in engines, advantages.

4 Hours

UNIT – 8

Hydrogen Energy : Properties of Hydrogen with respected to its utilization as a renewable form of energy, sources of hydrogen, production of hydrogen, electrolysis of water, thermal decomposition of water, thermo chemical production bio-chemical production.

Storage & Transportation Methods : Gaseous, cryogenic and metal hydrides, application of hydrogen, domestic and industrial safe burning of hydrogen.

5 Hours

TEXT BOOKS:

1. Non-Conventional Energy Sources by *G.D Rai K*, Khanna Publishers, 2003.
2. Solar energy, by *Subhas P Sukhatme* – Tata McGraw Hill, 2nd Edition, 1996.

REFERENCE BOOKS:

1. Renewable Energy Sources and Conversion Technology by *N.K.Bansal, Manfred Kleeman & Mechael Meliss*, Tata McGraw Hill, 2001.
2. Renewable Energy Resources, *John W.Twidell Anthony D. Weir El*, BG 2001.
3. Solar Power Engineering, *P.K.Nag*, Tata McGraw Hill, 2003.

CONTROL ENGINEERING

Subject Code	**: 10ME82**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Introduction: Concept of automatic controls, Open loop and closed loop systems, Concepts of feedback, requirements of an ideal control system, Types of controllers- Proportional, Integral Proportional Integral, Proportional Integral Differential controllers.

06 Hours

UNIT- 2

Mathematical Models: Transfer function models, models of mechanical systems, models of electrical circuits, DC and AC motors in control systems, models of thermal systems, models of hydraulic systems, pneumatic system, Analogous systems: Force voltage, Force current.

06 Hours

UNIT - 3

Block Diagrams and Signal Flow Graphs: Transfer Functions definition, function, block representation of systems elements, reduction of block diagrams, Signal flow graphs: Mason's gain formula.

07 Hours

UNIT- 4

Transient and Steady State Response Analysis: Introduction, first order and second order system response to step, ramp and impulse inputs, concepts of time constant and its importance in speed of response. System stability: Routh's-Hurwitz Criterion.

06 Hours

PART - B

UNIT - 5

Frequency Response Analysis: Polar plots, Nyquist stability criterion, Stability analysis, Relative stability concepts, Gain margin and phase margin, M&N circles.

06 Hours

UNIT - 6

Frequency Response Analysis Using Bode Plots: Bode attenuation diagrams, Stability analysis using Bode plots, Simplified Bode Diagrams.

07 Hours

UNIT - 7

Root Locus Plots: Definition of root loci, General rules for constructing root loci, Analysis using root locus plots.

06 Hours

UNIT 8

System Compensation and State Variable Characteristics of Linear Systems: Series and feedback compensation, Introduction to state concepts, state equation of linear continuous data system. Matrix representation of state equations, controllability and observability, Kalman and Gilberts test.

07 Hours

TEXT BOOKS :

1. **Modern Control Engineering,** Katsuhiko Ogatta, Pearson Education,2004.
2. **Control Systems Principles and Design,** M.Gopal, 3rd Ed., TMH,2000.

REFERENCE BOOKS :

1. **Modern Control Systems**, Richard.C.Dorf and Robert.H.Bishop, Addison Wesley,1999
2. **System dynamics & control**, Eronini-Umez, Thomson Asia pte Ltd. singapore, 2002.
3. **Feedback Control System**, Schaum's series. 2001.

ELECTIVE-IV (GROUP - D)

TRIBOLOGY

Subject Code	**: 10ME831**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Introduction To Tribology: Properties of oils and equation of flow: Viscosity, Newton's Law of viscosity, Hagen-Poiseuille Law, Flow between parallel stationary planes, viscosity measuring apparatus. Lubrication principles, classification of lubricants.

06 Hours

UNIT - 2

Hydrodynamic Lubrication: Friction forces and power loss in lightly loaded bearing, Petroff's law, Tower's experiments, mechanism of pressure development in an oil film, Reynold's investigation and Reynold's equation in 2D.

06 Hours

UNIT - 3

Idealized Journal Bearing: Introduction to idealized journal bearing, load carrying capacity, condition for equilibrium, Sommerfeld's numbers and significance of it; Partial bearings, end leakages in journal bearing, numerical problems.

07 Hours

UNIT - 4

Slider / Pad Bearing With A Fixed And Pivoted Shoe: Pressure distribution, Load carrying capacity, coefficient of friction, frictional resistance in a pivoted shoe bearing, numerical examples.

07 Hours

PART – B

UNIT - 5

Oil Flow And Thermal Equilibrium Of Journal Bearing: Oil flow through bearings, self-contained journal bearings, bearings lubricated under pressure, thermal equilibrium of journal bearings.

06 Hours

UNIT - 6

Hydrostatic Lubrication: Introduction to hydrostatic lubrication, hydrostatic step bearings, load carrying capacity and oil flow through the hydrostatic step bearing.

06 Hours

UNIT - 7

Bearing Materials: Commonly used bearings materials, properties of typical bearing materials. Advantages and disadvantages of bearing materials.

07 Hours

UNIT - 8

Behavior Of Tribological Components: Selection, friction, Wear of ceramic materials, wear measurements, effects of speed, temperature and pressure. Tribological measures, Material selection, improved design, surface engineering

07 Hours

TEXT BOOKS:

1. **Fundamentals of Tribology** , Basu S K., Sengupta A N., Ahuja B. B., , PHI 2006
2. **Introduction to Tribology Bearings,** Mujumdar B. C., S. Chand company pvt. Ltd 2008.

REFERENEC BOOKS:

1. **Theory and Practice of Lubrication for Engineers,** Fuller, D., New York company 1998
2. **Principles and Applications of Tribology,** Moore, Pergamaon press 1998
3. **Tribology in Industries,** Srivastava S., S Chand and Company limited, Delhi 2002
4. **Lubrication of bearings – Theoretical Principles and Design,** Redzimovskay E I., Oxford press company 2000

AUTOMOTIVE ENGINEERING

Subject Code	**: 10ME844**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Engine Components And Cooling & Lubrication Systems: Spark Ignition (SI) & Compression Ignition (CI) engines, cylinder – arrangements and their relatives merits, Liners, Piston, connecting rod, crankshaft, valves, valve actuating mechanisms, valve and port timing diagrams, Types of combustion chambers for S.I.Engine and C.I.Engines, Compression ratio, methods of a Swirl generation, choice of materials for different engine components, engine positioning, cooling requirements, methods of cooling, thermostat valves, different lubrication arrangements.

07 Hours

UNIT - 2

Fuels, Fuel Supply Systems For Si And Ci Engines: Conventional fuels, alternative fuels, normal and abnormal combustion, cetane and octane numbers, Fuel mixture requirements for SI engines, types of carburetors, C.D.& C.C. carburetors, multi point and single point fuel injection systems, fuel transfer pumps, Fuel filters, fuel injection pumps and injectors.

07 Hours

UNIT - 3

Superchargers And Turbochargers: Naturally aspirated engines, Forced Induction, Types pf superchargers, Turbocharger construction and operation, Intercooler, Turbocharger lag.

06 Hours

UNIT - 4

Ignition Systems: Battery Ignition systems, magneto Ignition system, Transistor assist contacts. Electronic Ignition, Automatic Ignition advance systems.

06 Hours

PART – B

UNIT - 5
Power Trains: General arrangement of clutch, Principle of friction clutches, Torque transmitted, Constructional details, Fluid flywheel, Single plate, multi-plate and centrifugal clutches.
Gear box: Necessity for gear ratios in transmission, synchromesh gear boxes, 3, 4 and 5 speed gear boxes. Free wheeling mechanism, planetary gears systems, over drives, fluid coupling and torque converters, Epicyclic gear box, principle of automatic transmission, calculation of gear ratios, Numerical calculations for torque transmission by clutches.

08 Hours

UNIT - 6
Drive To Wheels: Propeller shaft and universal joints, Hotchkiss and torque tube drives, differential, rear axle, different arrangements of fixing the wheels to rear axle, steering geometry, camber, king pin inclination, included angle, castor, toe in & toe out, condition for exact steering, steering gears, power steering, general arrangements of links and stub axle, over steer, under steer and neutral steer, numerical problems, types of chassis frames.

06 Hours

UNIT - 7
Suspension, Springs And Brakes: Requirements, Torsion bar suspension systems, leaf spring, coil spring, independent suspension for front wheel and rear wheel. Air suspension system.
Types of brakes, mechanical compressed air, vacuum and hydraulic braking systems, construction and working of master and wheel cylinder, brake shoe arrangements, Disk brakes, drum brakes, Antilock –Braking systems, purpose and operation of antilock-braking system, ABS Hydraulic Unit, Rear-wheel antilock & Numerical Problems

06 Hours

UNIT - 8
Automotive Emission Control Systems: Automotive emission controls, Controlling crankcase emissions, Controlling evaporative emissions, Cleaning the exhaust gas, Controlling the air-fuel mixture, Controlling the combustion process, Exhaust gas recirculation, Treating the exhaust gas, Air-injection system, Air-aspirator system, Catalytic converter, Emission standards- Euro I, II, III and IV norms, Bharat Stage II, III norms.

6 Hours

TEXT BOOKS:

1. **Automotive mechanics,** William H Crouse & Donald L Anglin, 10th Edition Tata McGraw Hill Publishing Company Ltd., 2007
2. **Automotive Mechanics,** S. Srinivasan, 2nd Ed., Tata McGraw Hill 2003.

REFERENCE BOOKS:

1. **Automotive mechanics: Principles and Practices**, Joseph Heitner, D Van Nostrand Company, Inc
2. **Fundamentals of Automobile Engineering,** K.K.Ramalingam, Scitech Publications (India) Pvt. Ltd.
3. **Automobile Engineering**, R. B. Gupta, Satya Prakashan, 4th edn. 1984.
4. **Automobile engineering**, Kirpal Singh. Vol I and II 2002.

MANAGEMENT & ORGANIZATIONAL BEHAVIOR

Subject Code	: 14MBA11	IA Marks	: 50
No. of Lecture Hours / Week	: 04	Exam Hours	: 03
Total Number of Lecture Hours	: 56	Exam Marks	: 100
Practical Component	: 01 Hour / Week		

Objectives:

1. To make students understand fundamental concepts and principles of management, including the basic roles, skills, and functions ofmanagement
2. To make students knowledgeable of historical development, theoretical aspects and practice application of managerialprocess
3. To understand the basic concepts and theories underlying individual behavior besides developing better insights into one's ownself
4. To make students aware of Individual behavior in groups, dynamics of groups and team building besides developing a better awareness of how they can be better facilitators for building effective teams as leadersthemselves

Part A- Principles of Management

Module1: (6 Hours)

Introduction: Management: Introduction, definition of management, nature, purpose and functions, levels and types of managers, managerial roles, skills for managers, evolution of management thought, Fayol's fourteen principles of management and recent trends in management.

Module2: (12 Hours)

Planning and Organizing:

Planning: Nature of planning, planning process, objectives, MBO, strategies, level of strategies, policies, methods and programs, planning premises, decision making, process of decision making, types of decisions, techniques in decision making.

Organizing: Organization structure, formal and informal organizations, principles of organizations-chain of command, span of control, delegation, decentralization, and empowerment. Functional, divisional, geographical, customer based and matrix organizations, tram based structures, virtual organizations, boundary lessorganizations.

Module3: (4 Hours)

Controlling: Controlling, importance of controlling, controlling process, types of control, factors influencing control effectiveness.

RECOMMENDED BOOKS

1. Essentials of Management-Koontz, 8/e, McGraw Hill
2. Management: Text and Cases-VSP Rao, ExcelBOOKS
3. MGMT, An Innovative approach to teaching and learning Principles of Management, Chuck Williams, Cengage Publications,2010
4. Principles and practices of Management, Kiran Nerkar, Vilas Chopde, Dreamtech Press,2011

5. Management Theory & practice – Chandan J. S, Vikas PublishingHouse.
6. Management Theory & Practice Text & Cases – Subba Rao P &HimaBindu, Himalaya Publication.

Part B- Organizational Behaviour

Module4: **(4 hours)**
Introduction: Organizational Behaviour: Introduction, definition, historical development, fundamental principles of OB, contributing disciplines, challenges and opportunities.

Module5: **(16 Hours)**
Foundations of Individual Behaviour: Individual behaviour: Foundations of individual behaviour. Ability: Intellectual abilities, Physical ability, the role of disabilities.
Personality: Meaning, formation, determinants, traits of personality, big five and MBTI, personality attributes influencing OB.
Attitude: Formation, components of attitudes, relation between attitude and behaviour.
Perception: Process of perception, factors influencing perception, link between perception and individual decision making.
Emotions: Affect, mood and emotion and their significance, basic emotions, emotional intelligence, self-awareness, self-management, social awareness, relationship management.

Module6: **(10 Hours)**
Motivation and Leadership:
Motivation: Meaning, theories of motivation-needs theory, two factor theory, Theory X and Y, application of motivational theories.
Leadership: Meaning, styles of leadership, leadership theories, trait theory, behavioural theories, managerial grid, situational theories-Fiedler's model, SLT, transactional and transformation leadership.

Module7: **(4 Hours)**
Group Behaviour: Definition, types, formation of groups, building effective teams. Conflict: Meaning, nature, types, process of conflict, conflict resolution.
Power and politics: Basis of power, effectiveness of power tactics. The ethics of behaving politically.

Practical Component

1. Studying organizational structures of any 10 companies and classifying them into different types of organizations which are studied in Module 2 and justifying why such structures are chosen by thoseorganizations.
2. Preparing the leadership profiles of any 5 business leaders and studying their leadership qualities and behaviours with respects to the trait, behavioural and contingency theoriesstudied.
3. Identifying any five job profiles and listing the various types abilities required for those jobs and also the personality traits/attributes required for the jobsidentified.

Note: Faculty can either identify the organizations/ leaders/jobs or students can be allowed to choose the same.

RECOMMENDED BOOKS:

1. Organizational behaviour, Stephen P Robbins, Timothy A. Judge, Neharika Vohra, Pearson, 14th Edition,2012.
2. Introduction to OrganisationalBehaviour – Michael Butler, Jaico PublishingHouse,
3. Organization Behaviour – Ashwathappa, Himalaya PublicationHouse
4. ORGB - Nelson, Quick, Khanelwal, 2/e, Cengage Learning,2012.
5. Organizational Behaviour - Anada Das Gupta, Biztantra,2011.
6. Organizational Behaviour: A modern approach - Arun Kumar and Meenakshi, Vikas Publishing House,2011.
7. Organizational Behaviour – Rao V. S. P, Excel BOOKS,2009.

REFERENCE BOOKS:

1. Organizational Behaviour - Fred Luthans, 12/e, McGraw Hill International,2011.
2. Management and Organizational Behaviour - Laurie J Mullins, Pearsoneducation
3. Fundamentals of Organizational Behaviour - Slocum/Hillriegel.CengeneLearning
4. Organizational Behaviour - Aquinas P. G, ExcelBOOKS.

ACCOUNTING FOR MANAGERS

Subject Code	: 14MBA13	IA Marks	: 50
No. of Lecture Hours / Week	: 04	Exam Hours	: 03
Total Number of Lecture Hours	: 56	Exam Marks	: 100
Practical Component	: 01 Hour / Week		

Objectives:

1. Explain fundamental accounting concepts, the elements of financial statements, and basic accountingvocabulary
2. Explain and use the accounting equation in basic financial analysis and explain how the equation is related to the financialstatements.
3. Prepare basic entries for business transactions and present the data in an accurate and meaningfulmanner
4. Prepare basic financial statements and explain the articulation between the basic statements.
5. To analyze a company's financial statements and come to a reasoned conclusion about the financial situation of thecompany.

Module1: (4 Hours)
Introduction to Accounting: Need and Types of Accounting, Users of Accounting, concepts and conventions of Accounting, Accounting Equation (problems on accounting equation).

Module2: (10 Hours)
Preparation of books of Accounts: Journals, Subsidiary books, three column cash book, ledgers and trial balance. Depreciation- Straight line and Written down Value Methods.

Module3: (12 Hours)
Preparation of Financial Statements: Preparation of final accounts of sole traders. Preparation of final accounts / statement of companies-both horizontal & vertical form of financial statements. (Basic problems on Final accounts of companies)

Module4: (14 Hours)
Analysis of Financial Statements: Comparative, common size and trend analysis, Ratio Analysis, Preparation of financial statements using ratios, Preparation of Cash flow Statement (only indirect method).

Module5: (6 Hours)
Accounting Standards and IFRS: Need for accounting standards. IFRS and proposed changes in Indian Accounting Standards.

Module6: (4 Hours)
Emerging issues in Accounting: Corporate Governance and clause 49 of the listing agreement, Human Resource Accounting, Forensic Accounting, Window Dressing-Sustainability Reporting

Module7: **(6 Hours)**
Fundamentals of Taxation: Overview of Heads of Income, deductions u/s 80C, Income Tax Rates and Returns – For Individuals only (Only Theory)

Practical Components:
1. Collecting Annual reports of the companies and analyzing the financial statements using different techniques and presenting the same in theclass.
2. Analyzing the companies' cash flow statements and presenting the same in theclass.
3. Exposing the students to usage of accounting software's (PreferablyTally)
4. Filling up of ITRforms
5. Identify the sustainability report of a company and study thecontents.

RECOMMENDED BOOKS:

1. Narayanaswamy R Financial Accounting: A Managerial Perspective –, 5/e , PHI, 2014
2. Maheswari S. N,Maheswari Sharad K. Maheswari ,A Text book of Accounting For Management , , 2/e, Vikas Publishing house (P)Ltd.
3. Tulsian P. C, Financial Accounting, 1/e, PearsonEducation.
4. Madegowda J, Accounting for managers, Himalaya PublishingHouse.
5. Gupta R. L &Radhaswamy M, Advanced Accountancy, Sultan ChandPublications
6. Jain S. P and Narang K L. Financial Accounting -, KalyaniPublishers
7. Business Taxation, Akhileshwar Pathak and SavanGodiawala, 2/e, McGraw Hill Education(India) Pvt. Ltd.2013

REFERENCE BOOKS:

1. Ambrish Gupta, Financial Accounting for Management: An Analytical Perspective, 4/e, PearsonEducation.
2. Ashish K Bhattacharya, Introduction to Financial Statement Analysis, ElsevierIndia
3. Raman B. S, Financial Accounting –, Vol I & Vol II, United Publishers,1/e, 2009.
4. Gary A. Porter & Curtis L. Norton, Financial Accounting (IFRS update)–, 6/e, Cengage Learning.
5. Arora M. N., Accounting For Management, Himalaya PublishingHouse.
6. Bhattacharya Essentials of Financial Accounting (Based on IFRS) , 2/e, Prentice Hall India,
7. Comdex (Computer and Financial Accounting with Tally 9.0 Course Kit). - Dream Tech.
8. Namrata Agrawal Comdex – Tally 9, -DreamTech.
9. Jasmine Kaur, IFRS: A Practical approach, McGrawHill.

BUSINESS, GOVERNMENT AND SOCIETY

Subject Code	: 14MBA14	IA Marks	: 50
No. of Lecture Hours / Week	: 04	Exam Hours	: 03
Total Number of Lecture Hours	: 56	Exam Marks	: 100
Practical Component	: 01 Hour / Week		

Objectives:

1. To enable students to understand the challenges and complexities faced by businesses and their leaders as they endeavor maximize returns while responsibly managing their duties to stakeholders andsociety.
2. To help students to understand the rationale for government interventions in market systems.
3. To help students develop an understanding of Social Responsibility and make their own judgments as to the proper balance of attention to multiple bottomlines.
4. To help students develop the skills needed to work through ethicaldilemmas

Module1: (8 Hours)

The Study of Business, Government and Society (BGS): Importance of BGS to Managers –Models of BGS relationships – Market Capitalism Model, Dominance Model, Countervailing Forces Model and Stakeholder Model – Global perspective – Historical Perspective.

Module2: (8 Hours)

Corporate Governance: Introduction, Definition, Market model and control model, OECD on corporate governance, A historical perspective of corporate governance, Issues in corporate governance, relevance of corporate governance, need and importance of corporate governance, benefits of good corporate governance, the concept of corporate, the concept of governance, theoretical basis for corporate governance, obligation to society, obligation to investors, obligation to employees, obligation to customers, managerial obligation, Indian cases

Module3: (4 Hours)

Public Policies: The role of public policies in governing business, Government and public policy, classification of public policy, areas of public policy, need for public policy in business and levels of public policy.

Module4: (8 Hours)

Environmental concerns and corporations: History of environmentalism, environmental preservation-role of stakeholders, international issues, sustainable development, costs and benefits of environmental regulation, industrial pollution, role of corporate in environmental management, waste management and pollution control, key strategies for prevention of pollution, environmental audit, Laws governing environment.

Module5: (8 Hours)

Business Ethics: Meaning of ethics, business ethics, relation between ethics and business ethics, evolution of business ethics, nature of business ethics, scope, need and purpose, importance, approaches to business ethics, sources of ethical knowledge for business roots of unethicalbehaviour, ethical decision making, some unethical issues, benefits from managing ethics at workplace, ethical organizations

Module6: (6 Hours)

Corporate Social Responsibility: Types and nature of social responsibilities, CSR principles and strategies, models of CSR, Best practices of CSR, Need of CSR, Arguments for and against CSR, CSR in Indian perspective, Indian examples.

Module7: (14 Hours)

Business Law: Law of contract - meaning of contract, agreement, essential elements of a valid contract. Law of agency- meaning, creation and termination of agency.Bailment and Pledge - meaning, rights and duties of bailor and bailee.

Negotiable Instruments Act 1881: Nature and Characteristics of Negotiable instruments, Kinds of Negotiable Instruments – Promissory Notes, Bills of Exchange and Cheques. Discharge and Dishonour of Negotiable Instruments.

Sale of Goods Act 1930: Definition of Sale, Sale v/s Agreement to Sell, Goods, Condition and Warranties, Express and Implied Condition, "Doctrine of Caveat Emptor", Right and duties of Unpaid Seller.

Meaning, scope and objectives of - Intellectual property law, law relating to patents, law relating to copyrights, law relating to trade mark.

Practical Components:

1. Students are expected to study any five CSR initiatives by Indian organizations and submit a report for thesame.
2. A group assignment on "The relationship between Business, Government and Society in Indian Context and relating the same with respect the models studied in Module1.
3. Case studies/Role plays related ethical issues in business with respect to Indian context.

RECOMMENDED BOOKS:

1. Business, Government, and Society: A Managerial Perspective, Text and Cases – John F. Steiner, 12/e, McGraw-Hill,2011.
2. Business and Government – Francis Cherunilam,HPH.
3. Corporate Governance: principles, policies and practices – Fernando A. C, 2/e, Pearson,2011.
4. Business Ethics and Corporate Governance - Ghosh B. N, Tata McGraw-Hill,2012.
5. Business Law for Managers, Goel P. K, Biztantra,2012.
6. CorporateSocialResponsibility:AStudyofCSRPracticesinIndianIndustry,Baxi C. V &Rupamanjari Sinha Ray, Vikas Publishing House, 2012.

REFERENCE BOOKS:

1. Business and Society - Lawrence and Weber, 12/e, Tata McGraw- Hill,2010.
2. Business Ethics - Bajaj P. S & Raj Agarwal, Biztantra,2012.
3. Corporate Governance - Keshoo Prasad, 2/e,PHI.
4. Corporate Governance, Ethics and social responsibility - Balachandran V, &Chandrashekharan V, 2/e, PHI,2011.
5. Corporate Governance – Machiraju H. R,HPH.
6. Business Ethics and Corporate Governance – Prabakaran S, ExcelBOOKS.
7. Corporate Goverance – Badi N. V, Vrinda Publications,2012.
8. Civic Sense – Prakash Pillappa, Excel BOOKS,2012.

MARKETING MANAGEMENT

Subject Code	: 14MBA15	IA Marks	: 50
No. of Lecture Hours / Week	: 04	Exam Hours	: 03
Total Number of Lecture Hours	: 56	Exam Marks	: 100
Practical Component	: 01 Hour / Week		

Objectives:

1. To provide students an insight to basic concepts of marketingmanagement.
2. To help students understand various marketing tools/models for solving marketing problems in the changing businessenvironment.
3. To understand fundamental premise underlying market drivenstrategies.

Module1: **(8 hours)**

Introduction to Marketing: Introduction, Definitions of market and marketing, The Exchange Process, Elements of Marketing Concept, Functions of Marketing, Old Concept or Product- oriented Concept, New or Modern or Customer- oriented Concept, Marketing Environment, Techniques used in environment analysis, Characteristics (Micro and Macro), Marketing to the 21st century customer

Module2: **(8 hours)**

Consumer Behaviour Analysis: Meaning and Characteristics, Importance, Factors Influencing Consumer Behaviour, Consumer Purchase Decision Process, Buying Roles, Buying Motives, Buyer Behaviour Models

Module3: **(8 hours)**

Market Segmentation, Targeting & Positioning: Concept of Market Segmentation, Benefits, Requisites of Effective Segmentation, Bases for Segmenting Consumer Markets, Market Segmentation Strategies.

Targeting - Bases for identifying target Customer target Marketing strategies,

Positioning - Meaning, Product Differentiation Strategies, Tasks involved in Positioning.

Branding - Concept of Branding, Types, Brand Equity, Brandingstrategies.

Module4: **(8 hours)**

Managing the Product: Concept, product hierarchy, product line, product mix, product mix strategies, Product life cycle and its strategies, New Product Development, packing as a marketing tool, Role of labelling in packing.

Module-5 **(8hours)**

Pricing decisions: Significance of pricing, factor influencing pricing (Internal factor and External factor), objectives, Pricing Strategies-Value based, Cost based, Market based, Competitor based, Pricing Procedure.

Marketing Channels: Meaning, Purpose, Factors Affecting Channel Choice, Channel Design, Channel Management Decision, Channel Conflict, Designing a physical Distribution System, Network Marketing,

Module 6: **(10 hours)**

Integrated Marketing communication: Meaning and Importance of Marketing Communication, Communication Objectives, Steps in Developing Effective Communication
Advertising - Objectives, Ad Budget, AIDA Model, Advertising Copy Deciding Media, Evaluating Advertising Effectiveness,
Sales Promotion - Kinds of Promotion, Tools and Techniques of Sales Promotion, Push and Pull Strategies
Personnel Selling - Concept, Features, Functions, and Steps involved in personal Selling.
Publicity - Meaning, Objectives, Types, Functions of Public relations,
Direct Marketing - Meaning, Features, Functions, Basic Concepts of E-Commerce, E-Business

Module7: **(6 hours)**

Marketing Planning: Meaning, Concepts, Steps involved in Marketing planning,
Marketing Audit- Meaning, Feature, Various components of Marketing Audit
Marketing Strategy-Analysis of Industry and Competition, Strategic Planning Process,

Case Studies of Indian Context

Practical Components

1. Analyze Product Life Cycle of few Products like-Electronic goods,Computers.
2. Analyze Packaging strategies used by FMCGcompanies
3. Analyze Marketing strategies/planning used by automobile cosmetic and FMCG companies

RECOMMENDED BOOKS

1. MarketingManagement: A South Asian Perspective – Kotler, Keller, Koshy &Jha, 13/e, Pearson Education,2012
2. Marketing Management, Ramaswamy V. S. &Namakumari S. 4/e, TMH,2014
3. Fundamentals of Marketing Management, Etzel M.J BJ Walker & William J. Stanton, 14/e, MH,2012
4. Marketing Management Concepts & Cases–S.A.Sherlekar
5. Marketing Management, Tapan Panda, 2/e, ExcelPublication

REFERENCE BOOKS

1. Marketing Management, Arun Kumar &Meenakshi N, 2/e, Vikas,2012
2. Applied Case Studies in Marketing – Shajahan S, Primus BOOKS,2011.
3. Marketing Management – Karunakaran, HPH.
4. Marketing in India: Text and Cases- Neelamegham S, 4/e,Vikas.
5. Marketing- Lamb, Hair, Mc Danniel, 7/e, Cengage Learning2012.
6. Marketing: Marketing in the 21st Century - Evans & Berman, 2/e, Cengage Learning, 2005.

Marketing: Planning, Implementation, and Control -William M. Pride, Ferrell O. C, Cengage Learning, 2010.

HUMAN RESOURCE MANAGEMENT

Subject Code	: 14MBA21	IA Marks	: 50
No. of Lecture Hours / Week	: 04	Exam Hours	: 03
Total Number of Lecture Hours	: 56	Exam Marks	: 100
Practical Component	: 01 Hour / Week		

OBJECTIVES:

1. To develop a meaningful understanding of HRM theory, functions andpractices.
2. To apply HRM concepts and skills across various types oforganizations.

Module1: (8 hours)

Human Resource Management:
Introduction, meaning, nature, scope of HRM.Importance and Evolution of the concept of HRM.Major functions of HRM, Principles of HRM, Organization of Personnel department, Role of HR Manager. HRM's evolving role in the 21^{st} century.

Module2: (8 hours)

Job Analysis: Meaning, process of Job Analysis, methods of collecting job analysis data, Job Description and Job Specification, Role Analysis.
Human Resource Planning: Objectives, Importance and process of Human Resource Planning, Effective HRP.

Module3: (8 hours)

Recruitment: Definition, Constraints and Challenges, Sources and Methods of Recruitment, New Approaches to recruitment.
Selection: Definition and Process of Selection.
Placement: Meaning, Induction/Orientation, Internal Mobility, Transfer, Promotion, Demotion and Employee Separation.

Module4: (8 hours)

Training and development: Training v/s development, Training v/s Education, Systematic Approach to Training, Training Methods, Executive Development, Methods and Development of Management Development, Career and SuccessionPlanning.

Module5: (8 hours)

Performance Appraisal: Concept of Performance Appraisal, the Performance Appraisal Process, Methods of Performance Appraisal, Essential Characteristic of an Effective Appraisal System.
Compensation: Objectives of Compensation Planning, Job Evaluation, Compensation Pay Structure in India, Wage and Salary Administration, Factors Influencing Compensation Levels, Executive Compensation.

Module6: (8 hours)
Employee Welfare: Introduction, Types of Welfare Facilities and Statutory Provisions.
Employee Grievances: Employee Grievance procedure, Grievances Management in Indian Industry.
Discipline: Meaning, approaches to discipline, essential of a good disciplinary system, managing difficult employees.

Module7: (8 hours)
Industrial Relations: Overview of industrial relations and industrial conflict.
Industrial disputes: preventive and settlement machinery, collective bargaining, industrial relations scenario: current issues and future challenges.

Practical Component:
1. Give a case and ask the students to prepare the recruitment advertisement for a newspaper.
2. Expose students to standard selection tests followed in varioussectors.
3. Exploring training and developmentpractices.
4. Exploring performance appraisal practices in varioussectors.
5. Exploring employee separationpractices.
6. Give a job analysis case and ask the students to prepare job description and job specification.
7. Ask the students to prepare an appointment letter for the post of office manager of a company known toyou.

RECOMMENDED BOOKS:
1. Human Resource Management – Rao V. S. P, Excel BOOKS,2010
2. Human Resource Management - Cynthia D. Fisher, 3/e, AIPD,Chennai.
3. Human Resources Management: A South Asian Perspective, Snell, Bohlander, & Vohra, Cengage Learning, 16th Rep., 2012.
4. Human Resource Management - Lawrence S. Kleeman, Biztantra ,2012.
5. Human Resource Management – Aswathappa KHPH

REFERENCE BOOKS:
1. Human Resource Management - John M. Ivancevich, 10/e, McGrawHill.
2. Human Resource Management in practice - Srinivas R. Kandula, PHI,2009
3. Managing Human Resources - Luis R Gomez-Mejia, David B. Balkin, Robert L. Cardy,6/e, PHI,2010.
4. P.Subba Rao, Human Resource Management & Industrial relations, Himalaya Publishing House,Mumbai.

FINANCIAL MANAGEMENT

Subject Code	: 14MBA22	IA Marks	: 50
No. of Lecture Hours / Week	: 04	Exam Hours	: 03
Total Number of Lecture Hours	: 56	Exam Marks	: 100
Practical Component	: 01 Hour / Week		

Objectives:

1. To explain the basic functions and responsibilities of a financial department in a business/firm;
2. To elaborate the key decision areas in financial management-investment, financing, dividend and working capitalmanagement
3. To explain the various techniques of evaluation of investmentproposals
4. To discuss the various factors to be considered in designing the target capital structure.

Module1: (10 Hours)

Financial management – Introduction to financial management, objectives of financial management – profit maximization and wealth maximization.Changing role of finance managers. Interface of Financial Management with other functional areas.

Indian financial system – Primary market, Secondary market – stocks & commodities market, Money market, Forex markets. (Theory Only)

Sources of Financing: Shares, Debentures, Term loans, Lease financing, Hybrid financing, Venture Capital, Angel investing and private equity, Warrants and convertibles (Theory Only)

Module2: (10 Hours)

Time value of money –Future value of single cash flow & annuity, present value of single cash flow, annuity & perpetuity.Simple interest & Compound interest, Capital recovery & loan amortization.

Module3: (8 Hours)

Cost of Capital Cost of capital – basic concepts. Cost of debenture capital, cost of preferential capital, cost of term loans, cost of equity capital (Dividend discounting and CAPM model). Cost of retained earnings. Determination of Weighted average cost of capital (WACC) and Marginal cost of capital.

Module4: (10 Hours)

Investment decisions -– Investment evaluation techniques – Net present value, Internal rate of return, Modified internal rate of return, Profitability index, Payback period, discounted payback period, accounting rate of return. Estimation of cash flow for new project, replacement projects.

Module5: (6 Hours)

Working capital management – factors influencing working capital requirements. Current asset policy and current asset finance policy. Determination of operating cycle and cash cycle. Estimation of working capital requirements of a firm (Does not include Cash, Inventory & ReceivablesManagement)

Module6: (8 Hours)

Capital structure and dividend decisions – Planning the capital structure. (No capital structure theories to be covered) Leverages – Determination of operating leverage, financial leverage and total leverage. Dividend policy – Factors affecting the dividend policy - dividend policies- stable dividend, stable payout. (No dividend theories to becovered).

Module7: (4 Hours)

Emerging Issues in Financial management: Derivatives, Mergers and Acquisitions, Behavioural Finance, Financial Modelling, Financial engineering, risk management. (Theory Only)**.**

RECOMMENDED BOOKS:

1. PrasannaChandra ,Financial Management -, 8/e, TMH,2011.
2. R K Sharma and Shashi K Gupta, Financial Management, Kalyani Publications-2012
3. Khan M. Y.& Jain P. K Financial Management, 6/e, TMH,2011.
4. Rajiv Srivastava and Anil Misra, Financial Management, Second edition,Oxford UniversityPress,2011
5. Vanhorne, James C, Financial Management & Policy-., 12/e, Pearson,2002

REFERENCE BOOKS:

1. I M Pandey, Financial Management , Vikas Publications-2013
2. Brigham & Houston, Fundamentals of Financial Management, 10/e, Cengage Learning.
3. Damodaran, Corporate Finance, , 2/e, Wiley India (P) Ltd.,2004
4. Paresh P., Shah Financial Management, 2/e, Biztantra.
5. Sheeba Kapil, Fundamentals of FinancialManagement,Pearson,2013

RESEARCH METHODS

SubjectCode	:14MBA23	IAMarks	50
No. of Lecture Hours/Week	: 04	Exam Hours	03
Total Number ofLectureHours	: 56	Exam Marks	100
PracticalComponent	: 01 Hour /Week		

Objectives:

1. To provide an understanding on the basic concepts of researchmethods
2. To expose the students to the role that statistics plays in businessdecisions

Module1: (6 hours)

Business Research – Meaning, types, process of research- management problem, defining the research problem, formulating the research Hypothesis, developing the research proposals, research design formulation, sampling design, planning and collecting the data for research, data analysis and interpretation. Research Application in business decisions, Features of good research study.

Module2: (8 hours)

Types of Business Research Design: Exploratory and Conclusive Research Design

Exploratory Research: Meaning, purpose, methods –secondary resource analysis, comprehensive case methods**,** expert opinion survey, focus groupdiscussions**.**

Conclusive research Design - Descriptive Research - Meaning, Types – cross sectional studies and longitudinal studies. –

Experimental research design – Meaning and classification of experimental designs- Pre experimental design, Quasi-experimental design, True experimental design, statistical experimental design.

Observation Research – Meaning – Uses – Participation and Non-participation – Evaluation – Conducting an Observation study – Datacollection

Module3: (6 hours)

Sampling: Concepts- Types of Sampling - Probability Sampling – simple random sampling, systematic sampling, stratified random sampling, cluster sampling -Non Probability Sampling – convenience sampling- judgemental sampling, snowball sampling- quota sampling - Errors insampling.

Module4: (6 hours)

Data Collection: Primary and Secondary data

Primary data collection methods - Observations, survey, Interview and Questionnaire, Qualitative Techniques of data collection.

Questionnaire design – Meaning - process of designing questionnaire.

Secondary data -Sources – advantages and disadvantages

Measurement and Scaling Techniques: Basic measurement scales-Nominal scale, Ordinal scale, Interval scale, Ratio scale. Attitude measurement scale - Likert’s Scale, Semantic Differential Scale, Thurstone scale, Multi-Dimensional Scaling.

Module5: (8 hours)
Preparing the Data for Analysis: Editing, Coding, Classification, Tabulation, Validation Analysis and Interpretation

Module6: (16 hours)
Hypothesis: Meaning, Types, characteristics, source, Formulation of Hypothesis, Errors in Hypothesis
Parametric and Non Parametric Test: T-Test, Z-Test, F-Test, U-Test, K-W Test (Theory Only)
Statistical Analysis: Bivarate Analysis (Chi-Square only), Multivariate Analysis (Theory Only)
ANOVA: One- Way and Two Way Classification. (Theory Only)

Module7: (6 hours)
Report writing and presentation of results: Importance of report writing, types of research report, report structure, guidelines for effective documentation.

Practical Components:

1. Students are expected to write the research design on Exploratory and Descriptive Research.
2. Students are asked to prepare the questionnaire on brand awareness, effectiveness of training in public sector organization, Investors attitude towards Mutual funds in any financialinstitutions.
3. Students are asked to conduct Market survey to know the consumer perception towards anyFMCG.
4. Identify the problem and collect relevant literatures and data foranalysis
5. Data Interpretation and report writing: Short and Longreports.
6. Report presentation methods, ex: Power Point Presentation,etc

RECOMMENDED BOOKS

1. Research Methodology- C R Kothari, Vishwa Prakashan,2002
2. Business Research Methods. Donald R. Cooper & Pamela s Schindler,TMH/9e/2007
3. Business Research Methods-SL Guptah and HeteshGuptha, McGraw hill -2012
4. Marketing Research- Naresh K Malhotrs- Pearson Education/PHI/5e/2007
5. Business Research Methodology – J K Sachdeva –HPH-2e-2011

REFERENCE BOOKS

1. Research Methods- William M C Trochi,- Biztantra, 2/e,2007
2. Methodology of Research in social Sciences- O R Krishnaswami, M Ranganatham, HPH,2007
3. Research Methodology – concepts and cases – Deepak Chawla and NeenaSondhi - Vikas Publication -2011
4. Research Methodology –C Murthy- Vrinda Publication -2011

STRATEGIC MANAGEMENT

Subject Code	: 14MBA25	IA Marks	: 50
No. of Lecture Hours / Week	: 04	Exam Hours	: 03
Total Number of Lecture Hours	: 56	Exam Marks	: 100
Practical Component	: 01 Hour / Week		

Objectives:

1. To explain core concepts in strategic management and provide examples of their relevance and use by actualcompanies
2. To focus on what every student needs to know about formulating, implementing and executing business strategies in today’s marketenvironments
3. To teach the subject using value-adding cases that features interesting products and companies, illustrate the important kinds of strategic challenges managers face, embrace valuable teaching points and spark student’sinterest.

ModuleI **(8 Hours)**

Meaning and Nature of Strategic Management, its importance and relevance.Characteristics of Strategic Management.The Strategic Management Process. Relationship between a Company’s Strategy and its Business Model.

ModuleII **(8 Hours)**

Strategy Formulation – Developing Strategic Vision and Mission for a Company – Setting Objectives – Strategic Objectives and Financial Objectives – Balanced Scorecard.Company Goals and Company Philosophy.The hierarchy of Strategic Intent – Merging the Strategic Vision, Objectives and Strategy into a Strategic Plan.

ModuleIII **(7Hours)**

Analyzing a Company’s External Environment – The Strategically relevant components of a Company’s External Environment – Industry Analysis – Industry Analysis – Porter’s dominant economic features – Competitive Environment Analysis – Porter’s Five Forces model – Industry diving forces – Key Success Factors – concept andimplementation.

ModuleIV **(8Hours)**

Analyzing a company’s resources and competitive position – Analysis of a Company’s present strategies – SWOT analysis – Value Chain Analysis – Benchmarking

Generic Competitive Strategies – Low cost provider Strategy – Differentiation Strategy – Best cost provider Strategy – Focused Strategy – Strategic Alliances and Collaborative Partnerships – Mergers and Acquisition Strategies – Outsourcing Strategies –International Business levelStrategies.

ModuleV **(7 Hours)**

Business Planning in different environments – Entrepreneurial Level

Business planning – Multi stage wealth creation model for entrepreneurs– Planning for large and diversified companies – brief overview of Innovation, integration, Diversification, Turnaround Strategies - GE nine cell planning grid and BCG matrix.

\ModuleVI **(10 Hours)**

Strategy Implementation – Operationalizing strategy, Annual Objectives, Developing Functional Strategies, Developing and communicating concise policies. Institutionalizing the strategy.Strategy, Leadership and Culture.Ethical Process and Corporate SocialResponsibility.

ModuleVII **(8 Hours)**

Strategic Control, guiding and evaluating strategies.Establishing Strategic Controls.Operational Control Systems. Monitoring performance and evaluating deviations, challenges of Strategy Implementation. Role of Corporate Governance

Practical Components:

- Business Plan: Students should be asked to prepare a Business Plan and present it at the end of the semester. This should include thefollowing:
    - ExecutiveSummary
    - Overview of Business and industryanalysis
    - Description of recommended strategy andjustification
    - Broad functional objectives and Key ResultAreas.
    - Spreadsheet with 5-year P&L, Balance Sheet, CashFlow projections, with detailed worksheets for the revenue and expensesforecasts.
- Analysing Mission and Vision statements of a few companies and comparingthem
- ApplyingMichaelPorter'smodeltoanindustry(Retail,Telecom, Infrastructure, FMCG, Insurance, Banking etc
    - Pick a successful growing company. Do a web-search of all news related to that company over a one-year period. Analyse the news items to understand and write down the company's strategy and executionefficiency.

· Pick a company that has performed very badly compared to its competitors. Collect information on why the company failed. What were the issues in strategy and execution that were responsible for the company's failure in the market.Analyse the internal and externalfactors

oMap out GE 9-cell matrix and BCG matrix for some companies and comparethem

· Conduct SWOT analysis of your institution and validate it by discussing withfaculty

· Conduct SWOT analysis of companies around your campus by talking to them

RECOMMENDED BOOKS:

1. Crafting and Executing Strategy, Arthur A. Thompson Jr., AJ Strickland III, John E Gamble, 18/e, Tata McGraw Hill,2012.
2. Strategic Management, Alex Miller, Irwin McGrawHill
3. Strategic Management - Analysis, Implementation, Control, Nag A, 1/e, Vikas,2011.
4. Strategic Management - An Integrated Approach, Charles W. L. Hill, Gareth R. Jones, CengageLearning.
5. Business Policy and Strategic Management, Subba Rao P,HPH.
6. Strategic Management, Kachru U, Excel BOOKS,2009.

REFERENCE BOOKS:

1. Strategic Management: Concepts and Cases, David R, 13/e,PHI.
2. Strategic Management: Building and Sustaining Competitive Advantage, Robert A. Pitts & David Lei, 4/e, CengageLearning.
3. Competitive Advantage, Michael E Porter, Free PressNY
4. Essentials of Strategic Management, Hunger, J. David, 5/e,Pearson.
5. Strategic Management, SarojDatta, jaico Publishing House,2011.
6. Business Environment for Strategic Management, Ashwathappa,HPH.
7. Contemporary Strategic Management, Grant, 6/e, 2012, WileyIndia.
8. Strategic Management-The Indian Context, R. Srinivasan,PHI

CONSUMER BEHAVIOUR

Subject Code	: 14MBA MM301	IA Marks	: 50
No. of Lecture Hours / Week	: 04	Exam Hours	: 03
Total Number of Lecture Hours	: 56	Exam Marks	: 100
Practical Component	: 01 Hour / Week		

Objectives:

1. To understand the concept of consumer behavior, decision making by consumers, behavior variables and influences on consumerbehavior.
2. To comprehend the social and cultural dimensions of consumer behavior, factors impacting attitudes andbehavior.
3. To arm the budding marketers with an insight of the psychological and behavioral concepts of consumers thus enabling them to achieve their objectives andexcel.

Module1: (4 Hours)

Introduction to the study of Consumer Behaviour: Meaning & Definition of CB, Difference between consumer & Customer, Nature & characteristics of Indian Consumers, Consumer Movement in India, Rights & Responsibilities of consumers in India, Benefits of consumerism.

Module2: (8 Hours)

Role of Research in understanding consumer behaviour: Consumer Research: Consumer Research Paradigms (Qualitative & Quantitative Research Methods) Developing research objectives, collecting secondary data, designing primary research, data analysis and reporting research findings.

Models of Consumer Behaviour: Input-Process-Output Model, *Nicosia Model, Howard Sheth Model*, Engel-Kollat-Blackwell *Models* of Consumer Behaviour, Internal Influences: Motivation, Personality, Perception, Learning, Attitude, Communications, External Influences: Social Class, Culture, REFERENCE Groups, Family members.

Levels of Consumer Decision Making – Consumer Buying Decision Process, Complex Decision Making or Extensive Problem Solving Model, Low Involvement Decision Making or Limited Problem Solving Model, Routinised Response Behaviour, Four views of consumer decision making. On-line Decision Making: Meaning &Process/Stages

Situational Influences- Nature of Situational Influence (The communication Situation, The Purchase Situation, The usage situation, The disposition situation) Situational Characteristics and consumption behaviour (Physical features, Social Surroundings, Temporal Perspectives, Task Definition, Antecedent States.)

Module3: (10 Hours)

Individual Influences on Consumer Behaviour and CRM: Part 1

A) Motivation: Basics of Motivation, Needs, Goals, Positive & Negative Motivation, Rational Vs Emotional motives, Motivation Process, Arousal of motives, Selection ofgoals.

Motivation Theories and Marketing Strategy - Maslow's Hierarchy of Needs, McGuire's Psychological Motives (Cognitive Preservation Motives, Cognitive Growth Motives, Affective Preservation Motives, Affective Growth Motives).

B) Personality: Basics of Personality, Theories of Personality and Marketing Strategy(Freudian Theory, Neo-Freudian Theory, Trait Theory), Applications of Personality concepts in Marketing, Personality and understanding consumer diversity(Consumer Innovativeness and related personality traits, Cognitive personality factors, Consumer Materialism, Consumer Ethnocentrisms), Brand Personality (Brand Personification, Gender,

Geography, Colour), Self and Self-Image (One or Multiple selves, The extended self, Altering theself).
C) Perception: Basics of Perception & Marketing implications, Elements of Perception(Sensation, Absolute Threshold, Differential Threshold, Subliminal Perception), Dynamics of Perception (Perceptual Selection, Perceptual Interpretation, Perceptual Organization ,perceived price, perceived quality, price/quality relationship, Perceived Risk, Types of risk, How consumers' handle risk.
Customer RelationshipManagement
Meaning & Significance of CRM, Types of CRM (Operational, Collaborative, Analytical), Strategies for building relationship marketing, e-CRM, Meaning, Importance of e-CRM, Difference Between CRM &e-CRM

Module4: (08 Hours)
Individual Influences on Consumer Behaviour: Part 2
A) Learning: Elements of Consumer Learning, Motivation, Cues, Response, Reinforcement, Marketing Applications of Behavioural Learning Theories, Classical Conditioning Pavlovian Model, Neo-Pavlovian Model), Instrumental Conditioning, Elaboration LikelihoodModel.
B) Attitude: Basics of attitude, the nature of attitude, Models of Attitude and Marketing Implication, (Tri-component Model of attitude, Multi attribute attitudemodels.
C) Persuasive Communication: Communications strategy, Target Audience, Media Strategy, Message strategies, Message structure andpresentation.

Module5: (07 Hours)
External Influences on Consumer Behaviour: Part 1
A) Social Class: Social Class Basics, What is Social Class? (Social class & Social status, the dynamics of status consumption, Features of Social Class, Five Social-Class Categories in India
B) Culture and Subculture - Major Focus on IndianPerspective
Culture: Basics, Meaning, Characteristics, Factors affecting culture, Role of customs, values and beliefs in Consumer Behaviour.
Subculture: Meaning, Subculture division and consumption pattern in India,
Types of subcultures (Nationality subcultures, Religious subcultures, Geographic and regional subcultures, racial subcultures, age subcultures, sex as asubculture)
Cross-cultural consumer analysis: Similarities and differences among people, the growing global middle class; Acculturation is a needed marketing viewpoint, applying research techniques Cross-cultural marketing strategy: Cross-cultural marketing problems in India, Strategies to overcome cross-cultural problems.

Module6: (07 Hours)
External Influences on Consumer Behaviour: Part 2
Groups: Meaning and Nature of Groups, Types

Family: The changing structure of family, Family decision making and consumption related roles, Key family consumption roles, Dynamics of husband-wife decision making, The expanding role of children in family decision making, The family life cycle & marketing strategy, Traditional family life cycle & marketing implications, Reference Groups: Understanding the power & benefits of reference groups, A broadened perspective on reference groups, Factors that affect reference group influence, Types of reference groups, Friendship groups, Shopping groups, Work groups, Virtual groups, Consumer-action groups, reference group appeals, Celebrities.

Module7: (08 Hours)

Consumer Influence and Diffusion of Innovations

Opinion Leadership: Dynamics of opinion leadership process, Measurement of opinion leadership, Market Mavens, Opinion Leadership & Marketing Strategy, Creation of Opinion Leaders

Diffusion of Innovations: Diffusion Process (Innovation, Communication channels, Social System, Time) Adoption Process: Stages, categories of adopters

Post Purchase Processes: Post Purchase Processes, Customer Satisfaction, and customer commitment: Post purchase dissonance, Product use and non use, Disposition, Product disposition.

Case studies in Indiancontextonly (04 Hours)

PracticalComponent:

1. Students can go to malls and unorganized retail outlets and observe the behavior of consumers of different demographic segments while buying different category of goods. Come back to class and present the findings / observations followed with a groupdiscussion.
2. Students can prepare a questionnaire and do a survey on consumer buying behavior and present the findings in theclass.
3. Find three advertisements that appeal to the need for power, affiliation and achievement and discuss their effectiveness. Rewrite these for persons in different levels of Maslow'sHierarchy?
4. Meet your friends and conduct a survey to find what are the important factors in their purchase of mobiles, shoes, bags etc. There are now plenty of advertisements regarding most products – how do they deal with this informationoverload?

RECOMMENDED BOOKS:

1. Consumer Behavior - Leon Schiff man, LesslieKanuk, 10/e, Pearson,2010.
2. Consumer Behavior: Building Marketing Strategy – Del I. Hawkins, & Others, 11/e TMH.
3. Consumer behavior - Jay D. Lindquist, Joseph Sirgy, 1/e, CengageLearning.
4. Consumer behavior – David L. Louden, Della Bitta, 4/e, McGrawHill.
5. Consumer Behavior – Raju M. S & Dominique Xardel, Vikas PublishingHouse.

REFERENCE BOOKS:

1. Consumer Behavior - Henry Asseal, CenageLearning.
2. Consumer Behavior in Indian Perspective – Suja Nair, HimalayaPublications
3. Customer Behavior: A Managerial Perspective – Sheth, Mittal, CengageLearning.
4. Consumer Behavior- Satish K. Batra& S H HKazmi, ExcelBOOKS.
5. CRM – Alok Kumar, Chhabi Sinha, 7/e,Biztantra.
6. Customer Relationship Management - Peru Ahamed&Sagadevan, VikasPublishing.
7. Consumer Behavior – Kumar Rajeev, HimalayaPublisher.

MARKETING RESEARCH

Subject Code	: 14MBA MM303	IA Marks	: 50
No. of Lecture Hours / Week	: 04	Exam Hours	: 03
Total Number of Lecture Hours	: 56	Exam Marks	: 100
Practical Component	: 01 Hour / Week		

Objectives of the course:

1. To provide an understanding of the basics of marketing research and to build a research vocabulary, key terms andideas.
2. To provide a balance of the theoretical and practical aspects of marketing research and encourage the students to take up analytical and critical thinking through research.
3. To highlight importance of research inmanagement

Module1: (8 Hours)

Introduction: Meaning, scope and importance of marketing research; own vs. agency marketing research; marketing information system; meaning, need and components, marketing information system and marketing research; marketing research process-I an overview; problem definition, formulation and preparation of research proposal.

Module2: (8 Hours)

Primary Data Collection: Primary data collection methods; mail survey, telephone survey and interviews and their evaluation; observations; experimental methods, questionnaire preparation and administering, organizing fieldwork for collecting data.

Module3: (8 Hours)

Research Design and Information Sources: Meaning and scope of research design; types of research designs, exploratory, descriptive and conclusive; sources and uses of secondary data, collection of secondary data.

Module4: (8 Hours)

Sample Design and Sampling: Determining universe, sampling frame and sampling unit; determining sampling method; non probability and probability methods; sample size determination; sampling errors vs. non-sampling errors.
Sampling: Steps &Types: Probability / non probability (simple, systematize; stratified proportionate, disproportionate), Sample size determination

Module5: (8 Hours)

Questionnaire design:-Steps in Q.D. with examples for each step. Rating Scales, Juster, Likert, Semantic Differential, Thurston, Attitude Scales, Scales for illiterate respondents

Module6: (8 Hours)

Measurement Techniques: Nominal Scale, Ordinal Scale, Interval Scale, Ratio Scale; Scale Types: Comparative Scaling, Non-comparative Scaling; Attitude Measurement, Self-Reporting Methods, Methods for Rating Attributes, Data Analysis, Customer Research, Advertising Research, Product Research, Distribution Research, Sales Research, Marketing Environment Research, Internet Marketing Research, and International Marketing Research

Module7: (8 Hours)

Research trends, Behavioural Science Based Approach, Economic and Competitive Pressures, Consumer Insight Groups, Quantifying Emotions, Impact of the Social Media, Do-it-Yourself (DIY) Research; Research ethics, typical research errors, Research andculture;

Practical Components:

1. Choose 5 successful products or services and identify the insight behind them through a fieldsurvey.
2. Do a comprehensive essay on the difference between consumer vs. trade vs. competition insights & how best to exploitthem.
3. Take 5 recent digital innovations e.g. twitter or face book and identify the insights. Locate 5 non-users of search or mail and Interview theirreasons.
4. Choose 5 recent successful campaigns and identify their insights through consumer interviews. Present your findings to theclass
5. Choose 3 successful movies e.g. Dabang&Zindaginamilegi& My name is Khan--- and interview consumers about the reasons for their success. Similarly repeat this with 3 recent expensive flop movies and Present your findings to theclass

RECOMMENDED BOOKS:

1. Marketing Research contemporary approach- Naraynreddy and GVRK Acharyalu Excelpublications
2. Marketing Research and consumer Behavior Saravanavel et.al Vikas publishinghouse
3. Essentials of Marketing Research – 4/e, Tony Proctor, PHI,2005
4. Essentials of Marketing Research – William G. Zikmund et.al. 4/e, Cengage Learning,2010.
5. Research Skills for Students: Transferable and Learning Skills - Allison, et.al.1996.
6. Market Research - Robin Birn, Patrick Forsyth, John Wiley and Sons Inc.2002.

REFERENCE BOOKS:

1. Market Research: a guide to planning, methodology & evaluation - Paul Hague, Kogan Page,1996.
2. Market Research Best Practice. 30 Visions of the Future – Peter Mouncey, et.al,2007.

INDUSTRIAL RELATIONS AND LEGISLATIONS

Subject Code	: 14MBA HR301	IA Marks	: 50
No. of Lecture Hours / Week	: 04	Exam Hours	: 03
Total Number of Lecture Hours	: 56	Exam Marks	: 100
Practical Component	: 01 Hour / Week		

Objectives:

1. To enable students to grasp and apply the principles of IR and develop an awareness of the significance of industrialpeace.
2. To provide a conceptual basis of IndustrialRelations.
3. To give an understanding of the components and meaning of sustaining Industrial peace anchored on harmonious Employee-Managementrelations.

PART A:
INDUSTRIAL RELATIONS
MODULE1: **(8 hours)**
Introduction:
Background of Industrial Relations – Definition, scope, objectives, factors affecting IR, participants of IR, importance of IR. Approaches to Industrial relations, system of IR in India – Historical perspective &post independence period, Code of Discipline and historical initiatives for harmonious IR, Government policies relating to labor, ILO and its influence on Legal enactments inIndia.

MODULE2: **(8 Hours)**
Collective Bargaining & Negotiation:
Collective Bargaining: Definition, Meaning, Nature, essential conditions for the success of collective bargaining, functions of collective bargaining, importance of Collective Bargaining, collective bargaining process, prerequisites for collective bargaining, implementation and administration ofagreements.
Negotiations-Types of Negotiations-Problem solving attitude, Techniques of negotiation, negotiation process, essential skills for negotiation, Workers Participation in Management

Module3: **(8 Hours)**
Trade Union
Trade Unions: Meaning, trade union movement in India, The role of the Trade Unions in Modern Industrial Society of India, functions of trade unions, objectives of important trade unions, The Trade Union Act, 1926, procedure for registration of Trade Union, Grounds for the withdrawal and cancellation of registration, union structure, Rights and responsibilities, Penalties for offences of trade unions, Difference between a registered and a recognised Trade Union, problems of trade unions, future trends of trade union movement inIndia.

Module4: **(8 Hours)**
Grievance procedure and Discipline management:
Grievance - Meaning and forms, sources of grievance, approaches to grievance machinery, Grievance procedures, model grievance procedure.

Discipline - Causes of Indiscipline - Maintenance of discipline. Principles of Natural Justice, Judicial approach to discipline, Domestic enquiries, Disciplinary procedures, approaches to manage discipline in Industry, Principles of Hot stove rule.

Module5: (8 Hours)
Industrial Conflicts:
Industrial conflict – perspectives, Nature of conflicts and its manifestations causes and types of Industrial conflicts, prevention of Industrial conflicts, industrial disputes act of 1947, settlement Machinery of Industrial disputes.
Paradigm shift from industrial relations to employee relations – shift in focus, difference, employee relations management at work, culture and employee relations, future of employee relations.

RECOMMENDED BOOKS:
1. Employee Relations Management - P N Singh, Singh P. N., PearsonPublications
2. Dynamics of Industrial Relations – Mamoria&Mamoria,
3. Human Resource Management, Principles & Practice – Aquinas, VikasPublication
4. Personnel Management & Industrial Relations – Nair
5. Essentials of Human Resource Management and Industrial Relations - Subba Rao – 3rd Revisededition
6. Malhotra, O.P. : The Law of IndustrialDisputes
7. Arya, V.P. : A Guide to Settlement of IndustrialDisputes
8. Aggarwal, Dr. Arjun P. and Larki, H. : Gherao and Industrial Relations, Trade Unionism in the NewSociety
9. Aggarwal, S.L. : Labour Relations Law inIndia

PART B:
INDUSTRIAL LEGISLATIONS (16 hours)

- Factories Act1948,
- Industrial Employment (Standing orders) Act,1946
- Employees’ State Insurance (ESI) Act,1948,
- Maternity benefit Act,1961
- Workmen’s compensation Act,1923
- Payment of Gratuity Act1972,
- Employees’ Provident Fund and Miscellaneous Provisions Act1952;
- Payment of Bonus Act,1965.
- Payment of Wages Act,1936,
- Child Labour (Prohibition & Regulation) Act,1986

RECOMMENDED BOOKS:
1. Labor Laws for Managers, BD Singh, ExcelBOOKS
2. Industrial Relations and Labor laws, 5th Edition, SC Srivastava, VikasPublications
3. Elements of Mercantile Law - N. DKapoor
4. Labor Industrial Laws – Dr. V. G. Goswami , EighthEdition
5. P R N Sinha et al Industrial Relations, Trade Unions &Labour Legislation, Pearson Education
6. Bareacts

RECRUITMENT & SELECTION

SubjectCode	:14MBAHR302	IAMarks	50
No. of Lecture Hours/Week	: 04	Exam Hours	03
Total Number ofLectureHours	: 56	Exam Marks	100
PracticalComponent	: 01 Hour /Week		

Module1: **(6 Hours)**

Job Analysis: Meaning, definition and purpose. Methods of job analysis: job analysis interviews, job analysis questionnaire, task analysis inventory, position analysis questionnaire, subject expert workshops, critical incident technique, F1eisclunann job analysis survey, functional job analysis, job element method, repertory grid, critical incident technique

Module2: **(9 Hours)**

Hiring Process & Hiring decision: Nature of hiring: regular, temporary, full time, part time, apprentice, contractual, and outsourcing, Existing post or new post to be created, Need analysis, cost analysis and job analysis.

Module3: **(7 Hours)**

Hiring internally: Meaning and definition of internal recruitment, Advantages and disadvantages in terms of cost, time, quality andsuitability.

Sources of internal recruitment: - circulars, intranet advertisements, employee referrals, Appointment or promotion, Policy guidelines and union settlements.

Module4: **(10 Hours)**

External Hiring: Meaning and definition of external recruitment.

Sources of recruitment:- advertisement, in newspaper, TV/Radio, Internet, search on the internet, wanted signboards, consultants, employment exchange, campus recruitment, employee referrals and unsolicited applications. Advantages and disadvantages of the above sources in terms of cost, time, convenience, reach of the targeted population, and quality of applicant pool.

Job advertisement: drafting, size and contents. Contents of public sector recruitment: single or multiple sources and choosing the best source

Module5: **(8 Hours)**

Screening the candidates: Application Forms: bio-data / resume / curriculum vitae and weighted application blanks: meaning definition, purpose, advantages and disadvantages – taking a Behavioural approach to recruitment: spotting personality patterns, making basic assumptions, predicting the future, strategy Vs. Technique, Pinning down what is needed: targeted interviewing, focusing on behaviour, assessing how person performs, assuming they have been hired. – Identifying the ingredients of success: the winning candidate‟s profile, challenges in the interview, the starting point, day to day execution, dealing with people, the inner person, additional characteristics. Studying the CV.

Module6: **(8 Hours)**

Testing: Meaning, definition, purpose, advantages and disadvantages, Ability tests clerical ability test, mechanical ability test, mental ability test, physical ability test, personality assessment test, typing test, shorthand test, computer proficiency test

Interviewing: Planning the interview, Interview process - getting started, examining the 5 interview areas, examining the strengths & weaknesses, listening to what are being said, digging for Behavioural gold, probing for specifics, spotting patterns, using an interview checklist, Allowing candidates to ask questions at the end, explaining the procedure of selection and concluding with a happy note, making the decision. Interview in public sector undertaking, statutory requirements.

Module7: (8 Hours)

Reference checking & Appointment orders: meaning, definition and purpose. Verification of character, criminal antecedents, previous work behavior and education qualifications. Verification of community certificates in public sector companies

Meaning, definition, and purpose.Statutory requirements (under the Shops and commercial establishments Act).Contents of appointment letter, hard copy (or soft copy), method of delivery and retrieving the acknowledgement copy.Medical Examination & acceptance of offer for joining.

Practical Component:

1. Students need to identify two jobs in the college and need to do job analysis for those positions using any of the job analysismethods.
2. In teams students can be asked to give presentations about various types of jobs **(**regular, temporary, full time, part time, apprentice, contractual, and outsourcing) in different industries along with its advantages anddisadvantages
3. In Teams, select and analyze any two of the Job postings advertisements in Newspapers to know more about job description and job specification mentioned in each advertisement for everypost.
4.Obtain online access to the resume data base of Naukri.com or Monsterindia.com for a week give at least four Job Descriptions and specification to each student, to search and download from the data base at least five resumes for eachpositions.
5. Students can identify 4 or 5 jobs of their interest and can create Advertisements for the same imaging that they are Proprietors of the companies and hiring for thesepositions.
6. Debate on Advantages and disadvantages of hiring external and Internal for the selected jobs like Police Constable, Doctor, CEO, Mechanical Engineer, Professoretc.,
7. Role play : Students can do the role play for the entire process of hiring and selecting 3 or 4 selected roles in a specificindustry.

RECOMMENDED BOOKS:

1. Human Resource Selection by Robert D. Gatewood and Hubert S. Feild, South western Cengage Learning, Mason, Ohio2001
2. Staffing Organization, Herbert G. Heneman III, Timothy A. Judge, 5th Edition, McGraw HillInternational

REFERENCE BOOKS:

1. Employee Selection, Lilly M Berry, ThomsonPublications
2. Hiring & keeping the best people, HBSPress
3. Human Resource Planning, Dipak Kumar Bhattacharyya, 2nd edition, ExcelBOOKS.
4. High performance hiring by Robert w. Wendover, Crisp Publication, California,1991.

PUBLIC RELATIONS

Subject Code	: 14MBA HR407	IA Marks	: 50
No. of Lecture Hours / Week	: 04	Exam Hours	: 03
Total Number of Lecture Hours	: 56	Exam Marks	: 100
Practical Component	: 01 Hour / Week		

Objective:
To provide an understanding of the fundamentals tools of public relations practice and to provide a multidisciplinary understanding of the emerging trends in the field of public relations

Module1: (8 Hours)
What is Public Relation? – Proactive and Reactive Approaches – Public Relations Process – Behavoiural Public Relations Model – Persuasion Model – Two way symmetrical Communications Model – When communications is not enough – 20 great truths about PublicRelations

Module2: (8 Hours)
Theoretical basis for Public Relations –Theories of Relationships –Systems Theory – situational Theory – Theories of Persuasion and Social Influence – Social Exchange Theory – Diffusion Theory – Social Learning Theory – Elaborated Likelihood Theory - Theories of Mass communication – Uses and Gratification Theory – Agenda Setting Theory – Public Relations roles – Models of Public Relations – Approaches to Conflict Resolutions

Module3: (8 Hours)
Employee communications – Role of employee communication – concept of Organizational culture – Establishing Communication Policy – Organizational change – Importance of employee communication – Special employee Communication Situations – Media of Employee communications – Objectives of Internal media – Starting internal media – controlling internal media- Occasional and Special media
Rules of Effective Employee Relations. Frontline supervisors as the key communicators
Case: Investing in Employees Pays Off (CJSS)
Case: Southwest Airlines – Where Fun, LUV, and Profit Go Hand –in Hand (CJSS)
Case: Employee Retention: It is the employer who is on probation (LLHT)
Case: Maintaining Employee Relationship in a Tragedy (LLHT)
Kodak Communicates One – on - One with All of its Employees (CJSS)

Module4: (8 Hours)
Community Relations – Importance of Public Relations – Community Relations Process – Guidelines for Effective Relations Programs -Specific Functions of Public Relations – Criteria for Community relations Activities – Corporate Social Responsibility & Philanthropy-Emerging Challenge of CommunityActivism
Case: Community Relationships Maintained During Hospital Closing (CJSS)

Module5: **(8 Hours)**

Media Relations – Media Relations –Role of Media in Public Relations – Social Media – working with the media –Media Relations Program Elements –Role of Technology in Public Relations

Case: Fatal Tiger Attack at San Francisco Zoo(LLHT)

Case: There's a Syringe in My Pepsi Can(CJSS)

Module6: **(8 Hours)**

Issues in Public Relations – public relations challenges –Types of Issues - Target audiences-Public Service as Preventive Public Relations – Special Interests – Importance of Compromise – Issue Anticipation – Scenario Technique

Case: Take your choice – Tobacco or Health (CJSS)

Module7: **(8 Hours)**

Crisis Management – Understanding how people typically react to issues – Human Nature – Role of communications – Types of crises – News media influence - Fundamental guidelines

Case: Bhopal – A Nightmare for Union Carbide (CJSS

Case: Sir Ganga Ram Hospital – Disaster management Plan (IS))

Pedagogy: Lecture+ Case Studies + Seminars. Faculty should bring latest issues concerning public relations in class discussions.

Practical Component:

1. Related cases for each module to be discussed in the classes and presentation can be done for each case by group ofstudents.
2. Team of students can be made and asked to report the media personalities about the event held in the college. Different styles of reporting the same event can be discussed in the class with its possible reactions from themedia.
3. Collect the newspaper articles about various messages from organizations through spokespersons and analyze the effect of each type of delivery and impact on theaudience.
4. Conduct a CSR Programme for the college like Blood donation, Eye camps in association with Lions, Rotary clubs etc and gather the information's about various challenges these organizations face during such community orientedprogrammes.

RECOMMENDED BOOKS

1. Lattimore, Laskin, Heiman &Toth, "Public Relations – The Profession and Practice", third edition, Tata McGraw Hill, 2012(LLHT)
2. Center, Jackson, Smith and Stansbury, "Public Relations Practices – Managerial Case Studies and Problems", Seventh Edition, Prentice Hall of India,2008(CJSS)
3. Iqbal Sachdeva, "Public Relations – Principles and Practices, Oxford University Press, 2009(IS)

WORKPLACE ETHICS AND VALUE SYSTEMS

Subject Code	: 14MBA HR408	IA Marks	: 50
No. of Lecture Hours / Week	: 04	Exam Hours	: 03
Total Number of Lecture Hours	: 56	Exam Marks	: 100
Practical Component	: 01 Hour / Week		

Objectives:

1. To make students understand the meaning of good ethics, doing things right and the obstacles to making good ethicaldecisions
2. To enable students to identify and critically assess the principles and values they personally embrace and use in addressing the ethical issues which arise in their workinglives.
3. To acquaint students with some of the major kinds of ethical problems encountered while performing work assignments and some possible ways of responding tothem.

Module1: (8 Hours)

Workplace Ethics: Introduction, Needs, Principals, Development of Personal Ethics, Workplace Ethics for Employees-Ethical behaviour in workplace- Professionalism, Ethical violations by employees, Employee Attitude and Ethics, Employee Etiquettes. Benefits of ethics in Workplace- employee commitment, investor loyalty, customer satisfaction, profits

Module2: (8 Hours)

Conducting Professionalism at Workplace: Unethical Conduct for employees and employers.Factors leading to Unethical Behaviours.Different unethical behaviours.Measures to control unethical behaviours. Rewarding ethicalbehaviour

Module3: (10 Hours)

Business Ethics and Corporate Governance: Overview of Business Ethics, Corporate Governance, Ethical issues in human resource management- The principal of ethical hiring, Firing, worker safety, whistle blowing, Equality of opportunity, Discrimination, Ethics and remuneration, Ethics in retrenchment. Ethical Dilemmas at workplace, Ethical issues in global business, corporate responsibility ofemployers.

Module4: (8 Hours)

Workplace Privacy & Ethics: Watching what you say and what you do in the workplace, Hardware, Software and Spyware, Plagiarism and Computer Crimes, Convenience and Death of Privacy, Defence of employee privacy rights.

Module5: (8 Hours)

Teamwork in the Workplace & Ethics: Teams, Elements of team, Stages of team development, team meetings, team rules, and teams work and professional responsibility, rules of professional responsibility, ASME code of ethics.

Module6: (8 Hours)

Managing Change in Workplace through Ethics: Introduction to Change Management, Models of change, the Ethics of Managing Change, the role of ethics and responsibilities in leading innovation and change, ethics based model for change management, ethics and risks of change management

Module7: (6 Hours)

Ethics, Discrimination and Harassment at Workplace: Discrimination, sexual harassment, Creating awareness about workplace harassment, Vishaka Dutta vs. State of Rajasthan – Supreme Court directions. Compulsory workplace guidelines.

Practical Components:

1. To solve case studies on WorkplaceEthics
2. To visit organizations and find out the problems and causes for unethical behavior at workplace.
3. To visit organizations and find out the measures adopted to control unethical behavior ofemployees.
4. To compare and contrast the various ethical codes of conduct practiced in organizations.
5. To study the recent cases on breach of workplaceprivacy.

RECOMMENDED BOOKS:

1. Ethical Theory and Business, 8th Edition, Tom L. Beauchamp, Norman E. Bowie and DenisArnold
2. Business Ethics, 9th Edition, O.C. Ferrell, John Fraedrich, and Linda Ferrell, Cengage Learning.
3. How technology is compromising Workplace Privacy, Fredrick S Lane 111, AMACOM Div American Mgmt Assn,2003
4. Ethics in the Workplace, Dean Bredeson, Keith Goree, Cengage Learning,2011.
5. Ethics in 21st Century, Mary Alice Trent, Oral Roberts University,Longman.
6. Ethics in workplace, Elizabeth P Tierney, Oak treepress
7. Ethics in Workplace: System Perspective, William F Roth, Pearson,2014.

CONCRETE TECHNOLOGY
(COMMON TO CV/TR/CTM)

Sub Code	**:**	**10 CV 42**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

Unit- 1
Cement, Chemical composition, hydration of cement, Types of cement, manufacture of OPC by wet and dry, process (flow charts only) Testing of cement - Field testing, Fineness by sieve test and Blaine's air permeability test, Normal consistency, testing time, soundness, Compression strength of cement and grades of cement, Quality of mixing water. –7 Hours

Unit-2
Fine aggregate - grading, analysis, Specify gravity, bulking, moisture content, deleterious materials. Coarse aggregate – Importance of size, shape and texture.Grading of aggregates - Sieve analysis, specific gravity, Flakiness and elongation index, crushing, impact and abrasion tests. - 6 Hours

Unit-3

Workability - factors affecting workability, Measurement of workability - slump, flow tests, Compaction factor and vee-bee consistometer tests, Segregation and bleeding, Process of manufactures of concrete : Batching, Mixing, Transporting, Placing, Compaction, Curing. -7 Hours

Unit-4

Chemical admixtures - plasticizers, accelerators, retarders and air entraining agents, Mineral admixtures - Fly ash, Silica fumes and rice husk ash.

-6 Hours

Part-B

Unit-5

Factors affecting strength, w/c ratio, gel/space ratio, maturity concept, Effect of aggregate properties, relation between compressive strength, and tensile strength, bond strength, modulus of rupture, Accelerated curing, aggregate - cement bond strength, Testing of hardened concrete - compressive strength, split tensile strength, Flexural strength, factors influencing strength test results. - 6Hours

Unit-6

Elasticity - Relation between modulus of elasticity and Strength, factors affecting modulus of elasticity, Poisson , Ratio, Shrinkage - plastic shrinkage and drying shrinkage, Factors affecting shrinkage, Creep - Measurement of creep, factors affecting creep, effect of creep, - 7 Hours

Unit-7

Durability - definition, significance, permeability, Sulphate attack, Chloride attack, carbonation, freezing and thawing, Factors contributing to cracks in concrete - plastic shrinkage, settlement cracks, construction joints, Thermal expansion, transition zone, structural design deficiencies, - 6 Hours

Unit-8

Concept of Concrete Mix design, variables in proportioning , exposure conditions, Procedure of mix design as per IS 10262-1982, Numerical examples of Mix Design - 7 Hours

TEXT BOOKS:

1. "Concrete Technology" - Theory and Practice, M.S.Shetty, S.Chand and Company, New Delhi, 2002.

REFERENCES :

1. "Properties of Concrete"Neville, A.M. : , ELBS, London
2. "Concrete Technology" – A.R.Santakumar. Oxford University Press (2007)'
3. "Concrete Manual" - Gambhir Dhanpat Rai & Sons, New Delhi.
4. "Concrete Mix Design" - N.Krishna Raju, Sehgal - publishers.
5. "Recommended guidelines for concrete mix design" - IS:10262,BIS Publication

2. **Fundamentals of Surveying** - S.K. Roy – Prentice Hall of India
3. **Surveying**, Arther Bannister et al., Pearson Education, India

STRUCTURAL ANALYSIS –I
(COMMON TO CV/TR)

Sub Code	**:**	**10 CV 43**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:
STRUCTURAL SYSTEMS AND ENERGY CONCEPT
1.1 Forms of structures, 1.2 Conditions of equilibrium, 1.3 Degree of freedom, 1.4 Linear and Non linear structures, 1.5 One, two, three dimensional structural systems, 1.6 Determinate and indeterminate structures [Static and Kinematics]. 1.7 Strain energy and complimentary strain energy, 1.8 Strain energy due to axial load, bending and shear, 1.9 Theorem of minimum potential energy, 1.10 Law of conservation of energy, 1.11 Principle of virtual work,

7 Hours

UNIT 2:
DEFLECTION OF BEAMS
2.1 Moment area method, 2.2 Conjugate beam method

6 Hours

UNIT 3:
DEFLECTION OF BEAMS AND FRAMES BY STRAIN ENERGY
3.1 The first and second theorem of Castigliano, problems on beams, frames and trusses, 3.2 Betti's law, 3.3 Clarke - Maxwell's theorem of reciprocal deflection.

7 **Hours**

UNIT 4:
ANALYSIS OF BEAMS AND PLANE TRUSSES BY STRAIN ENERGY
4.1 Analysis of beams (Propped cantilever and Fixed beams) and trusses using strain energy and unit load methods

7 Hours

PART – B

UNIT 5:
ARCHES AND CABLES
5.1 Three hinged circular and parabolic arches with supports at same levels and different levels, 5.2 Determination of thrust, shear and bending moment, 5.3 Analysis of cables under point loads and UDL, length of cables (Supports at same levels and at different levels).

6 Hours

UNIT 6:
ANALYSIS OF BEAMS
6.1 Consistent deformation method – Propped cantilever and fixed beams

6 Hours

UNIT 7:
7.1 Clapeyron's theorem of three moments – continuous beams and fixed beams

6 Hours

UNIT 8:
ANALYSIS OF ARCHES
8.1 Two hinged parabolic arch, 8.2 Two hinged Circular Arch

7 Hours

TEXT BOOKS:
1. **Theory of Structures**, Pandit and Guptha, Vol. – I, Tata McGraw Hill, New Delhi.
2. **Basic Structural Analysis** Reddy C. S., Tata McGraw Hill, New Delhi.
3. **Strength of Materials and theory of structures** Vol I & II, B.C. Pumia , R.K., Jain Laxmi Publication New Delhi

REFERENCE BOOKS:
1. **Elementary Structural Analysis**, Norris and Wilbur, International Student Edition. McGraw Hill Book Co: New York
2. **Structural Analysis**, 4th SI Edition by Amit Prasanth & Aslam Kassimali, Thomson Learning.
3. **Analysis of Structures**, Thandava Murthy, Oxford University Press, Edition 2005.

SURVEYING – II
(COMMON TO CV/TR/EV/CTM)

Sub Code	**:**	**10 CV 44**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:
THEODOLITE SURVEY
1.1 Thedolite and types, 1.2 Fundamental axes and parts of a transit theodolite, 1.3 Uses of theodolite, 1.4 Temperary adjustments of a transit thedolite, 1.5 Measurement of horizontal angles – Method of repetitions and reiterations, 1.6 Measurements of vertical angles, 1.7 Prolonging a straight line by a theodolite in adjustment and theodolite not in adjustment

6 Hours

UNIT 2:
PERMANENT ADJUSTMENT OF DUMPY LEVEL AND TRANSIT THEODOLITE
2.1 Interrelationship between fundamental axes for instrument to be in adjustment and step by step procedure of obtaining permanent adjustments

7 Hours

UNIT 3:
TRIGONOMETRIC LEVELING
3.1 Determination of elevation of objects when the base is accessible and inaccessible by single plane and double plane method, 3.2 Distance and difference in elevation between two inaccessible objects by double plane method. Salient features of Total Station, Advantages of Total Station over conventional instruments, Application of Total Station.

8 Hours

UNIT 4:
TACHEOMETRY
4.1 Basic principle, 4.2 Types of tacheometric survey, 4.3 Tacheometric equation for horizontal line of sight and inclined line of sight in fixed hair method, 4.4 Anallactic lens in external focusing telescopes, 4.5 Reducing the constants in internal focusing telescope, 4.6 Moving hair method and

tangential method, 4.7 Subtance bar, 4.8 Beaman stadia arc.

7 Hours

PART – B

UNIT 5:
CURVE SETTING (Simple curves)
5.1 Curves – Necessity – Types, 5.2 Simple curves, 5.3 Elements, 5.4 Designation of curves, 5.5 Setting out simple curves by linear methods, 5.6 Setting out curves by Rankines deflection angle method.

6 Hours

UNIT 6:
CURVE SETTING (Compound and Reverse curves)
6.1 Compound curves 6.2 Elements 6.3 Design of compound curves 6.4 Setting out of compound curves 6.5 Reverse curve between two parallel straights (Equal radius and unequal radius).

6 Hours

UNIT 7:
CURVE SETTING (Transition and Vertical curves)
7.1 Transition curves 7.2 Characteristics 7.3 Length of Transition curve 7.4 Setting out cubic Parabola and Bernoulli's Lemniscates, 7.5 Vertical curves – Types – Simple numerical problems.

6 Hours

UNIT 8:
AREAS AND VOLUMES
8.1 Calculation of area from cross staff surveying, 8.2 Calculation of area of a closed traverse by coordinates method. 8.3 Planimeter – principle of working and use of planimeter to measure areas, digital planimter, 8.4 Computations of volumes by trapezoidal and prismoidal rule, 8.5 Capacity contours

6 Hours

TEXT BOOKS:

1.'**Surveying'** Vol 2 and Vol 3 - B. C. Punmia, Laxmi Publications
2.**'Plane Surveying'** A. M. Chandra – New age international (P) Ltd
3.**'Higher Surveying'** A.M. Chandra New age international (P) Ltd

REFERENCE BOOKS:

1. **Fundamentals of Surveying** - Milton O. Schimidt – Wong, Thomson Learning.

DESIGN OF RCC STRUCTURAL ELEMENTS

Subject Code	**: 10CV52**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

GENERAL FEATURES OF REINFORCED CONCRETE: Introduction, Design Loads, Materials for Reinforced Concrete and Code requirements. Design Philosophy – Limit State Design principles. Philosophy of limit state design, Principles of limit states, Factor of Safety, Characteristic and design loads, Characteristic and design strength.

6 Hours

UNIT - 2

PRINCIPLES OF LIMIT STATE DESIGN AND ULTIMATE STRENGTH OF R.C. SECTION: General aspects of Ultimate strength, Stress block parameters for limit state of collapse, Ultimate flexural strength of singly reinforced rectangular sections, Ultimate flexural strength of doubly reinforced rectangular sections, Ultimate flexural strength of flanged sections, Ultimate shear strength of RC sections, Ultimate torsional strength of RC sections, Concepts of development length and anchorage, Analysis examples of singly reinforced, doubly reinforced, flanged sections, shear strength and development length.

7 Hours

UNIT - 3

FLEXURE AND SERVICEABILITY LIMIT STATES: General Specification for flexure design of beams-practical requirements, size of beam, cover to reinforcement-spacing of bars. General aspects of serviceability-Deflection limits in IS: 456 – 2000-Calculation of deflection (Theoretical method), Cracking in structural concrete members, Calculation of deflections and crack width.

6 Hours

UNIT - 4

DESIGN OF BEAMS: Design procedures for critical sections for moment and shears. Anchorages of bars, check for development length, Reinforcement requirements, Slenderness limits for beams to ensure lateral stability, Design examples for Simply supported and Cantilever beams for rectangular and flanged sections.

8 Hours

PART - B

UNIT - 5

DESIGN OF SLABS: General consideration of design of slabs, Rectangular slabs spanning one direction, Rectangular slabs spanning in two directions for various boundary conditions. Design of simply supported, cantilever and continuous slabs as per IS: 456 – 2000.

8 Hours

UNIT - 6

DESIGN OF COLUMNS: General aspects, effective length of column, loads on columns, slenderness ratio for columns, minimum eccentricity, design of short axially loaded columns, design of column subject to combined axial load and uniaxial moment and biaxial moment using SP – 16 charts.

5 Hours

UNIT - 7

DESIGN OF FOOTINGS: Introduction, load for footing, Design basis for limit state method, Design of isolated rectangular footing for axial load and uniaxial moment, design of pedestal.

6 Hours

UNIT - 8

DESIGN OF STAIR CASES: General features, types of stair case, loads on stair cases, effective span as per IS code provisions, distribution of loading on stairs, Design of stair cases. With waistslabs.

6 Hours

REFERENCE BOOKS:

1. **Limit State Design of Reinforced concrete-**by P.C. Varghese, PHI Learning Private Limited 2008-2009
2. **Fundamentals of Reinforced concrete Design-**by M.L.Gambhir, PHI Learning Private Limited 2008-2009.
3. **Reinforced concrete Design-**by Pallai and Menon, TMH Education Private Limited,
4. **Reinforced concrete Design-**by S.N.Shinha, TMH Education Private Limited,

5. **Reinforced concrete Design**-by Karve & Shaha, Structures Publishers Pune.
6. **Design of RCC Structural Elements** S. S. Bhavikatti, Vol-I, New Age International Publications, New Delhi.
7. **IS-456-2000 and SP-16**

GEOTECHNICAL ENGINEERING – I

Subject Code	**: 10CV54**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT- 1

INTRODUCTION: History of soil mechanics, Definition, origin and formation of soil. Phase Diagram, Voids ratio, Porosity, Percentage Air Voids, Air content, Degree of saturation, Water content, Specific Gravity of soil solids and soil mass, Densities and Unit weights - Bulk, Dry, Saturated & Submerged and their inter relationships.

6 Hours

UNIT - 2

INDEX PROPERTIES OF SOIL AND THEIR DETERMINATION: Index Properties of soil- Water content , Specific Gravity, Particle size distribution, Relative Density, Consistency limits and indices, in-situ density, Activity of Clay, Laboratory methods of determination of index properties of soil: Water content (Oven Drying method & Rapid Moisture method), Specific gravity of soil solids (Pycnometer and density bottle method), Particle size distribution (Sieve analysis and Hydrometer analysis only), Liquid Limit- (Casagrande and Cone penetration methods), Plastic limit and shrinkage limit.

7 Hours

UNIT - 3

CLASSIFICATION OF SOILS: Purpose of soil classification, Particle size classification – MIT classification and IS classification, Textural classification. IS classification - Plasticity chart and its importance, Field identification of soils.

CLAY MINERALOGY AND SOIL STUCTURE: Single grained, honey combed, flocculent and dispersed structures, Valence bonds, Soil-Water system, Electrical diffuse double layer, adsorbed water, base-exchange capacity, Isomorphous substitution. Common clay minerals in soil and their structures- Kaolinite, Illite and Montmorillonite.

8 Hours

UNIT - 4

FLOW OF WATER THROUGH SOILS: Darcy's law- assumption and validity, coefficient of permeability and its determination (laboratory and field), factors affecting permeability, permeability of stratified soils, Seepage

velocity, Superficial velocity and coefficient of percolation, quick sand phenomena, Capillary Phenomena.

6 Hours

PART - B

UNIT - 5

SHEAR STRENGTH OF SOIL: Concept of shear strength, Mohr-coulomb theory, conventional and modified failure envelops, Effective stress concept-total stress, effective stress and Neutral stress, Concept of pore pressure, Total and effective shear strength parameters, factors affecting shear strength of soils, Sensitivity and Thixotropy of clay.

7 Hours

UNIT - 6

COMPACTION OF SOIL: Definition, Principle of compaction, Standard and Modified proctor's compaction tests, factors affecting compaction, effect of compaction on soil properties, Field compaction control – compactive effort & method, lift thickness and number of passes, Proctor's needle, Compacting equipment.

6 Hours

UNIT - 7

CONSOLIDATION OF SOIL: Definition, Mass-spring analogy, Terzaghi's one dimensional consolidation theory-assumption and limitations (no derivation), Normally consolidated, under consolidated and over consolidated soils, pre-consolidation pressure and its determination by Casagrande's method. Consolidation characteristics of soil (C_c, a_v, m_v and C_v).

UNIT- 8

DETERMINATION OF SHEAR STRENGTH AND CONSOLIDATION OF SOIL: Measurement of shear parameters- Direct shear test, unconfined compression test, Triaxial compression test and vane shear test, Test under different drainage conditions.

Laboratory one dimensional consolidation test, Determination of consolidation characteristics of soils-compression index and coefficient of consolidation (square root of time fitting method, logarithmic time fitting method).

6 Hours

TEXT BOOKS:

1. **Soil Mechanics and Foundation Engg**.- Punmia B.C. (2005), 16th Edition Laxmi Publications Co. , New Delhi.
2. **Principles of Soil Mechanics and Foundation Engineering**-Murthy V.N.S. (1996), 4th Edition, UBS Publishers and Distributors, New Delhi.

3. **Geotechnical Engineering**; Braja, M. Das (2002), Fifth Edition, Thomson Business Information India (P) Ltd., India

REFERENCES BOOKS:

1. **Foundation Analysis and Design**- Bowles J.E. (1996), 5th Edition, McGraw Hill Pub. Co. New York.
2. **Soil Engineering in Theory and Practice**- Alam Singh and Chowdhary G.R. (1994), CBS Publishers and Distributors Ltd., New Delhi.
3. **Basic and Applied Soil Mechanics**- Gopal Ranjan and Rao A.S.R. (2000), New Age International (P) Ltd., Newe Delhi.
4. **Geotechnical Engineering**- Donold P Coduto Phi Learning Private Limited, New Delhi
5. **Geotechnical Engineering**- Shashi K. Gulathi & Manoj Datta. (2009), " Tata Mc Graw Hill.
6. **Text Book of Geotechnical Engineering**- Iqbal H. Khan (2005),, 2nd Edition, PHI, India.
7. **Numerical Problems, Examples and objective questions in Geotechnical Engineering**- Narasimha Rao A. V. & Venkatrahmaiah C. (2000), Universities Press., Hyderabad.

Hydrology and Irrigation Engineering

Sub Code	**:**	**10CV55**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART-A
HYDROLOGY

UNIT 1: INTRODUCTION & PRECIPITATION

Introduction ,Hydrologic cycle (Horton's representation). Water budget equation

Precipitation: introduction, forms of precipitation, types of precipitation, measurement of precipitation (Simon's gauge & Syphon gauge only), selection of rain gauge station. Adequacy of raingauges, methods of computing average rainfall, interpolation of missing data, adjustment of missing data by double mass curve method. Hyetograph and mass curve of rainfall, 07 hrs

UNIT 2 : LOSSES FROM PRECIPITATION

Evaporation: Definition, factors affecting, measurement (Class A pan). Estimation using empirical methods (Meyer's and Rohwer's equation), evaporation control.
Evapo-transpiration: Definition, factors affecting, measurement, estimation (Blaney criddle method)
Infiltration: Definition, factors affecting, measurement (double ring infiltrometer), infiltration indices, Horton's equation of infiltration. 07 hrs

UNIT 3: HYDROGRAPHS
Definition, components of hydrographs, unit hydrograph and its derivation from simple storm hydrograph, base flow separation, Prepositions of unit hydrograph- problems
06 hrs

UNIT 4: ESTIMATION OF FLOOD & FLOOD ROUTING
Definition of flood, factors affecting flood, methods of estimation (envelope curves, empirical formulae, rational method).
Flood routing: Introduction to hydrological routing, relationship of out flow and storage, general storage equation, Muskingum routing method. 07 hrs

PART-B
IRRIGATION ENGINEERING

UNIT 5 : INTRODUCTION
Introduction, need for irrigation, advantages and disadvantages of irrigation, environmental impacts of irrigation, Systems of irrigation: Gravity irrigation, lift irrigation, well irrigation, tube well irrigation, infiltration galleries, sewage irrigation, supplemental irrigation.
06 hrs

UNIT 6: SOIL-WATER-CROP RELATIONSHIP

Introduction, soil profile, physical properties of soil, soil classification. Indian soils, functions of irrigation soils, maintaining soil fertility, soil-water-plant relationship, soil-moisture. Irrigation relationship, frequency of irrigation.
06 hrs

UNIT 7: WATER REQUIREMENT OF CROPS

Introduction, definitions, crop seasons of India, water requirement of a crop, duty, delta, base period. Consumptive use. Irrigation efficiencies. Assessment of irrigation water.

07 hrs

Unit 8: Canals

Definition, Types of canals, Alignment of canals, Design of canals by Kenedy's and Lacey's methods- Problems
06 hrs

TEXT BOOKS:

1. Engineering Hydrology – Subramanya.K; Tata Mcgraw Hill NewDelhi-2008 (Ed)

2. Hydrology- Madan Mohan Das, Mim Mohan Das-PHI Learning private Ltd. New Delhi-2009 (Ed)

3. A Text Book Of Hydrology- Jayarami Reddy, Laksmi Publications, New Delhi-2007 (Ed)

4. Irrigation, water Resources and water power Engineering- P.N.Modi- standard book house, New Delhi.

5. Irrigation and Water Power Engineering-Madan Mohan Das & Mimi Das Saikia; PHILearning pvy. Ltd. New Delhi 2009 (Ed).

REFERENCE BOOKS:

1. Hydrology & Soil Conservation Engineering- Ghanshyam Das- PHI Learning Private Ltd., New Delhi- 2009 (Ed)

2. Hydrology & Water Resources Engineering- Patra K.C. Narosa Book Distributors Pvt. Ltd. New Delhi-2008 (Ed)

3. Hydrology & Water Resources Engineering- R.K.Sharma & Sharma, Oxford and Ibh, New Delhi

4. Irrigation Engineering and Hydraulic structures- S. K. garg- Khanna Publication, New Delhi.

TRANSPORTATION ENGINEERING I

Subject Code :10CV56
I A Marks :25
No. of lecture Hours/week :04
Exam Hours :03
Total No. of Lecture Hours :52
Exam Marks :100

PART – A

UNIT – 1

PRINCIPLES OF TRANSPORTATION ENGINEERING: Importance of transportation, Different modes of transportation and comparison, Characteristics of road transport Jayakar committee recommendations, and implementation – Central Road Fund, Indian Roads Congress, Central Road Research Institute

04 Hrs

UNIT – 2

HIGHWAY DEVELOPMENT AND PLANNING: Road types and classification, road patterns, planning surveys, master plan – saturation system of road planning, phasing road development in India, problems on best alignment among alternate proposals Salient Features of 3rd and 4th twenty year

road development plans and Policies, Present scenario of road development in India (NHDP & PMGSY) and in Karnataka (KSHIP & KRDCL) Road development plan - vision 2021.

06 Hrs

UNIT – 3

HIGHWAY ALIGNMENT AND SURVEYS: Ideal Alignment, Factors affecting the alignment, Engineering surveys-Map study, Reconnaissance, Preliminary and Final location & detailed survey, Reports and drawings for new and re-aligned projects **04 Hrs**

HIGHWAY GEOMETRIC DESIGN – I: Importance, Terrain classification, Design speed, Factors affecting geometric design, **Cross sectional elements**-Camber- width of pavement-Shoulders-, Width of formation- Right of way, Typical cross sections **05 Hrs**

UNIT – 4

HIGHWAY GEOMETRIC DESIGN – II: Sight Distance-Restrictions to sight distance- Stopping sight distance-Overtaking sight distance- overtaking zones- Examples on SSD and OSD- Sight distance at intersections, **Horizontal alignment**-Radius of Curve- Superelevation – Extra widening-Transition curve and its length, setback distance – Examples, **Vertical alignment**-Gradient-summit and valley curves with examples. **07 Hrs**

PART - B

UNIT – 5

PAVEMENT MATERIALS: Subgrade soil - desirable properties-HRB soil classification-determination of CBR and modulus of subgrade reaction-Examples on CBR and Modulus of subgrade reaction, **Aggregates-** Desirable properties and list of tests, **Bituminous materials**-Explanation on Tar, bitumen,cutback and emulsion-List of tests on bituminous materials **06 Hrs**

UNIT – 6

PAVEMENT DESIGN: Pavement types, component parts of flexible and rigid pavements and their functions,design factors, ESWL and its determination-Examples, **Flexible pavement**-Design of flexible pavements as per IRC;37-2001-Examples, **Rigid pavement**- Westergaard's equations for load and temperature stresses- Examples- Design of slab thickness only as per IRC:58-2002

06 Hrs

UNIT – 7

PAVEMENT CONSTRUCTION: Earthwork –cutting-Filling, Preparation of subgrade, Specification and construction of i) Granular Subbase, ii) WBM Base, iii) WMM base, iv) Bituminous Macadam, v) Dense Bituminous Macadam vi) Bituminous Concrete, vii) Dry Lean Concrete sub base and PQC viii) concrete roads **05 Hrs**

HIGHWAY DRAINAGE: Significance and requirements, Surface drainage system and design-Examples, sub surface drainage system, design of filter materials

03 Hrs

UNIT – 8

HIGHWAY ECONOMICS: Highway user benefits, VOC using charts only-Examples, Economic analysis - annual cost method-Benefit Cost Ratio method-NPV-IRR methods-Examples, Highway financing-BOT-BOOT concepts

06 Hrs

TEXT BOOKS:

1. **Highway Engineering –** S K Khanna and C E G Justo, Nem Chand Bros, Roorkee

2. **Highway Engineering** - L R Kadiyali, Khanna Publishers, New Delhi
3. **Transportation Engineering** – K P Subramanium, Scitech Publications, Chennai
4. **Transportation Engineering – James** H Banks, Mc. Graw. Hill Pub. New Delhi
5. **Highway Engineeering** –R. Sreenivasa Kumar, University Press. Pvt.Ltd. Hyderabad

REFERENCE BOOKS:

1. **Relevant IRC Codes**
2. **Specifications for Roads and Bridges-MoRT&H, IRC, New Delhi.**
3. **Transportation Engineering** – C. Jotin Khisty, B. Kent lal, PHI Learning Pvt. Ltd. New Delhi.

VI SEMESTER

ENVIRONMENTAL ENGINEERING-I

Subject Code	: 10CV61	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

Part - A

Unit - 1

INTRODUCTION: Human activities and environmental pollution. Water for various beneficial uses and quality requirement. Need for protected water supply.

2 Hours

DEMAND OF WATER: Types of water demands- domestic demand in detail, institutional and commercial, public uses, fire demand. Per capita consumption –factors affecting per capita demand, population forecasting, different methods with merits &demerits- variations in demand of water. Fire demand – estimation by Kuichling's formula, Freeman formula & national board of fire underwriters formula, peak factors, design periods & factors governing the design periods

6 Hours

Unit - 2

SOURCES: Surface and subsurface sources – suitability with regard to quality and quantity.

3 Hours

COLLECTION AND CONVEYANCE OF WATER: Intake structures – different types of intakes; factor of selection and location of intakes. Pumps- Necessity, types – power of pumps; factors for the selection of a pump. Pipes – Design of the economical diameter for the rising main; Nomograms – use; Pipe appurtenances.

6 Hours

Unit - 3

QUALITY OF WATER: Objectives of water quality management. wholesomeness & palatability, water borne diseases. Water quality parameters – Physical, chemical and Microbiological. Sampling of water for examination. Water quality analysis (IS: 3025 and IS: 1622) using analytical and instrumental techniques. Drinking water

standards BIS & WHO guidelines. Health significance of Fluoride, Nitrates and heavy metals like Mercury, Cadmium, Arsenic etc. and toxic / trace organics.

6 Hours

Unit - 4

WATER TREATMENT: Objectives – Treatment flow-chart. Aeration-Principles, types of Aerators.

2 Hours

SEDIMENTATION: Theory, settling tanks, types, design. Coagulant aided sedimentation, jar test, chemical feeding, flash mixing, and clari-flocculator.

4 Hours

Part - B

Unit - 5

FILTRATION: Mechanism – theory of filtration, types of filters, slow sand, rapid sand and pressure filters including construction, operation, cleaning and their design – excluding under drainage system – back washing of filters. Operational problems in filters.

6 Hours

Unit - 6

DISINFECTION: Theory of disinfection, types of disinfection, Chlorination, chlorine demand, residual chlorine, use of bleaching powder. UV irradiation treatment – treatment of swimming pool water

4 Hours

SOFTENING – definition, methods of removal of hardness by lime soda process and zeolite process RO & Membrane technique.

3 Hours

Unit - 7

MISCELLANEOUS TREATMENT: Removal of color, odor, taste, use of copper sulfate, adsorption technique, fluoridation and defluoridation.

4 Hours

DISTRIBUTION SYSTEMS: System of supply, service reservoirs and their capacity determination, methods of layout of distribution systems.

4
Hours

Unit - 8

MISCELLANEOUS: Pipe appurtenances, various valves, type of fire hydrants, pipefitting, Layout of water supply pipes in buildings.

2
Hours

TEXT BOOKS:

1. Water supply Engineering –S.K.Garg, Khanna Publishers
2. Environmental Engineering I –B C Punima and Ashok Jain
3. Manual on Water supply and treatment –CPHEEO, Minstry of Urban Development, New Delhi

REFERENCES

1. Hammer, M.J., (1986), **Water and Wastewater Technology** –SI Version, 2nd Edition, John Wiley and Sons.

2. Karia, G.L., and Christian, R.A., (2006), **Wastewater Treatment – Concepts and Design Approach,** Prentice Hall of India Pvt. Ltd., New Delhi.

3. Metcalf and Eddy, (2003), **Wastewater Engineering, Treatment and Reuse ,** 4th Edition, Tata McGraw Hill Edition, Tata McGraw Hill Publishing Co. Ltd.

4. Peavy, H.S., Rowe, D.R., and Tchobanoglous, G., (1986),**Environmental Engineering**–Mc Graw Hill Book Co.

5. Raju, B.S.N., (1995), **Water Supply and Wastewater Engineering, T**ata McGraw Hill Pvt. Ltd., New Delhi.

6. Sincero, A.P., and Sincero, G.A., (1999), **Environmental Engineering – A Design Approach**–Prentice Hall of India Pvt. Ltd., New Delhi.

GEOTECHNICAL ENGINEERING – II

Subject Code	**: 10CV64**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

SUBSURFACE EXPLORATION: Importance of exploration program, Methods of exploration: Boring, Seismic refraction method of grophysical exploration, Types of samples - undisturbed, disturbed and representative samples, Samplers, sample disturbance, area ratio, Recovery ratio, clearance, Stabilisation of boreholes - Typical bore log. Number and depth of borings for various civil engineering structures, soil exploration report.

DRAINAGE AND DEWATERING: Determination of ground water level by Hvorselev's method, Control of ground water during excavation: Dewatering - Ditches and sumps, well point system, Vacuum method, Electro- Osmosis method.

8 Hours

UNIT - 2

STRESSES IN SOILS: Boussinesq's and Westergaard's theories for concentrated, circular and rectangular loads. Comparison of Boussinesq's and westergaard's analysis. Pressure distribution diagrams, Contact pressure, Newmark's chart.

6 Hours

UNIT - 3

FLOWNETS: Laplace equation (no derivation) assumptions and limitations only, characteristics and uses of flownets, Methods of drawing flownets for Dams and sheet piles. Estimating quantity of seepage and Exit gradient. Determination of phreatic line in earth dams with and without filter. Piping and protective filter.

5 Hours

UNIT - 4

LATERAL EARTH PRESSURE: Active and Passive earth pressures, Earth pressure at rest. Rankine's and Coulomb's Earth pressure theories-–assumptions and limitations, Graphical solutions for active earth pressure (cohesionless soil only) – Culmann's and Rebhann's methods, Lateral earth pressure in cohesive and cohesionless soils, Earth pressure distribution.

7 Hours

PART - B

UNIT - 5

STABILITY OF EARTH SLOPES: Types of slopes, causes and type of failure of slopes. Definition of factor of safety, Stability of infinite slopes, Stability of finite slopes by Method of slices and Friction Circle method, Taylor's stability number, Fellineous method,.

7 Hours

UNIT - 6

BEARING CAPACITY: Definitions of ultimate, net and safe bearing capacities, Allowable bearing pressure. Terzaghi's and Brinch Hansen's bearing capacity equations - assumptions and limitations, Bearing capacity of footing subjected to eccentric loading. Effect of ground water table on bearing capacity. Field methods of evaluation of bearing capacity - Plate load test, Standard penetration test and cone penetration test.

8 Hours

UNIT - 7

FOUNDATION SETTLEMENT: Importance and Concept of Settlement Analysis, Immediate, Consolidation and Secondary settlements (no derivations, but, computation using relevant formula for Normally Consolidated soils), Tolerance. BIS specifications for total and differential settlements of footings and rafts.

5 Hours

UNIT – 8

PROPORTIONING SHALLOW AND PILE FOUNDATIONS

Allowable Bearing Pressure, Factors influencing the selection of depth of foundation, Factors influencing Allowable Bearing Pressure, Factors influencing the choice of foundation, Proportioning isolated, combined, strip and mat foundations, Classification of pile foundation, Pile load capacity, Proportioning pile foundation.

6 Hours

TEXT BOOKS:

1. **Soil Engineering in Theory and Practice**- Alam Singh and Chowdhary G.R. (1994), CBS Publishers and Distributors Ltd., New Delhi.
2. **Soil Mechanics and Foundation Engg.**- Punmia B.C. (2005), 16th Edition Laxmi Publications Co. , New Delhi.

REFERENCES BOOKS:

1. **Foundation Analysis and Design**- Bowles J.E. (1996), 5th Edition, McGraw Hill Pub. Co. New York.

2. **Soil Mechanics and Foundation Engineering**- Murthy V.N.S. (1996), 4th Edition, UBS Publishers and Distributors, New Delhi.
3. **Basic and Applied Soil Mechanics**- Gopal Ranjan and Rao A.S.R. (2000), New Age International (P) Ltd., Newe Delhi.
4. **Geotechnical Engineering**- Venkatrahmaiah C. (2006), 3rd Edition New Age International (P) Ltd., Newe Delhi.
5. **Soil Mechanics**- Craig R.F. (1987), Van Nostrand Reinhold Co. Ltd.
6. **Principles of Geotechnical Engineering**- Braja M. Das (2002), 5th Edition, Thomson Business Information India (P) Ltd., India.
7. **Text Book of Geotechnical Engineering**- Iqbal H. Khan (2005), 2nd Edition, PHI, India.

ALTERNATIVE BUILDING MATERIALS AND TECHNOLOGIES

Subject Code	**: 10CV662**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1
INTRODUCTION:

1. Energy in building materials
2. Environmental issues concerned to building materials
3. Global warming and construction industry
4. Environmental friendly and cost effective building technologies.
5. Requirements for building of different climatic regions.
6. Traditional building methods and vernacular architecture.

6 Hours

UNIT - 2
ALTERNATIVE BUILDING MATERIALS:

1. Characteristics of building blocks for walls
2. Stones and Laterite blocks
3. Bricks and hollow clay blocks
4. Concrete blocks
5. Stabilized blocks: Mud Blocks, Steam Cured Blocks, Fal-G Blocks and Stone Masonry Block

6 Hours

UNIT - 3
LIME-POZZOLANA CEMENTS

1. Raw materials
2. Manufacturing process
3. Properties and uses
4. Fibre reinforced concretes
5. Matrix materials
6. Fibers : metal and synthetic
7. Properties and applications
8. Fibre reinforced plastics
9. Matrix materials
10. Fibers : organic and synthetic
11. Properties and applications
12. Building materials from agro and industrial wastes
13. Types of agro wastes

14. Types of industrial and mine wastes
15. Properties and applications
16. Field quality control test methods

6 Hours

UNIT - 4
ALTERNATIVE BUILDING TECHNOLOGIES

1. Alternative for wall construction
2. Types
3. Construction method
4. Masonry mortars
5. Types
6. Preparation
7. Properties
8. Ferrocement and ferroconcrete building components
9. Materials and specifications
10. Properties
11. Construction methods
12. Applications
13. Alternative roofing systems
14. Concepts
15. Filler slabs
16. Composite beam panel roofs
17. Masonry vaults and domes

8 ours

PART - B

UNIT - 5
STRUCTURAL MASONRY

1. Compressive strength of masonry elements
2. Factors affecting compressive strength
3. Strength of units, prisms / wallettes and walls
4. Effect of brick work bond on strength
5. Bond strength of masonry : Flexure and shear
6. Elastic properties of masonry materials and masonry

6 Hours

UNIT - 6

1. IS Code provisions
2. Design of masonry compression elements
3. Concepts in lateral load resistance

8 Hours

UNIT - 7
COST EFFECTIVE BUILDING DESIGN
1. Cost concepts in buildings
2. Cost saving techniques in planning, design and construction
3. Cost Analysis : Case studies using alternatives.

6 Hours

UNIT - 8
EQUIPMENT FOR PRODUCTION OF ALTERNATIVE MATERIALS
1. Machines for manufacture of concrete
2. Equipments for production of stabilized blocks
3. Moulds and methods of production of precast elements.

6 Hours

TEXT BOOKS:
1. **Alternative building methodologies for engineers and architects, lecture notes edited**: K.S. Jagadish and B.V. Venkatarama Reddy, Indian Institute of cience, Bangalore.
2. **Structural Masonry** by Arnold W. Hendry.

REFERENCE BOOKS:
1. **Relevant IS Codes.**
2. **Alternative building materials and technologies.**
3. **Proceedings of workshop on Alternative building material and technology,** 19th to 20th December 2003 @ BVB College of Engineering. & Tech., Hubli.

GROUND WATER HYDROLOGY

Subject Code	**: 10CV665**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1
INTRODUCTION: Importance. Vertical distribution of sub-surface water. Occurrence in different types of rocks and soils. Definition of aquifer, Aquifuge, Aquitard and Aquiclude. Confined and unconfined aquifers.

6 Hours

UNIT - 2
AQUIFER PROPERTIES: Aquifer parameters – Specific yield, Specific retention, Porosity, Storage coefficient, derivation of the expression. Determination of specific yield. Land subsidence due to ground water withdrawals.

6 Hours

UNIT - 3
DARCY'S LAW AND HYDRAULIC CONDUCTIVITY: Introduction. Darcy's law. Hydraulic conductivity. Coefficient of permeability and Intrinsic permeability, Transmissibility, Permeability in Isotropic, Unisotropic layered soils. Steady one dimensional flow, different cases with recharge.

7 Hours

UNIT - 4
WELL HYDRAULICS – STEADY FLOW: Introduction. Steady radial flow in confined and unconfined aquifers. Pumping tests.

7 Hours

PART - B

UNIT - 5
WELL HYDRAULICS – UNSTEADY FLOW: Introduction. General equation derivation; Theis method, Cooper and JaCob method, Chow's method. Solution of unsteady flow equations.

7 Hours

UNIT - 6

GROUND WATER DEVELOPMENT: Types of wells. Methods of constructions. Tube well design. Dug wells. Pumps for lifting water: Working principles, Power requirements.

7 Hours

UNIT - 7

GROUND WATER EXPLORATION: Seismic method, Electrical resistivity method, Bore hole geo-physical techniques; Electrical logging, Radio active logging, Induction logging, Sonic logging and Fluid logging.

6 Hours

UNIT - 8

GROUND WATER RECHARGE AND RUNOFF: Recharge by vertical leakage. Artificial recharge. Ground water runoff. Ground water budget.

6 Hours

TEXT BOOKS:

1. **Ground Water**- H.M. Raghunath, - Wiley Eastern Limited, New Delhi.
2. **Ground Water Hydrology**- K. Todd, - Wiley and Sons, New Delhi.
3. **Numerical Ground Water Hydrology**- A.K. Rastogi, - Penram, International Publishing (India), Pvt. Ltd., Mumbai.

REFERENCE BOOKS:

1. **Ground Water Hydrology**- Bower H.- McGraw Hill, New Delhi.
2. **Ground Water and Tube Wells**- Garg Satya Prakash, - Oxford and IBH, New Delhi.
3. **Ground Water Resource Evaluation**- W.C. Walton, - McGraw Hill - Kogakusha Ltd., New Delhi.
4. **Water wells and Pumps** – Michel D.M., Khepar. S.D., Sondhi. S.K., McGraw Hill Education – 2nd Edition.

TRAFFIC ENGINEERING

Subject Code	**: 10CV667**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

INTRODUCTION: Definition, objectives of Traffic Engineering and scope of Traffic Engineering.

2

Hours

UNIT - 2

TRAFFIC CHARACTERISTICS: Road user characteristics, vehicular characteristics – static and dynamic characteristics, power

performance of vehicles, Resistance to the motion of vehicles – Reaction time of driver – Problems on above.

6 Hours

UNIT - 3

TRAFFIC STUDIES: Various types of traffic engineering studies, data collection, analysis objectives and method of study – Definition of study area – Sample size and analysis.

6 Hours

UNIT - 4

INTERPRETATION OF TRAFFIC STUDIES: Classified traffic Volume at mid block and intersections, PCU, origin and destination, spot speed, speed and delay, parking – on street parking, off street parking, Accident – causes, analysis measures to reduce accident – problems on above.

6 Hours

PART - B

UNIT - 5

TRAFFIC FLOW THEORIES: Traffic flow theory, Green shield theory – Goodness of fit, - correlation and regression analysis (linear only) – Queuing theory, Car following theory and relevant problems on above.

8 Hours

UNIT - 6

STATISTICAL ANALYSIS: Poisson's distribution and application to traffic engineering. Normal Distribution – Significance tests for observed traffic data, Chi Square test – problems on above. Traffic forecast – simulation technique.

12 Hours

UNIT - 7

TRAFFIC REGULATION AND CONTROL: Driver, vehicle and road controls – Traffic regulations – one way – Traffic markings, Traffic signs, Traffic signals – Vehicle actuated and synchronized signals – Signals co-ordination. Webster's method of signal design, IRC method, traffic rotary elements and designs, traffic operation – Street lighting, Road side furniture, Relevant problems on above.

10 Hours

UNIT - 8

INTELLIGENT TRANSPORT SYSTEM: Definition, Necessities, Application in the present traffic scenario

2 Hours

TEXT BOOKS:

1. **Traffic Engineering & Transport Planning** – L.R. Kadiyali- Khanna Publishers.
2. **Highway Engineering Nemchand & Bros**- Khanna & Justo- Roorkee (UA).
3. **Traffic Engg.** - Matson & Smith:-Mc.Graw Hill and Co.
4. **Traffic flow theory** – Drew- Mc. Graw Hill and Co.

REFERENCE BOOKS:

1. **Traffic Engineering.** Pignataro- Prentice Hall.
2. **Highway Capacity Manual** – 2000.
3. **An introduction to traffic engineering**- Jotin Khistey and Kentlal- PHI.
4. **Traffic Engineering**- Mc Shane & Roess- PHI.

ESTIMATION & VALUATION

Subject Code	**: 10CV73**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

ESTIMATION: Study of various drawings with estimates, important terms, units of measurement, abstract Methods of taking out quantities and cost – center line method, long and short wall method or crossing method. Preparation of detailed and abstract estimates for the following Civil Engineering works – Buildings – RCC framed structures with flat, sloped RCC roofs with all Building components.

16 Hours

PART - B

ESTIMATE: Different type of estimates, approximate methods of estimating buildings, cost of materials. Estimation of wooden joineries such as doors, windows & ventilators.

5 Hours

ESTIMATES: Steel truss (Fink and Howe truss), manhole and septic tanks, RCC Culverts.

6 Hours

SPECIFICATIONS: Definition of specifications, objective of writing specifications, essentials in specifications, general and detail specifications of common item of works in buildings.

5 Hours

PART - C

RATE ANALYSIS: Definition and purpose. Working out quantities and rates for the following standard items of works – earth work in different types of soils, cement concrete of different mixes, bricks and stone masonry, flooring, plastering, RCC works, centering and form work for different RCC items, wood and steel works for doors, windows and ventilators.

6 Hours

MEASUREMENT OF EARTHWORK FOR ROADS: Methods for computation of earthwork – cross sections – mid section formula or average end area or mean sectional area, trapezoidal & prismoidal formula with and without cross slopes.

6 Hours

CONTRACTS: Types of contract – essentials of contract agreement – legal aspects, penal provisions on breach of contract. Definition of the terms – Tender, earnest money deposit, security deposit, tender forms, documents and types. Acceptance of contract documents. Termination of contract, completion certificate, quality control, right of contractor, refund of deposit. Administrative approval – Technical sanction. Nominal muster roll, measurement books – procedure for recording and checking measurements – preparation of bills.

Valuation- Definitions of various terms, method of valuation, Freehold & Leasehold properties, Sinking fund, depreciation and method of estimating depreciation, Outgoings.

8 Hours

REFERENCE BOOKS:

1. **Estimating & Costing**, B. N. Dutta, Chand Publisher
2. **Quantity Surveying**- P.L. Basin S. Chand : New Delhi.
3. **Estimating & Specification** - S.C. Rangwala :: Charotar publishing house, Anand.
4. **Text book of Estimating & Costing**- G.S. Birde, Dhanpath Rai and sons : New Delhi.
5. **A text book on Estimating, Costing and Accounts**- D.D. Kohli and R.C. Kohli S. Chand : New Delhi.
6. **Contracts and Estimates,** B. S. Patil, University Press, 2006.

DESIGN OF PRE-STRESSED CONCRETE STRUCTURES

Subject Code	**: 10CV74**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

MATERIALS: High strength concrete and steel, Stress-Strain characteristics and properties.

2 Hours

BASIC PRINCIPLES OF PRESTRESSING: Fundamentals, Load balancing concept, Stress concept, centre of Thrust. Pre-tensioning and post-tensioning systems, tensioning methods and end anchorages.

4 Hours

UNIT - 2

ANALYSIS OF SECTIONS FOR FLEXURE: Stresses in concrete due to pre-stress and loads, stresses in steel due to loads, Cable profiles.

8 Hours

UNIT - 3

LOSSES OF PRE-STRESS: Various losses encountered in pre-tensioning and post tensioning methods, determination of jacking force.

6 Hours

UNIT - 4

DEFLECTIONS: Deflection of a pre-stressed member – Short term and long term deflections, Elastic deflections under transfer loads and due to different cable profiles. Deflection limits as per IS 1343. Effect of creep on deflection, load verses deflection curve, methods of reducing deflection

6 Hours

PART - B

UNIT - 5

LIMIT STATE OF COLLAPSE: Flexure -IS Code recommendations – Ultimate flexural strength of sections.

5 Hours

UNIT - 6

LIMIT STATE OF COLLAPSE (cont…): Shear - IS Code recommendations, shear resistance of sections, shear reinforcement. Limit state of serviceability – control of deflections and cracking.

7 Hours

UNIT - 7

DESIGN OF END BLOCKS: Transmission of prestress in pretensioned members, transmission length, Anchorage stress in post-tensioned members. Bearing stress and bursting tensile force-stresses in end blocks-Methods, I.S. Code, provision for the design of end block reinforcement.

6 Hours

UNIT - 8

DESIGN OF BEAMS: Design of pre-tensioned and post-tensioned symmetrical and asymmetrical sections. Permissible stress, design of prestressing force and eccentricity, limiting zone of pre-stressing force cable profile.

8 Hours

REFERENCE BOOKS:

1. **Pre-stressed Concrete**- N. Krishna Raju - Tata Mc. Graw Publishers.
2. **Pre-stressed Concrete**- P. Dayarathnam : Oxford and IBH Publishing Co.

3. **Design of pre-stressed concrete structures**- T.Y. Lin and Ned H. Burns - John Wiley & Sons, New York.
4. **Fundamental of pre-stressed concrete**- N.C. Sinha & S.K. Roy
5. IS : 1343 : 1980
6. **Pre-stressed Concrete**- N. Rajgopalan

PAVEMENT MATERIALS AND CONSTRUCTION

Subject Code	**: 10CV763**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A
PAVEMENT MATERIALS

UNIT - 1
AGGREGATES: Origin, classification, requirements, properties and tests on road aggregates, concepts of size and gradation – design gradation, maximum aggregate size, aggregate blending by different methods to meet specification.

6 Hours

UNIT - 2
BITUMEN AND TAR: Origin, preparation, properties and chemical constitution of bituminous road binders; requirements.

4 Hours

UNIT - 3
BITUMINOUS EMULSIONS AND CUTBACKS: Preparation, characteristics, uses and tests. Adhesion of Bituminous Binders to Road Aggregates: Adhesion failure, mechanism of stripping, tests and methods of improving adhesion.

8 Hours

UNIT - 4
BITUMINOUS MIXES: Mechanical properties, dense and open textured mixes, flexibility and brittleness, (no Hveem Stabilometer & Hubbar – Field Tests) bituminous mix, design methods using Rothfuch's Method only and

specification, Marshal mixed design criteria- voids in mineral aggregates, voids in total mix, density, flow, stability, percentage voids filled with bitumen.

6 Hours

PART - B

PAVEMENT CONSTRUCTION

UNIT - 5

EQUIPMENT IN HIGHWAY CONSTRUCTION: Various types of equipment for excavation, grading and compaction – their working principle, advantages and limitations. Special equipment for bituminous and cement concrete pavement and stabilized soil road construction.

6 Hours

UNIT - 6

SUBGRADE: Earthwork grading and construction of embankments and cuts for roads. Preparation of subgrade, quality control tests.

6 Hours

UNIT - 7

FLEXIBLE PAVEMENTS: Specifications of materials, construction method and field control checks for various types of flexible pavement layers.

8 Hours

UNIT - 8

CEMENT CONCRETE PAVEMENTS: Specifications and method of cement concrete pavement construction (PQC Importance of providing DLC as sub-base and polythene thin layer between PQC and sub-base); Quality control tests; Construction of various types of joints.

8 Hours

TEXT BOOKS:

1. **Highway Engineering**- Khanna, S.K., and Justo, C.E.G., : Nem Chand and Bros. Roorkee
2. **Construction Equipment and its Management**- Sharma, S.C. : Khanna Publishers.
3. **Hot Mix Asphalt Materials, Mixture Design and Construction**- Freddy L. Roberts, Kandhal, P.S. : University of Texas Austin, Texas. NAPA Education Foundation Lanham, Maryland.

REFERENCES BOOKS:

1. RRL, DSIR, '**Bituminous Materials in Road Construction**', HMSO Publication.
2. RRL, DSIR, '**Soil Mechanics for Road Engineers**', HMSO Publication.
3. Relevant IRC codes and MoRT & H specifications.

CONCRETE AND HIGHWAY MATERIALS LABORATORY

Subject Code	**: 10CVL78**	IA Marks	: 25
No. of Practical Hours/Week	: 03	Exam Hours	: 03
Total No. of Practical Hours	: 42	Exam Marks	: 50

PART - A

CEMENT: Normal Consistency, Setting time, Soundness by Autoclave method, Compression strength test and Air permeability test for fineness, Specific gravity of cement.

FRESH CONCRETE: Workability – slump, Compaction factor and Vee Bee tests.

HARDENED CONCRETE: Compression strength and Split tensile tests. Test on flexural strength of RCC beams, Permeability of concrete.

PART - B

SOIL: Density of Soil by Sand replacement method, CBR Text.

AGGREGATES: Crushing, abrasion, impact and Shape tests (Flaky, Elongation, Angularity number) Specific gravity and water absorption.

BITUMINOUS MATERIALS AND MIXES: Specific Gravity, Penetration,Ductility, Softening point, Flash and fire point, Viscosity, proportioning of aggregate mixes by Rothfutch Method, Marshall Stability tests.

REFERENCE BOOK:

1. Relevant IS Codes and IRC Codes.

2. **Highway Material Testing Laboratory Manual** by Khanna S K and Justo, – CEG Nemi Chand & Bros.
3. M. L. Gambhir : Concrete Manual : Dhanpat Rai & sons New – Delhi.

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VIII -SEMESTER

ADVANCED CONCRETE TECHNOLOGY

Subject Code	**: 10CV81**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

Importance of Bogue's compounds, Structure of a Hydrated Cement Paste, Volume of hydrated product, porosity of paste and concrete, transition Zone, Elastic Modulus, factors affecting strength and elasticity of concrete, Rheology of concrete in terms of Bingham's parameter.

7 Hour

UNIT - 2

CHEMICAL ADMIXTURES- Mechanism of chemical admixture, Plasticizers and super Plasticizers and their effect on concrete property in fresh and hardened state, Marsh cone test for optimum dosage of super plasticizer, retarder, accelerator, Air-entraining admixtures, new generation superplasticiser.

MINERAL ADMIXTURE-Fly ash, Silica fume, GCBS, and their effect on concrete property in fresh state and hardened state.

6 Hours

UNIT - 3

MIX DESIGN - Factors affecting mix design, design of concrete mix by BIS method using IS10262 and current American (ACI)/ British (BS) methods. Provisions in revised IS10262-2004.

6 Hours

UNIT - 4

DURABILITY OF CONCRETE - Introduction, Permeability of concrete, chemical attack, acid attack, efflorescence, Corrosion in concrete. Thermal conductivity, thermal diffusivity, specific heat. Alkali Aggregate Reaction, IS456-2000 requirement for durability.

7 Hours

PART - B

UNIT - 5

RMC concrete - manufacture, transporting, placing, precautions, Methods of concreting- Pumping, under water concreting, shotcrete, High volume fly ash concrete concept, properties, typical mix

Self compacting concrete concept, materials, tests, properties, application and Typical mix.

6 Hours

UNIT - 6

Fiber reinforced concrete - Fibers types and properties, Behavior of FRC in compression, tension including pre-cracking stage and post-cracking stages, behavior in flexure and shear, Ferro cement - materials, techniques of manufacture, properties and application

7 Hours

UNIT - 7

Light weight concrete-materials properties and types. Typical light weight concrete mix High density concrete and high performance concrete-materials, properties and applications, typical mix.

6 Hours

UNIT - 8

Test on Hardened concrete-Effect of end condition of specimen, capping, H/D ratio, rate of loading, moisture condition. Compression, tension and flexure tests. Tests on composition of hardened concrete-cement content, original w/c ratio. NDT tests concepts-Rebound hammer, pulse velocity methods.

7 Hours

TEXT / REFERENCE BOOKS:

1. **Properties of Concrete**- Neville, A.M. - ELBS Edition, Longman Ltd., London
2. **Concrete Technology-** M.S. Shetty
3. **Concrete Technology**- A.R. Santhakumar,-Oxford University Press.
4. **Concrete**- P.K. Mehta, P J M Monteiro,- Prentice Hall, New Jersey (Special Student Edition by Indian Concrete Institute Chennai)
5. ACI Code for Mix Design
6. IS 10262-2004
7. **Concrete Mix Design**- N. Krishna Raju - Sehgal Publishers
8. **Concrete Manual**- Gambhir M.L.- Dhanpat Rai & Sons, New Delhi
9. **Advanced Concrete Technology Processes**- John Newman, Ban Seng Choo, - London.
10. **Advanced Concrete Technology Constituent materials**- John Newman, Ban Seng Choo- London
11. **Non-Destructive Test and Evaluation of Materials**- J.Prasad, C G K Nair,-Mc Graw Hill.
12. **High Performance Concrete**- Prof Aitcin P C- E and FN, London.
13. **Properties of Fresh Concrete**- Power T.C.- E and FN, London

ENVIRONMENTAL IMPACT ASSESSMENT

Subject Code	**: 10CV847**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

Development Activity and Ecological Factors EIA, Rapid and Comprehensive EIA, EIS, FONSI. Need for EIA Studies, Baseline Information,

6 Hours

UNIT - 2

Step-by-step procedures for conducting EIA, Limitations of EIA.

6 Hours

UNIT - 3

Frame work of Impact Assessment. Development Projects-Environmental Setting, Objectives and Scope, Contents of EIA, Methodologies, Techniques of EIA.

8 Hours

UNIT - 4

Assessment and Prediction of Impacts on Attributes Air, Water, Noise, Land Ecology, Soil, Cultural and Socio-economic Environment. EIA guidelines for Development Projects, Rapid and Comprehensive EIA.

6 Hours

PART - B

UNIT - 5
EIA guidelines for Development Projects, Rapid and Comprehensive EIA.

6 Hours

UNIT - 6
Public Participation in Environmental Decision making. Practical Considerations in preparing Environmental Impact Assessment and Statements.

6 Hours

UNIT - 7
Salient Features of the Project Activity-Environmental Parameter Activity Relationships- Matrices.

4 Hours

UNIT - 8
EIA for Water resource developmental projects, Highway projects: Nuclear-Power plant projects, Mining project (Coal, Iron ore), Thermal Power Plant, Infrastructure Construction Activities.

10 Hours

REFERENCES

1. **Environmental Impact Analysis**-Jain R.K.-Van Nostrand Reinhold Co.
2. **Environment Impact Assessment.-** Anjaneyalu. Y.
3. Guidelines for EIA of developmental Projects Ministry of Environment and Forests, GOI.
4. **Environment Impact Assessment** - Larry W. Canter - McGraw Hill Publication.

SOFTWARE ENGINEERING

Subject Code: 10IS51	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT – 1 **6 Hours**

Overview: Introduction: FAQ's about software engineering, Professional and ethical responsibility.

Socio-Technical systems: Emergent system properties; Systems engineering; Organizations, people and computer systems; Legacy systems.

UNIT – 2 **6 Hours**

Critical Systems, Software Processes: Critical Systems: A simple safety-critical system; System dependability; Availability and reliability.

Software Processes: Models, Process iteration, Process activities; The Rational Unified Process; Computer Aided Software Engineering.

UNIT – 3 **7 Hours**

Requirements: Software Requirements: Functional and Non-functional requirements; User requirements; System requirements; Interface specification; The software requirements document.

Requirements Engineering Processes: Feasibility studies; Requirements elicitation and analysis; Requirements validation; Requirements management.

UNIT – 4 **7 Hours**

System models, Project Management: System Models: Context models; Behavioral models; Data models; Object models; Structured methods.

Project Management: Management activities; Project planning; Project scheduling; Risk management

PART - B

UNIT – 5 **7 Hours**

Software Design: Architectural Design: Architectural design decisions; System organization; Modular decomposition styles; Control styles.

Object-Oriented design: Objects and Object Classes; An Object-Oriented design process; Design evolution.

UNIT – 6 **6 Hours**

Development: Rapid Software Development: Agile methods; Extreme programming; Rapid application development.

Software Evolution: Program evolution dynamics; Software maintenance; Evolution processes; Legacy system evolution.

UNIT – 7 **7 Hours**

Verification and Validation: Verification and Validation: Planning; Software inspections; Automated static analysis; Verification and formal methods.

Software testing: System testing; Component testing; Test case design; Test automation.

UNIT – 8 **6 Hours**

Management: Managing People: Selecting staff; Motivating people; Managing people; The People Capability Maturity Model.

Software Cost Estimation: Productivity; Estimation techniques; Algorithmic cost modeling, Project duration and staffing.

Text Books:

1. Ian Sommerville: Software Engineering, 8th Edition, Pearson Education, 2007.
   (Chapters-: 1, 2, 3, 4, 5, 6, 7, 8, 11, 14, 17, 21, 22, 23, 25, 26)

Reference Books:

1. Roger.S.Pressman: Software Engineering-A Practitioners approach, 7th Edition, Tata McGraw Hill, 2007.
2. Pankaj Jalote: An Integrated Approach to Software Engineering, Wiley India, 2009.

DATABASE MANAGEMENT SYSTEMS

Subject Code: 10CS54	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART - A

UNIT – 1 **6 Hours**

Introduction: Introduction; An example; Characteristics of Database approach; Actors on the screen; Workers behind the scene; Advantages of using DBMS approach; A brief history of database applications; when not to use a DBMS.

Data models, schemas and instances; Three-schema architecture and data independence; Database languages and interfaces; The database system environment; Centralized and client-server architectures; Classification of Database Management systems.

UNIT – 2 **6 Hours**

Entity-Relationship Model: Using High-Level Conceptual Data Models for Database Design; An Example Database Application; Entity Types, Entity Sets, Attributes and Keys; Relationship types, Relationship Sets, Roles and Structural Constraints; Weak Entity Types; Refining the ER Design; ER Diagrams, Naming Conventions and Design Issues; Relationship types of degree higher than two.

UNIT – 3 **8 Hours**

Relational Model and Relational Algebra : Relational Model Concepts; Relational Model Constraints and Relational Database Schemas; Update Operations, Transactions and dealing with constraint violations; Unary Relational Operations: SELECT and PROJECT; Relational Algebra Operations from Set Theory; Binary Relational Operations : JOIN and DIVISION; Additional Relational Operations; Examples of Queries in Relational Algebra; Relational Database Design Using ER- to-Relational Mapping.

UNIT – 4 **6 Hours**

SQL – 1: SQL Data Definition and Data Types; Specifying basic constraints in SQL; Schema change statements in SQL; Basic queries in SQL; More complex SQL Queries.

PART - B

UNIT – 5 **6 Hours**

SQL – 2 : Insert, Delete and Update statements in SQL; Specifying constraints as Assertion and Trigger; Views (Virtual Tables) in SQL; Additional features of SQL; Database programming issues and techniques; Embedded SQL, Dynamic SQL; Database stored procedures and SQL / PSM.

UNIT – 6 **6 Hours**

Database Design – 1: Informal Design Guidelines for Relation Schemas; Functional Dependencies; Normal Forms Based on Primary Keys; General Definitions of Second and Third Normal Forms; Boyce-Codd Normal Form

UNIT – 7 **6 Hours**

Database Design -2: Properties of Relational Decompositions; Algorithms for Relational Database Schema Design; Multivalued Dependencies and Fourth Normal Form; Join Dependencies and Fifth Normal Form; Inclusion Dependencies; Other Dependencies and Normal Forms

UNIT – 8 **8 Hours**

Transaction Management: The ACID Properties; Transactions and Schedules; Concurrent Execution of Transactions; Lock- Based Concurrency Control; Performance of locking; Transaction support in SQL; Introduction to crash recovery; 2PL, Serializability and Recoverability; Lock Management; Introduction to ARIES; The log; Other recovery-related structures; The write-ahead log protocol; Checkpointing; Recovering from a System Crash; Media Recovery; Other approaches and interaction with concurrency control.

Text Books:

1. Elmasri and Navathe: Fundamentals of Database Systems, 5^{th} Edition, Pearson Education, 2007.

   (Chapters 1, 2, 3 except 3.8, 5, 6.1 to 6.5, 7.1, 8, 9.1, 9.2 except SQLJ, 9.4, 10)
2. Raghu Ramakrishnan and Johannes Gehrke: Database Management Systems, 3^{rd} Edition, McGraw-Hill, 2003. (Chapters 16, 17.1, 17.2, 18)

Reference Books:

1. Silberschatz, Korth and Sudharshan: Data base System Concepts, 6^{th} Edition, Mc-GrawHill, 2010.
2. C.J. Date, A. Kannan, S. Swamynatham: An Introduction to Database Systems, 8^{th} Edition, Pearson Education, 2006.

COMPUTER NETWORKS - I

Subject Code: 10CS55	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT - 1 **7 Hours**

Introduction: Data Communications, Networks, The Internet, Protocols & Standards, Layered Tasks,

The OSI model, Layers in OSI model, TCP/IP Protocol suite, Addressing

UNIT- 2 **7 Hours**

Physical Layer-1: Analog & Digital Signals, Transmission Impairment, Data Rate limits, Performance, Digital-digital conversion (Only Line coding: Polar, Bipolar and Manchester coding), Analog-to-digital conversion (only PCM), Transmission Modes, Digital-to-analog conversion

UNIT- 3 **6 Hours**

Physical Layer-2 and Switching: Multiplexing, Spread Spectrum, Introduction to switching, Circuit Switched Networks, Datagram Networks, Virtual Circuit Networks

UNIT- 4 **6 Hours**

Data Link Layer-1: Error Detection & Correction: Introduction, Block coding, Linear block codes, Cyclic codes, Checksum.

PART - B

UNIT- 5 **6 Hours**

Data Link Layer-2: Framing, Flow and Error Control, Protocols, Noiseless Channels, Noisy channels, HDLC, PPP (Framing, Transition phases only)

UNIT- 6 **7 Hours**

Multiple Access & Ethernet: Random access, Controlled Access, Channelization, Ethernet: IEEE standards, Standard

Ethernet, Changes in the standard, Fast Ethernet, Gigabit Ethernet

UNIT - 7 **6 Hours**

Wireless LANs and Cellular Networks: Introduction, IEEE 802.11, Bluetooth, Connecting devices, Cellular Telephony

UNIT - 8: **7 Hours**

Network Layer: Introduction, Logical addressing, IPv4 addresses, IPv6 addresses, Internetworking basics,
IPv4, IPv6, Comparison of IPv4 and IPv6 Headers.

Text Books:

1. Behrouz A. Forouzan,: Data Communication and Networking, 4th Edition Tata McGraw-Hill, 2006.
   (Chapters 1.1 to 1.4, 2.1 to 2.5, 3.1 To 3.6, 4.1 to 4.3, 5.1, 6.1, 6.2, 8.1 to 8.3, 10.1 to 10.5, 11.1 to 11.7, 12.1 to 12.3, 13.1 to 13.5, 14.1, 14.2, 15.1, 16.1, 19.1, 19.2, 20.1 to 20.3)

Reference Books:

1. Alberto Leon-Garcia and Indra Widjaja: Communication Networks - Fundamental Concepts and Key architectures, 2nd Edition Tata McGraw-Hill, 2004.
2. William Stallings: Data and Computer Communication, 8th Edition, Pearson Education, 2007.
3. Larry L. Peterson and Bruce S. Davie: Computer Networks – A Systems Approach, 4th Edition, Elsevier, 2007.
4. Nader F. Mir: Computer and Communication Networks, Pearson Education, 2007.

DATABASE APPLICATIONS LABORATORY

Subject Code: 10CSL57	**I.A. Marks : 25**
Hours/Week : 03	**Exam Hours: 03**
Total Hours : 42	**Exam Marks: 50**

1. Consider the following relations:
   Student (*snum:* integer, *sname:* string, *major:* string, *level:* string, *age:* integer)
   Class (*name:* string, *meets at:* string, *room:* string, *d:* integer)
   Enrolled (*snum:* integer, *cname:* string)
   Faculty (fi*d*: integer, *fname:* string, *deptid:* integer)
   The meaning of these relations is straightforward; for example, Enrolled has one record per student-class pair such that the student is enrolled in the class. Level is a two character code with 4 different values (example: Junior: JR etc)
   Write the following queries in SQL. No duplicates should be printed in any of the answers.

   i. Find the names of all Juniors (level = JR) who are enrolled in a class taught by Prof. Harshith
   ii. Find the names of all classes that either meet in room R128 or have five or more Students enrolled.
   iii. Find the names of all students who are enrolled in two classes that meet at the same time.
   iv. Find the names of faculty members who teach in every room in which some class is taught.
   v. Find the names of faculty members for whom the combined enrollment of the courses that they teach is less than five.

2. The following relations keep track of airline flight information:
   Flights (*no:* integer, *from:* string, *to:* string, *distance:* integer, *Departs:* time, *arrives:* time, *price:* real)
   Aircraft (*aid:* integer, *aname:* string, *cruisingrange:* integer)
   Certified (*eid:* integer, *aid:* integer)
   Employees (*eid:* integer, *ename:* string, *salary:* integer)
   Note that the Employees relation describes pilots and other kinds of employees as well; Every pilot is certified for some aircraft,

and only pilots are certified to fly.
Write each of the following queries in SQL.

i. Find the names of aircraft such that all pilots certified to operate them have salaries more than Rs.80, 000.
ii. For each pilot who is certified for more than three aircrafts, find the *eid* and the maximum *cruisingrange* of the aircraft for which she or he is certified.
iii. Find the names of pilots whose *salary* is less than the price of the cheapest route from Bengaluru to Frankfurt.
iv. For all aircraft with *cruisingrange* over 1000 Kms, .find the name of the aircraft and the average salary of all pilots certified for this aircraft.
v. Find the names of pilots certified for some Boeing aircraft.
vi. Find the *aid*s of all aircraft that can be used on routes from Bengaluru to New Delhi.

3. Consider the following database of student enrollment in courses & books adopted for each course.

STUDENT (regno: string, name: string, major: string, bdate:date)
COURSE (course #:int, cname:string, dept:string)
ENROLL (regno:string, course#:int, sem:int, marks:int)
BOOK _ ADOPTION (course# :int, sem:int, book-ISBN:int)
TEXT (book-ISBN:int, book-title:string, publisher:string, author:string)

i. Create the above tables by properly specifying the primary keys and the foreign keys.
ii. Enter at least five tuples for each relation.
iii. Demonstrate how you add a new text book to the database and make this book be adopted by some department.
iv. Produce a list of text books (include Course #, Book-ISBN, Book-title) in the alphabetical order for courses offered by the 'CS' department that use more than two books.
v. List any department that has *all* its adopted books published by a specific publisher.
vi. Generate suitable reports.
vii. Create suitable front end for querying and displaying the results.

4. The following tables are maintained by a book dealer.

AUTHOR (author-id:int, name:string, city:string, country:string)
PUBLISHER (publisher-id:int, name:string, city:string, country:string)
CATALOG (book-id:int, title:string, author-id:int, publisher-id:int, category-id:int, year:int, price:int)
CATEGORY (category-id:int, description:string)
ORDER-DETAILS (order-no:int, book-id:int, quantity:int)

i. Create the above tables by properly specifying the primary keys and the foreign keys.
ii. Enter at least five tuples for each relation.
iii. Give the details of the authors who have 2 or more books in the catalog and the price of the books is greater than the average price of the books in the catalog and the year of publication is after 2000.
iv. Find the author of the book which has maximum sales.
v. Demonstrate how you increase the price of books published by a specific publisher by 10%.
vi. Generate suitable reports.
vii. Create suitable front end for querying and displaying the results.

5. Consider the following database for a banking enterprise

BRANCH(branch-name:string, branch-city:string, assets:real)
ACCOUNT(accno:int, branch-name:string, balance:real)
DEPOSITOR(customer-name:string, accno:int)
CUSTOMER(customer-name:string, customer-street:string, customer-city:string)
LOAN(loan-number:int, branch-name:string, amount:real)

BORROWER(customer-name:string, loan-number:int)

i. Create the above tables by properly specifying the primary keys and the foreign keys
ii. Enter at least five tuples for each relation
iii. Find all the customers who have at least two accounts at the *Main* branch.
iv. Find all the customers who have an account at *all* the branches located in a specific city.
v. Demonstrate how you delete all account tuples at every branch located in a specific city.
vi. Generate suitable reports.
vii. Create suitable front end for querying and displaying the results.

Instructions:

1. The exercises are to be solved in an RDBMS environment like Oracle or DB2.
2. Suitable tuples have to be entered so that queries are executed correctly.
3. Front end may be created using either VB or VAJ or any other similar tool.
4. The student need not create the front end in the examination. The results of the queries may be displayed directly.
5. Relevant queries other than the ones listed along with the exercises may also be asked in the examination.
6. Questions must be asked based on lots.

COMPUTER NETWORKS - II

Subject Code: 10CS64	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART - A

UNIT - 1 **6 Hours**

Packet Switching Networks - 1: Network services and internal network operation, Packet network topology, Routing in Packet networks, Shortest path routing: Bellman-Ford algorithm.

UNIT – 2 **6 Hours**

Packet Switching Networks – 2: Shortest path routing (continued), Traffic management at the Packet level, Traffic management at Flow level, Traffic management at flow aggregate level.

UNIT – 3 **6 Hours**

TCP/IP-1: TCP/IP architecture, The Internet Protocol, IPv6, UDP.

UNIT – 4 **8 Hours**

TCP/IP-2: TCP, Internet Routing Protocols, Multicast Routing, DHCP, NAT and Mobile IP.

PART – B

UNIT - 5 **7 Hours**

Applications, Network Management, Network Security: Application layer overview, Domain Name System (DNS), Remote Login Protocols, E-mail, File Transfer and FTP, World Wide Web and HTTP, Network management, Overview of network security, Overview of security methods, Secret-key encryption protocols, Public-key encryption protocols, Authentication, Authentication and digital signature, Firewalls.

UNIT – 6 **6 Hours**

QoS, VPNs, Tunneling, Overlay Networks: Overview of QoS, Integrated Services QoS, Differentiated services QoS, Virtual Private Networks, MPLS, Overlay networks.

UNIT - 7 **7 Hours**

Multimedia Networking: Overview of data compression, Digital voice and compression, JPEG, MPEG, Limits of compression with loss, Compression methods without loss, Overview of IP Telephony, VoIP signaling protocols, Real-Time Media Transport Protocols, Stream control Transmission Protocol (SCTP)

UNIT – 8 **6 Hours**

Mobile AdHoc Networks and Wireless Sensor Neworks: Overview of Wireless Ad-Hoc networks, Routing in AdHOc Networks, Routing protocols for and Security of AdHoc networks, Sensor Networks and protocol structures, Communication Energy model, Clustering protocols, Routing protocols, ZigBee technology and 802.15.4.

Text Books:

1. Communication Networks – Fundamental Concepts & key architectures, Alberto Leon Garcia & Indra Widjaja, 2nd Edition, Tata McGraw-Hill, India
   (7 - excluding 7.6, 8)
2. Computer & Communication Networks, Nadir F Mir, Pearson Education, India
   (9, 10 excluding 10.7, 12.1 to 12.3, 16, 17.1 to 17.6, 18.1 to18.3, 18.5, 19, 20)

Reference Books:

1. Behrouz A. Forouzan: Data Communications and Networking, 4th Edition, Tata McGraw-Hill, 2006.
2. William Stallings: Data and Computer Communication, 8th Edition, Pearson Education, 2007.
3. Larry L. Peterson and Bruce S. Davie: Computer Networks – A Systems Approach, 4th Edition, Elsevier, 2007.
4. Wayne Tomasi: Introduction to Data Communications and Networking, Pearson Education, 2005.

OBJECT-ORIENTED MODELING AND DESIGN

Subject Code: 10CS71	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT – 1 **7 Hours**

Introduction, Modeling Concepts, class Modeling: What is Object Orientation? What is OO development? OO themes; Evidence for usefulness of OO development; OO modeling history

Modeling as Design Technique: Modeling; abstraction; The three models.

Class Modeling: Object and class concepts; Link and associations concepts; Generalization and inheritance; A sample class model; Navigation of class models; Practical tips.

UNIT – 2 **6 Hours**

Advanced Class Modeling, State Modeling: Advanced object and class concepts; Association ends; N-ary associations; Aggregation; Abstract classes; Multiple inheritance; Metadata; Reification; Constraints; Derived data; Packages; Practical tips.

State Modeling: Events, States, Transitions and Conditions; State diagrams; State diagram behavior; Practical tips.

UNIT – 3 **6 Hours**

Advanced State Modeling, Interaction Modeling: Advanced State Modeling: Nested state diagrams; Nested states; Signal generalization; Concurrency; A sample state model; Relation of class and state models; Practical tips.
Interaction Modeling: Use case models; Sequence models; Activity models. Use case relationships; Procedural sequence models; Special constructs for activity models.

UNIT – 4 **7 Hours**

Process Overview, System Conception, Domain Analysis: Process Overview: Development stages; Development life cycle.
System Conception: Devising a system concept; Elaborating a concept; Preparing a problem statement.
Domain Analysis: Overview of analysis; Domain class model; Domain state model; Domain interaction model; Iterating the analysis.

PART – B

UNIT – 5 **7 Hours**

Application Analysis, System Design: Application Analysis: Application interaction model; Application class model; Application state model; Adding operations.
Overview of system design; Estimating performance; Making a reuse plan; Breaking a system in to sub-systems; Identifying concurrency; Allocation of sub-systems; Management of data storage; Handling global resources; Choosing a software control strategy; Handling boundary conditions; Setting the trade-off priorities; Common architectural styles; Architecture of the ATM system as the example.

UNIT – 6 **7 Hours**

Class Design, Implementation Modeling, Legacy Systems: Class Design: Overview of class design; Bridging the gap; Realizing use cases; Designing algorithms; Recursing downwards, Refactoring; Design optimization; Reification of behavior; Adjustment of inheritance; Organizing a class design; ATM example.
Implementation Modeling: Overview of implementation; Fine-tuning classes; Fine-tuning generalizations; Realizing associations; Testing.
Legacy Systems: Reverse engineering; Building the class models; Building the interaction model; Building the state model; Reverse engineering tips; Wrapping; Maintenance.

UNIT – 7 **6 Hours**

Design Patterns – 1: What is a pattern and what makes a pattern? Pattern categories; Relationships between patterns; Pattern description
Communication Patterns: Forwarder-Receiver; Client-Dispatcher-Server; Publisher-Subscriber.

UNIT – 8 **6 Hours**

Design Patterns – 2, Idioms: Management Patterns: Command processor; View handler.
Idioms: Introduction; what can idioms provide? Idioms and style; Where to find idioms; Counted Pointer example

Text Books:

1. Michael Blaha, James Rumbaugh: Object-Oriented Modeling and Design with UML, 2nd Edition, Pearson Education, 2005. (Chapters 1 to 17, 23)
2. Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michael Stal: Pattern-Oriented Software Architecture, A System of Patterns, Volume 1, John Wiley and Sons, 2007. (Chapters 1, 3.5, 3.6, 4)

Reference Books:

1. Grady Booch et al: Object-Oriented Analysis and Design with Applications, 3rd Edition, Pearson Education, 2007.
2. Brahma Dathan, Sarnath Ramnath: Object-Oriented Analysis, Design, and Implementation, Universities Press, 2009.

3. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado: UML 2 Toolkit, Wiley- Dreamtech India, 2004.
4. Simon Bennett, Steve McRobb and Ray Farmer: Object-Oriented Systems Analysis and Design Using UML, 2nd Edition, Tata McGraw-Hill, 2002.

EMBEDDED COMPUTING SYSTEMS

Sub Code: 10CS72	**IA Marks :25**
Hrs/Week: 04	**Exam Hours :03**
Total Hrs: 52	**Exam Marks :100**

PART- A

UNIT – 1 **6 Hours**

Embedded Computing: Introduction, Complex Systems and Microprocessors, Embedded Systems Design Process, Formalism for System design
Design Example: Model Train Controller.

UNIT – 2 **7 Hours**

Instruction Sets, CPUs: Preliminaries, ARM Processor, Programming Input and Output, Supervisor mode, Exceptions, Traps, Coprocessors, Memory Systems Mechanisms, CPU Performance, CPU Power Consumption. Design Example: Data Compressor.

UNIT – 3 **6 Hours**

Bus-Based Computer Systems: CPU Bus, Memory Devices, I/O devices, Component Interfacing, Designing with Microprocessor, Development and Debugging, System-Level Performance Analysis
Design Example: Alarm Clock.

UNIT – 4 **7 Hours**

Program Design and Analysis: Components for embedded programs, Models of programs, Assembly, Linking and Loading, Basic Compilation Techniques, Program optimization, Program-Level performance analysis, Software performance optimization, Program-Level energy and power analysis, Analysis and optimization of program size, Program validation and testing. Design Example: Software modem.

PART- B

UNIT – 5 **6 Hours**

Real Time Operating System (RTOS) Based Design – 1: Basics of OS, Kernel, types of OSs, tasks, processes, Threads, Multitasking and Multiprocessing, Context switching, Scheduling Policies, Task Communication, Task Synchronization.

UNIT – 6 **6 Hours**

RTOS-Based Design - 2: Inter process Communication mechanisms, Evaluating OS performance, Choice of RTOS, Power Optimization. Design Example: Telephone Answering machine

UNIT – 7 **7 Hours**

Distributed Embedded Systems: Distributed Network Architectures, Networks for Embedded Systems: I2C Bus, CAN Bus, SHARC Link Ports, Ethernet, Myrinet, Internet, Network Based Design. Design Example: Elevator Controller.

UNIT – 8 **7 Hours**

Embedded Systems Development Environment: The Integrated Development Environment, Types of File generated on Cross Compilation, Dis-assembler /Decompiler, Simulators, Emulators, and Debugging, Target Hardware Debugging.

Text Books:

1. Wayne Wolf: Computers as Components, Principles of Embedded

Computing Systems Design, 2nd Edition, Elsevier, 2008.
2. Shibu K V: Introduction to Embedded Systems, Tata McGraw Hill, 2009
(Chapters 10, 13)

Reference Books:

1. James K. Peckol: Embedded Systems, A contemporary Design Tool, Wiley India, 2008
2. Tammy Neorgaard: Embedded Systems Architecture, Elsevier, 2005.

PROGRAMMING THE WEB

Subject Code: 10CS73	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

UNIT – 1 **6 Hours**
Fundamentals of Web, XHTML – 1: Internet, WWW, Web Browsers and Web Servers, URLs, MIME, HTTP, Security, The Web Programmers Toolbox.
XHTML: Basic syntax, Standard structure, Basic text markup, Images, Hypertext Links.

UNIT – 2 **7 Hours**
XHTML – 2, CSS: XHTML (continued): Lists, Tables, Forms, Frames
CSS: Introduction, Levels of style sheets, Style specification formats, Selector forms, Property value forms, Font properties, List properties, Color, Alignment of text, The box model, Background images, The <span> and <div> tags, Conflict resolution.

UNIT – 3 **6 Hours**
Javascript: Overview of Javascript, Object orientation and Javascript, Syntactic characteristics, Primitives, operations, and expressions, Screen output and keyboard input, Control statements, Object creation and modification, Arrays, Functions, Constructors, Pattern matching using regular expressions, Errors in scripts, Examples.

UNIT – 4 **7 Hours**
Javascript and HTML Documents, Dynamic Documents with Javascript: The Javascript execution environment, The Document Object Model, Element access in Javascript, Events and event handling, Handling events from the Body elements, Button elements, Text box and Password elements, The DOM 2 event model, The navigator object, DOM tree traversal and modification.
Introduction to dynamic documents, Positioning elements, Moving elements, Element visibility, Changing colors and fonts, Dynamic content, Stacking elements, Locating the mouse cursor, Reacting to a mouse click, Slow movement of elements, Dragging and dropping elements.

PART - B

UNIT – 5 **6 Hours**
XML: Introduction, Syntax, Document structure, Document type definitions, Namespaces, XML schemas, Displaying raw XML documents, Displaying XML documents with CSS, XSLT style sheets, XML processors, Web services.

UNIT – 6 **7 Hours**
Perl, CGI Programming: Origins and uses of Perl, Scalars and their operations, Assignment statements and simple input and output, Control statements, Fundamentals of arrays, Hashes, References, Functions, Pattern matching, File input and output; Examples.
The Common Gateway Interface; CGI linkage; Query string format; CGI.pm module; A survey example; Cookies.
Database access with Perl and MySQL

UNIT – 7 **6 Hours**

PHP: Origins and uses of PHP, Overview of PHP, General syntactic characteristics, Primitives, operations and expressions, Output, Control statements, Arrays, Functions, Pattern matching, Form handling, Files, Cookies, Session tracking, Database access with PHP and MySQL.

UNIT – 8 **7 Hours**

Ruby, Rails: Origins and uses of Ruby, Scalar types and their operations, Simple input and output, Control statements, Arrays, Hashes, Methods, Classes, Code blocks and iterators, Pattern matching.
Overview of Rails, Document requests, Processing forms, Rails applications with Databases, Layouts.

Text Books:

1. Robert W. Sebesta: Programming the World Wide Web, 4^{th} Edition, Pearson Education, 2008.
   (Listed topics only from Chapters 1 to 9, 11 to 15)

Reference Books:

1. M. Deitel, P.J. Deitel, A. B. Goldberg: Internet & World Wide Web How to Program, 4^{th} Edition, Pearson Education, 2004.
2. Chris Bates: Web Programming Building Internet Applications, 3^{rd} Edition, Wiley India, 2007.
3. Xue Bai et al: The web Warrior Guide to Web Programming, Cengage Learning, 2003.

Web Programming Laboratory

Subject Code: 10CSL78	**I.A. Marks : 25**
Hours/Week : 03	**Exam Hours: 03**
Total Hours : 42	**Exam Marks: 50**

1. Develop and demonstrate a XHTML file that includes Javascript script for the following problems:
   a) Input: A number n obtained using prompt
      Output: The first n Fibonacci numbers
   b) Input: A number n obtained using prompt
      Output: A table of numbers from 1 to n and their squares using **alert**
2. a) Develop and demonstrate, using Javascript script, a XHTML document that collects the USN (the valid format is: A digit from 1 to 4 followed by two upper-case characters followed by two digits followed by two upper-case characters followed by three digits; no embedded spaces allowed) of the user. Event handler must be included for the form element that collects this information to validate the input. Messages in the alert windows must be produced when errors are detected.
   b) Modify the above program to get the current semester also (restricted to be a number from 1 to 8)
3. a) Develop and demonstrate, using Javascript script, a XHTML document that contains three short paragraphs of text, stacked on top of each other, with only enough of each showing so that the mouse cursor can be placed over some part of them. When the cursor is placed over the exposed part of any paragraph, it should rise to the top to become completely visible.
   b) Modify the above document so that when a paragraph is moved from the top stacking position, it returns to its original position rather than to the bottom.
4. a) Design an XML document to store information about a student in an engineering college affiliated to VTU. The information must include USN, Name, Name of the College, Brach, Year of Joining, and e-mail id. Make up sample data for 3 students. Create a CSS style sheet and use it to display the document.
   b) Create an XSLT style sheet for one student element of the above document and use it to create a display of that element.
5. a) Write a Perl program to display various Server Information like Server Name, Server Software, Server protocol, CGI Revision etc.
   b) Write a Perl program to accept UNIX command from a HTML form and to display the output of the command executed.

6. a) Write a Perl program to accept the User Name and display a greeting message randomly chosen from a list of 4 greeting messages.
   b) Write a Perl program to keep track of the number of visitors visiting the web page and to display this count of visitors, with proper headings.
7. Write a Perl program to display a digital clock which displays the current time of the server.
8. Write a Perl program to insert name and age information entered by the user into a table created using MySQL and to display the current contents of this table.
9. Write a PHP program to store current date-time in a COOKIE and display the 'Last visited on' date-time on the web page upon reopening of the same page.
10. Write a PHP program to store page views count in SESSION, to increment the count on each refresh, and to show the count on web page.
11. Create a XHTML form with Name, Address Line 1, Address Line 2, and E-mail text fields. On submitting, store the values in MySQL table. Retrieve and display the data based on Name.
12. Build a Rails application to accept book information viz. Accession number, title, authors, edition and publisher from a web page and store the information in a database and to search for a book with the title specified by the user and to display the search results with proper headings.

Note: In the examination *each* student picks one question from the lot of *all* 12 questions.

DATA WAREHOUSING AND DATA MINING

Subject Code: 10CS755	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT – 1 **6 Hours**

Data Warehousing:
Introduction, Operational Data Stores (ODS), Extraction Transformation Loading (ETL), Data Warehouses. Design Issues, Guidelines for Data Warehouse Implementation, Data Warehouse Metadata

UNIT – 2

6 Hours

Online Analytical Processing (OLAP): Introduction, Characteristics of OLAP systems, Multidimensional view and Data cube, Data Cube Implementations, Data Cube operations, Implementation of OLAP and overview on OLAP Softwares.

UNIT – 3 **6 Hours**

Data Mining: Introduction, Challenges, Data Mining Tasks, Types of Data, Data Preprocessing, Measures of Similarity and Dissimilarity, Data Mining Applications

UNIT – 4 **8 Hours**

Association Analysis: Basic Concepts and Algorithms: Frequent Itemset Generation, Rule Generation, Compact Representation of Frequent Itemsets, Alternative methods for generating Frequent Itemsets, FP Growth Algorithm, Evaluation of Association Patterns

PART - B

UNIT – 5 **6 Hours**

Classification -1 : Basics, General approach to solve classification problem, Decision Trees, Rule Based Classifiers, Nearest Neighbor Classifiers.

UNIT – 6 **6 Hours**

Classification - 2 : Bayesian Classifiers, Estimating Predictive accuracy of classification methods, Improving accuracy of clarification methods, Evaluation criteria for classification methods, Multiclass Problem.

UNIT – 7 **8 Hours**

Clustering Techniques: Overview, Features of cluster analysis, Types of Data and Computing Distance, Types of Cluster Analysis Methods, Partitional Methods, Hierarchical Methods, Density Based Methods, Quality and Validity of Cluster Analysis

UNIT – 8 **6 Hours**

Web Mining: Introduction, Web content mining, Text Mining, Unstructured Text, Text clustering, Mining Spatial and Temporal Databases.

Text Books:

1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar: Introduction to Data Mining, Pearson Education, 2005.
2. G. K. Gupta: Introduction to Data Mining with Case Studies, 3rd Edition, PHI, New Delhi, 2009.

Reference Books:

1. Arun K Pujari: Data Mining Techniques 2nd Edition, Universities Press, 2009.
2. Jiawei Han and Micheline Kamber: Data Mining **-** Concepts and Techniques, 2nd Edition, Morgan Kaufmann Publisher, 2006.
3. Alex Berson and Stephen J. Smith: Data Warehousing, Data Mining, and OLAP Computing, Mc GrawHill Publisher, 1997.

C# PROGRAMMING AND .NET

Subject Code: 10CS761	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT – 1 **6 Hours**

Interfaces and Collections: Defining Interfaces Using C# Invoking Interface Members at the object Level, Exercising the Shapes Hierarchy, Understanding Explicit Interface Implementation, Interfaces As Polymorphic Agents, Building Interface Hierarchies, Implementing, Implementation, Interfaces Using VS .NET, understanding the IConvertible Interface, Building a Custom Enumerator (IEnumerable and Enumerator), Building Cloneable objects (ICloneable), Building Comparable Objects (I Comparable), Exploring the system. Collections Namespace, Building a Custom Container (Retrofitting the Cars Type).

UNIT – 2 **8 Hours**

Callback Interfaces, Delegates, and Events, Advanced Techniques: Understanding Callback Interfaces, Understanding the .NET Delegate Type, Members of System. Multicast Delegate, The Simplest Possible Delegate Example, , Building More a Elaborate Delegate Example, Understanding Asynchronous Delegates, Understanding (and Using)Events.

The Advances Keywords of C#, A Catalog of C# Keywords Building a Custom Indexer, A Variation of the Cars Indexer Internal Representation of Type Indexer . Using C# Indexer from VB .NET. Overloading operators, The Internal Representation of Overloading Operators, interacting with Overload Operator from Overloaded- Operator- Challenged Languages, Creating Custom Conversion Routines, Defining Implicit Conversion Routines, The Internal Representations of Customs Conversion Routines

UNIT – 3 **6 Hours**

Understanding .NET Assembles: Problems with Classic COM Binaries, An Overview of .NET Assembly, Building a Simple File Test Assembly, A C#. Client Application, A Visual Basic .NET Client Application, Cross Language Inheritance, Exploring the CarLibrary's, Manifest, Exploring the CarLibrary's Types, Building the Multifile Assembly ,Using Assembly, Understanding Private Assemblies, Probing for Private Assemblies (The Basics), Private A Assemblies XML Configurations Files, Probing for Private Assemblies (The Details), Understanding Shared Assembly, Understanding Shared Names,

Building a Shared Assembly, Understanding Delay Signing, Installing/Removing Shared Assembly, Using a Shared Assembly

UNIT – 4 **6 Hours**

Object- Oriented Programming with C#: Forms Defining of the C# Class, Definition the "Default Public Interface" of a Type, Recapping the Pillars of OOP, The First Pillars: C#'s Encapsulation Services, Pseudo- Encapsulation: Creating Read-Only Fields, The Second Pillar: C#'s Inheritance Supports, keeping Family Secrets: The " Protected" Keyword, Nested Type Definitions, The Third Pillar: C #'s Polymorphic Support, Casting Between .

PART – B

UNIT – 5 **6 Hours**

Exceptions and Object Lifetime: Ode to Errors, Bugs, and Exceptions, The Role of .NET Exception Handing, the System. Exception Base Class, Throwing a Generic Exception, Catching Exception, CLR System – Level Exception(System. System Exception), Custom Application-Level Exception(System. System Exception), Handling Multiple Exception, The Family Block, the Last Chance Exception Dynamically Identifying Application – and System Level Exception Debugging System Exception Using VS. NET, Understanding Object Lifetime, the CIT of "new', The Basics of Garbage Collection,, Finalization a Type, The Finalization Process, Building an Ad Hoc Destruction Method, Garbage Collection Optimizations, The System. GC Type.

UNIT – 6 **6 Hours**

Interfaces and Collections: Defining Interfaces Using C# Invoking Interface Members at the object Level, Exercising the Shapes Hierarchy, Understanding Explicit Interface Implementation, Interfaces As Polymorphic Agents, Building Interface Hierarchies, Implementing, Implementation, Interfaces Using VS .NET, understanding the IConvertible Interface, Building a Custom Enumerator (IEnumerable and Enumerator), Building Cloneable objects (ICloneable), Building Comparable Objects (I Comparable), Exploring the system. Collections Namespace, Building a Custom Container (Retrofitting the Cars Type).

UNIT – 7 **8 Hours**

Callback Interfaces, Delegates, and Events, Advanced Techniques: Understanding Callback Interfaces, Understanding the .NET Delegate Type, Members of System. Multicast Delegate, The Simplest Possible Delegate Example, Building More a Elaborate Delegate Example, Understanding Asynchronous Delegates, Understanding (and Using)Events.

The Advances Keywords of C#, A Catalog of C# Keywords Building a Custom Indexer, A Variation of the Cars Indexer Internal Representation of Type Indexer . Using C# Indexer from VB .NET. Overloading operators, The Internal Representation of Overloading Operators, interacting with Overload Operator from Overloaded- Operator- Challenged Languages, Creating Custom Conversion Routines, Defining Implicit Conversion Routines, The Internal Representations of Customs Conversion Routines

UNIT – 8 **6 Hours**

Understanding .NET Assembles: Problems with Classic COM Binaries, An Overview of .NET Assembly, Building a Simple File Test Assembly, A C#. Client Application, A Visual Basic .NET Client Application, Cross Language Inheritance, Exploring the CarLibrary's, Manifest, Exploring the CarLibrary's Types, Building the Multifile Assembly, Using Assembly, Understanding Private Assemblies, Probing for Private Assemblies (The Basics), Private A Assemblies XML Configurations Files, Probing for Private Assemblies (The Details), Understanding Shared Assembly, Understanding Shared Names, Building a Shared Assembly, Understanding Delay Signing, Installing/Removing Shared Assembly, Using a Shared Assembly

Text Books:

1. Andrew Troelsen: Pro C# with .NET 3.0, 4^{th} Edition, Wiley India, 2009.
   Chapters: 1 to 11 (up to pp.369)
2. E. Balagurusamy: Programming in C#, 2^{nd} Edition, Tata McGraw

Hill, 2008.

(Programming Examples 3.7, 3.10, 5.5, 6.1, 7.2, 7.4, 7.5, 7.6, 8.1, 8.2, 8.3, 8.5, 8.7, 8.8, 9.1, 9.2, 9.3, 9.4, 10.2, 10.4, 11.2, 11.4, 12.1, 12.4, 12.5, 12.6, 13.1, 13.2, 13.3, 13.6, 14.1, 14.2, 14.4, 15.2, 15.3, 16.1, 16.2, 16.3, 18.3, 18.5.18.6)

Reference Books:

1. Tom Archer: Inside C#, WP Publishers, 2001.
2. Herbert Schildt: C# The Complete Reference, Tata McGraw Hill, 2004.

JAVA AND J2EE

Subject Code:10CS753	**IA Marks: 25**
Hours/Week: 4	**Exam Marks: 100**
Total Hours: 52	**Exam Hours: 3**

PART - A

UNIT – 1 **6 Hours**

Introduction to Java: Java and Java applications; Java Development Kit (JDK); Java is interpreted, Byte Code, JVM; Object-oriented programming; Simple Java programs.

Data types and other tokens: Boolean variables, int, long, char, operators, arrays, white spaces, literals, assigning values; Creating and destroying objects; Access specifiers.

Operators and Expressions: Arithmetic Operators, Bitwise operators, Relational operators, The Assignment Operator, The ? Operator; Operator Precedence; Logical expression; Type casting; Strings

Control Statements: Selection statements, iteration statements, Jump Statements.

UNIT – 2 **6 Hours**

Classes, Inheritance, Exceptions, Applets : Classes: Classes in Java; Declaring a class; Class name; Super classes; Constructors; Creating instances of class; Inner classes.

Inheritance: Simple, multiple, and multilevel inheritance; Overriding, overloading.

Exception handling**:** Exception handling in Java.

The Applet Class: Two types of Applets; Applet basics; Applet Architecture; An Applet skeleton; Simple Applet display methods; Requesting repainting; Using the Status Window; The HTML APPLET tag; Passing parameters to Applets; getDocumentbase() and getCodebase(); ApletContext and showDocument(); The AudioClip Interface; The AppletStub Interface; Output to the Console.

UNIT – 3 **7 Hours**

Multi Threaded Programming, Event Handling: Multi Threaded Programming: What are threads? How to make the classes threadable; Extending threads; Implementing runnable; Synchronization; Changing state of the thread; Bounded buffer problems, read-write problem, producer-consumer problems.

Event Handling: Two event handling mechanisms; The delegation event model; Event classes; Sources of events; Event listener interfaces; Using the delegation event model; Adapter classes; Inner classes.

UNIT – 4 **7 Hours**

Swings: Swings: The origins of Swing; Two key Swing features; Components and Containers; The Swing Packages; A simple Swing Application; Create a Swing Applet; Jlabel and ImageIcon; JTextField;The Swing Buttons; JTabbedpane; JScrollPane; JList; JComboBox; JTable.

PART – B

UNIT – 5 **6 Hours**

Java 2 Enterprise Edition Overview, Database Access: Overview of J2EE and J2SE
The Concept of JDBC; JDBC Driver Types; JDBC Packages; A Brief Overview of the JDBC process; Database Connection; Associating the JDBC/ODBC Bridge with the Database; Statement Objects; ResultSet; Transaction Processing; Metadata, Data types; Exceptions.

UNIT – 6 **7 Hours**
Servlets: Background; The Life Cycle of a Servlet; Using Tomcat for Servlet Development; A simple Servlet; The Servlet API; The Javax.servlet Package; Reading Servlet Parameter; The Javax.servlet.http package; Handling HTTP Requests and Responses; Using Cookies; Session Tracking.

UNIT – 7 **6 Hours**
JSP, RMI: Java Server Pages (JSP): JSP, JSP Tags, Tomcat, Request String, User Sessions, Cookies, Session Objects.
Java Remote Method Invocation: Remote Method Invocation concept; Server side, Client side.

UNIT – 8 **7 Hours**
Enterprise Java Beans: Enterprise java Beans; Deployment Descriptors; Session Java Bean, Entity Java Bean; Message-Driven Bean; The JAR File.

Text Books:

1. Herbert Schildt: Java The Complete Reference, 7th Edition, Tata McGraw Hill, 2007.
   (Chapters 1, 2, 3, 4, 5, 6, 8, 10, 11, 21, 22, 29, 30, 31)
2. Jim Keogh: J2EE - The Complete Reference, Tata McGraw Hill, 2007.
   (Chapters 5, 6, 11, 12, 15)

Reference Books:

1. Y. Daniel Liang: Introduction to JAVA Programming, 7th Edition, Pearson Education, 2007.
2. Stephanie Bodoff et al: The J2EE Tutorial, 2nd Edition, Pearson Education, 2004.

SOFTWARE TESTING

Subject Code: 10CS842	**I.A. Marks: 25**
Hours/Week: 4	**Exam Marks: 100**
Total Hours: 52	**Exam Hours: 3**

PART – A

UNIT 1 **6 Hours**
A Perspective on Testing, Examples: Basic definitions, Test cases, Insights from a Venn diagram, Identifying test cases, Error and fault taxonomies, Levels of testing. Examples: Generalized pseudocode, The triangle problem, The NextDate function, The commission problem, The SATM (Simple Automatic Teller Machine) problem, The currency converter, Saturn windshield wiper.

UNIT 2 **7 Hours**
Boundary Value Testing, Equivalence Class Testing, Decision Table-Based Testing: Boundary value analysis, Robustness testing, Worst-case testing, Special value testing, Examples, Random testing, Equivalence classes, Equivalence test cases for the triangle problem, NextDate function, and the commission problem, Guidelines and observations. Decision tables, Test cases for the triangle problem, NextDate function, and the commission problem, Guidelines and observations.

UNIT 3 **7 Hours**
Path Testing, Data Flow Testing: DD paths, Test coverage metrics, Basis path testing, guidelines and observations. Definition-Use testing, Slice-based testing, Guidelines and observations.

UNIT 4 **6 Hours**

Levels of Testing, Integration Testing: Traditional view of testing levels, Alternative life-cycle models, The SATM system, Separating integration and system testing. A closer look at the SATM system, Decomposition-based, call graph-based, Path-based integrations.

PART – B

UNIT 5 **7 Hours**

System Testing, Interaction Testing: Threads, Basic concepts for requirements specification, Finding threads, Structural strategies and functional strategies for thread testing, SATM test threads, System testing guidelines, ASF (Atomic System Functions) testing example. Context of interaction, A taxonomy of interactions, Interaction, composition, and determinism, Client/Server Testing,.

UNIT 6 **7 Hours**

Process Framework: Validation and verification, Degrees of freedom, Varieties of software. Basic principles: Sensitivity, redundancy, restriction, partition, visibility, Feedback. The quality process, Planning and monitoring, Quality goals, Dependability properties, Analysis, Testing, Improving the process, Organizational factors.

UNIT 7 **6 Hours**

Fault-Based Testing, Test Execution: Overview, Assumptions in fault-based testing, Mutation analysis, Fault-based adequacy criteria, Variations on mutation analysis. Test Execution: Overview, from test case specifications to test cases, Scaffolding, Generic versus specific scaffolding, Test oracles, Self-checks as oracles, Capture and replay.

UNIT 8 **6 Hours**

Planning and Monitoring the Process, Documenting Analysis and Test: Quality and process, Test and analysis strategies and plans, Risk planning, Monitoring the process, Improving the process, The quality team, Organizing documents, Test strategy document, Analysis and test plan, Test design specifications documents, Test and analysis reports.

TEXT BOOKS:

1. Paul C. Jorgensen: Software Testing, A Craftsman's Approach, 3rd Edition, Auerbach Publications, 2008.
   (Listed topics only from Chapters 1, 2, 5, 6, 7, 9, 10, 12, 1314, 15)
2. Mauro Pezze, Michal Young: Software Testing and Analysis – Process, Principles and Techniques, Wiley India, 2009.
   (Listed topics only from Chapters 2, 3, 4, 16, 17, 20, 24)

REFERENCE BOOKS:

1. Aditya P Mathur**:** Foundations of Software Testing, Pearson Education, 2008.
2. Srinivasan Desikan, Gopalaswamy Ramesh: Software Testing Principles and Practices, 2nd Edition, Pearson Education, 2007.
3. Brian Marrick: The Craft of Software Testing, Pearson Education, 1995.

INFORMATION AND NETWORK SECURITY

Subject Code: 10CS835	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT 1 **6 Hours**

Planning for Security: Introduction; Information Security Policy, Standards, and Practices; The Information Security Blue Print; Contingency plan and a model for contingency plan

UNIT 2 **6 Hours**
Security Technology-1: Introduction; Physical design; Firewalls; Protecting Remote Connections

UNIT 3 **6 Hours**
Security Technology – 2: Introduction; Intrusion Detection Systems (IDS); Honey Pots, Honey Nets, and Padded cell systems; Scanning and Analysis Tools

UNIT 4 **8 Hours**
Cryptography: Introduction; A short History of Cryptography; Principles of Cryptography; Cryptography Tools; Attacks on Cryptosystems.

PART - B

UNIT 5 **8 Hours**
Introduction to Network Security, Authentication Applications: Attacks, services, and Mechanisms; Security Attacks; Security Services; A model for Internetwork Security; Internet Standards and RFCs Kerberos, X.509 Directory Authentication Service.

UNIT 6 **6 Hours**
Electronic Mail Security: Pretty Good Privacy (PGP); S/MIME

UNIT 7 **6 Hours**
IP Security: IP Security Overview; IP Security Architecture; Authentication Header; Encapsulating Security Payload; Combining Security Associations; Key Management.

UNIT 8 **6 Hours**
Web Security: Web security requirements; Secure Socket layer (SSL) and Transport layer Security (TLS); Secure Electronic Transaction (SET)

Text Books:

1. Michael E. Whitman and Herbert J. Mattord: Principles of Information Security, 2nd Edition, Cengage Learning, 2005. (Chapters 5, 6, 7, 8; Exclude the topics not mentioned in the syllabus)
2. William Stallings: Network Security Essentials: Applications and Standards, 3rd Edition, Pearson Education, 2007. (Chapters: 1, 4, 5, 6, 7, 8)

Reference Book:

1. Behrouz A. Forouzan: Cryptography and Network Security, Special Indian Edition, Tata McGraw-Hill, 2007.

DIGITAL IMAGE PROCESSING

Subject Code: 10CS762	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT – 1 **6 Hours**
Digitized Image and its properties: Basic concepts, Image digitization, Digital image properties

UNIT – 2 **7 Hours**
Image Preprocessing: Image pre-processing: Brightness and geometric transformations, local preprocessing.

UNIT – 3 **7 Hours**
Segmentation – 1: Thresholding, Edge-based segmentation.

UNIT – 4 **7 Hours**
Segmentation – 2: Region based segmentation, Matching.

PART – B

UNIT – 5 **7 Hours**

Image Enhancement: Image enhancement in the spatial domain: Background, Some basic gray level transformations, Histogram processing, Enhancement using arithmetic/ logic operations, Basics of spatial filtering, Smoothing spatial filters, Sharpening spatial filters. Image enhancement in the frequency domain: Background, Introduction to the Fourier transform and the frequency domain, Smoothing Frequency-Domain filters, Sharpening Frequency Domain filters, Homomorphic filtering.

UNIT – 6 **6 Hours**

Image Compression: Image compression: Fundamentals, Image compression models, Elements of information theory, Error-Free Compression, Lossy compression.

UNIT – 7 **7 Hours**

Shape representation: Region identification, Contour-based shape representation and description, Region based shape representation and description, Shape classes.

UNIT – 8 **6 Hours**

Morphology: Basic morphological concepts, Morphology principles, Binary dilation and erosion, Gray-scale dilation and erosion, Morphological segmentation and watersheds

Text Books:

1. Milan Sonka, Vaclav Hlavac and Roger Boyle: Image Processing, Analysis and Machine Vision, 2nd Edition, Thomoson Learning, 2001.
   (Chapters 2, 4.1 to 4.3, 5.1 to 5.4, 6, 11.1 to 11.4, 11.7)
2. Rafel C Gonzalez and Richard E Woods: Digital Image Processing, 3rd Edition, Pearson Education, 2003.
   (Chapters 3.1 to 3.7, 4.1 to 4.5, 8.1 to 8.5)

Reference Books:

1. Anil K Jain, "Fundamentals of Digital Image Processing", PHI, 1997, Indian Reprint 2009.
2. B.Chanda, D Dutta Majumder, "Digital Image Processing and Analysis", PHI, 2002.

MULTI-CORE ARCHITECTURE AND PROGRAMMING

Subject Code: 10CS846	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART - A

UNIT 1 **7 Hours**

Introduction

The power and potential of parallelism, Examining sequential and parallel programs, Parallelism using multiple instruction streams, The Goals: Scalability and performance portability, Balancing machine specifics with portability, A look at six parallel computers: Chip multiprocessors, Symmetric multiprocessor architectures, Heterogeneous chip designs, Clusters, Supercomputers, Observations from the six parallel computers.

UNIT 2 **6 Hours**

Reasoning about Performance

Motivation and basic concepts, Sources of performance loss, Parallel structure, Performance trade-offs, Measuring performance, Scalable performance.

UNIT 3 **6 Hours**

Examples of Multi-Core Architectures

Introduction to Intel Architecture, How an Intel Architecture System works, Basic Components of the Intel Core 2 Duo Processor: The CPU, Memory Controller, I/O Controller; Intel Core i7: Architecture, The Intel Core i7

Processor, Intel QuickPath Interconnect, The SCH; Intel Atom Architecture.

Introduction to Texas Instruments' Multi-Core Multilayer SoC architecture for communications, infrastructure equipment

UNIT 4 **7 Hours**

Parallel Algorithm Design

Introduction, The Task / Channel model, Foster's design methodology, Examples: Boundary value problem, Finding the maximum, The n-Body problem, Adding data input.

PART – B

UNIT 5 **7 Hours**

Parallel Programming – 1 (Using OpenMP)

Designing for threads: Task decomposition, Data decomposition, Data flow decomposition, Implications of different decompositions; Challenges in decomposition, Parallel programming patters, A motivating problem: Error diffusion.

Threading and Parallel Programming Constructs: Synchronization, Critical sections, Deadlocks, Synchronization primitives: Semaphores, Locks, Condition variables; Messages, Flow Control-Based concepts: Fence, Barrier; Implementation-Dependent threading issues.

UNIT 6 **6 Hours**

Parallel Programming – 2 (Using OpenMP)

Introduction, The shared-memory model, Parallel *for* loops, Declaring private variables, Critical sections, Reductions, Performance improvements, More general data parallelism, Functional parallelism.

UNIT 7 **7 Hours**

Solutions to Common Parallel Programming Problems

Too many threads, Data races, deadlocks, and live locks, Heavily contended locks, Non-blocking algorithms, Thread-safe functions and libraries, Memory issues, Cache-related issues, Avoiding pipeline stalls, Data organization for high performance.

UNIT 8 **6 Hours**

Threading in the Processor

Single-Core Processors: Processor architecture fundamentals, Comparing Superscalar and EPIC architectures.

Multi-Core Processors: Hardware-based threading, Hyper-threading technology, Multi-Core processors, Multiple processor interactions, Power consumption, Beyond multi-core architecture.

NOTE: In order to acquire a sound understanding of the subject, it is desirable for the students to work in the laboratory using OpenMP. The hands-on experience would reinforce the concepts learnt in theory. Problems similar to the ones solved in the Algorithms Laboratory can be solved and issues like speed-up achieved can be analyzed in depth. Several free tools are available from companies like INTEL to facilitate such a study.

Text Books:

1. Calvin Lin, Lawrence Snyder: Principles of Parallel Programming, Pearson Education, 2009.
   (Listed topics only from Chapters 1, 2, 3)
2. Michael J. Quinn: Parallel Programming in C with MPI and OpenMP, Tata McGraw Hill, 2004.
   (Listed topics only from Chapters 3, 17)
3. Shameem Akhter, Jason Roberts: Multi-Core Programming, Increasing Performance through Software Multithreading, Intel Press, 2006.
   (Listed topics only from Chapters 3, 4, 7, 9, 10)
4. Web resources for Example Architectures of INTEL and Texas Instruments:
   http://download.intel.com/design/intarch/papers/321087.pdf ;
   http://focus.ti.com/lit/wp/spry133/spry133.pdf

Reference Books:

1. Introduction to Parallel Computing – Ananth Grama et. al., Pearson Education, 2009.
2. Reinders : Intel Threading Building Blocks, O'reilly – 2005
3. David Culler et. al.: Parallel Computer Architecture: A Hardware/Software Approach, Elsevier, 2006.
4. Richard Gerber, Aart J.C. Bik, Kevin B. Smith, Xinmin Tian: Software Optimization Cookbook, High-Performance Recipes for IA-32 Platforms, 2nd Edition, Intel Press, 2006.

WIRELESS NETWORKS AND MOBILE COMPUTING

Sub Code: 10CS831	**IA Marks**	**: 25**
Hrs/Week: 04	**Exam Hours**	**: 03**
Total Hrs: 52	**Exam Marks**	**: 100**

PART-A

UNIT – 1

6 Hours

Mobile Computing Architecture: Types of Networks, Architecture for Mobile Computing, 3-tier Architecture, Design Considerations for Mobile Computing.

UNIT – 2 **7 Hours**

Wireless Networks – 1: GSM and SMS: Global Systems for Mobile Communication (GSM and Short Service Messages (SMS): GSM Architecture, Entities, Call routing in GSM, PLMN Interface, GSM Addresses and Identities, Network Aspects in GSM, Mobility Management, GSM Frequency allocation. Introduction to SMS, SMS Architecture, SM MT, SM MO, SMS as Information bearer, applications

UNIT – 3 **6 Hours**

Wireless Networks – 2: GPRS : GPRS and Packet Data Network, GPRS Network Architecture, GPRS Network Operations, Data Services in GPRS, Applications for GPRS, Billing and Charging in GPRS

UNIT – 4 **7 Hours**

Wireless Networks – 3: CDMA, 3G and WiMAX: Spread Spectrum technology, IS-95, CDMA versus GSM, Wireless Data, Third Generation Networks, Applications on 3G, Introduction to WiMAX.

PART - B

UNIT – 5 **6 Hours**

Mobile Client: Moving beyond desktop, Mobile handset overview, Mobile phones and their features, PDA, Design Constraints in applications for handheld devices.Mobile IP: Introduction, discovery, Registration, Tunneling, Cellular IP, Mobile IP with IPv6

UNIT – 6 **7 Hours**

Mobile OS and Computing Environment: Smart Client Architecture, The Client: User Interface, Data Storage, Performance, Data Synchronization, Messaging. The Server: Data Synchronization, Enterprise Data Source, Messaging. Mobile Operating Systems: WinCE, Palm OS, Symbian OS, Linux, Proprietary OS Client Development : The development process, Need analysis phase, Design phase, Implementation and Testing phase, Deployment phase, Development Tools, Device Emulators.

UNIT – 7 **6 Hours**

Building, Mobile Internet Applications: Thin client: Architecture, the client, Middleware, messaging Servers, Processing a Wireless request, Wireless Applications Protocol (WAP) Overview, Wireless Languages: Markup Languages, HDML, WML, HTML, cHTML, XHTML, VoiceXML.

UNIT – 8 **7 Hours**

J2ME: Introduction, CDC, CLDC, MIDP; Programming for CLDC, MIDlet model, Provisioning, MIDlet life-cycle, Creating new application, MIDlet

event handling, GUI in MIDP, Low level GUI Components, Multimedia APIs; Communication in MIDP, Security Considerations in MIDP.

Text Books:

1. Dr. Ashok Talukder, Ms Roopa Yavagal, Mr. Hasan Ahmed: Mobile Computing, Technology, Applications and Service Creation, 2d Edition, Tata McGraw Hill, 2010
2. Martyn Mallik: Mobile and Wireless Design Essentials, Wiley, 2003

Reference Books:

1. Raj kamal: Mobile Computing, Oxford University Press, 2007.
2. Iti Saha Misra: Wireless Communications and Networks, 3G and Beyond, Tata McGraw Hill, 2009.

DIGITAL SIGNAL PROCESSING

Subject Code: 10CS752	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART - A

UNIT – 1 **7 Hours**

The Discrete Fourier Transform: Its Properties and Applications : Frequency Domain Sampling: The Discrete Fourier Transform: Frequency Domain Sampling and Reconstruction of Discrete-Time Signals, The Discrete Fourier Transform (DFT), The DFT as a Linear Transformation, Relationship of the DFT to other Transforms. Properties of the DFT: Periodicity, Linearity and Symmetry Properties, Multiplication of Two DFT's and Circular Convolution, Additional DFT Properties; Linear FilteringMethods Based on the DFT: Use of the DFT in Linear Filtering, Filtering of Long Data Sequences; Frequency Analysis of Signals using the DFT.

UNIT – 2 **7 Hours**

Efficient Computation of the DFT: Fast Fourier Transform Algorithms: Efficient Computation of the DFT: FFT Algorithms : Direct Computation of the DFT, Divide-and-Conquer Approach to Computation of the DFT, Radix-2 FFT Algorithms, Radix-4 FFT Algorithms, Split-Radix FFT Algorithms, Implementation of FFT Algorithms.

Applications of FFT Algorithms: Efficient computation of the DFT of Two Real Sequences, Efficient computation of the DFT of a 2N-Point Real Sequence, Use of the FFT Algorithm in Linear filtering and Correlation.

A Linear filtering approach to Computation of the DFT: The Goertzel Algorithm, The Chirp-Z Transform Algorithm.

Quantization Effects in the Computation of the DFT: Quantization Errors in the Direct Computation of the DFT, Quantization Errors in FFT Algorithms.

UNIT – 3 **6 Hours**

Implementation of Discrete-Time Systems – 1: Structures for the Realization of Discrete-Time Systems

Structures for FIR Systems: Direct-Form Structures, Cascade-Form Structures, Frequency-Sampling Structures, Lattice Structure.

Structures for IIR Systems: Direct-Form Structures, Signal Flow Graphs and Transposed Structures, Cascade-Form Structures, Parallel-Form Structures, Lattice and Lattice-Ladder Structures for IIR Systems.

UNIT – 4 **6 Hours**

Implementation of Discrete-Time Systems – 2: State-Space System Analysis and Structures: State-Space Descriptions of Systems Characterized by Difference Equations, Solution of the State-Space Equations, Relationships between Input-Output and State-Space Descriptions, State-Space Analysis in the Z-Domain, Additional State-Space Structures.

Representation of Numbers: Fixed-Point Representation of Numbers, Binary Floating-Point Representation of Numbers, Errors Resulting from Rounding and Truncation.

PART – B

UNIT – 5 **6 Hours**

Implementation of Discrete-Time Systems – 3: Quantization of Filter Coefficients: Analysis of Sensitivity to Quantizatior of Filter Coefficients, Quantization of Coefficients in FIR Filters

Round-Off Effects in Digital Filters: Limit-Cycle Oscillations in Recursive Systems, Scaling to Prevent Overflow, Statistical Characterization of Quantization effects in Fixed-Point Realizations of Digital Filters.

UNIT – 6 **7 Hours**

Design of Digital Filters – 1: General Considerations: Causality and its Implications, Characteristics of Practical Frequency-Selective Filters.
Design of FIR Filters: Symmetric And Antisymetric FIR Filters, Design of Linear-Phase FIR Filters Using Windows, Design of Linear-Phase FIR Filters by the Frequency-Sampling Method, Design of Optimum Equiripple Linear-Phase FIR Filters, Design of FIR Differentiators, Design of Hilbert Transformers, Comparison of Design Methods for Linear-Phase FIR filters.

UNIT – 7 **6 Hours**

Design of Digital Filters – 2: Design of IIR Filters from Analog Filters: IIR Filter Design by Approximation of Derivatives, IIR Filter Design by Impulse Invariance, IIR Filter Design by the Bilinear Transformation, The Matched-Z Transformation, Characteristics of commonly used Analog Filters, Some examples of Digital Filters Designs based on the Bilinear Transformation.

UNIT – 8 **7 Hours**

Design of Digital Filters – 3: Frequency Transformations: Frequency Transformations in the Analog Domain, Frequency Transformations in the Digital Domain.
Design of Digital Filters based on Least-Squares method: Padé Approximations method, Least-Square design methods, FIR least-Squares Inverse (Wiener) Filters, Design of IIR Filters in the Frequency domain.

Text Books:

1. John G. Proakis and Dimitris G. Manolakis: Digital Signal Processing, 3rd Edition, Pearson Education, 2003. (Chapters 5, 6, 7 and 8)

Reference Books:

1. Paulo S. R. Diniz, Eduardo A. B. da Silva And Sergio L. Netto: Digital Signal Processing: System Analysis and Design, Cambridge University Press, 2002.
2. Sanjit K. Mitra: Digital Signal Processing: A Computer Based Approach, Tata Mcgraw-Hill, 2001.
3. Alan V Oppenheim and Ronald W Schafer: Digital Signal Processing, PHI, Indian Reprint, 2008.

DIGITAL SIGNAL PROCESSING

Subject Code: 10CS752	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART - A

UNIT – 1 **7 Hours**

The Discrete Fourier Transform: Its Properties and Applications : Frequency Domain Sampling: The Discrete Fourier Transform: Frequency Domain Sampling and Reconstruction of Discrete-Time Signals, The Discrete Fourier Transform (DFT), The DFT as a Linear Transformation, Relationship of the DFT to other Transforms. Properties of the DFT: Periodicity, Linearity and Symmetry Properties, Multiplication of Two DFT's and Circular Convolution, Additional DFT Properties; Linear Filtering

Methods Based on the DFT: Use of the DFT in Linear Filtering, Filtering of Long Data Sequences; Frequency Analysis of Signals using the DFT.

UNIT – 2 **7 Hours**

Efficient Computation of the DFT: Fast Fourier Transform Algorithms: Efficient Computation of the DFT: FFT Algorithms : Direct Computation of the DFT, Divide-and-Conquer Approach to Computation of the DFT, Radix- 2 FFT Algorithms, Radix-4 FFT Algorithms, Split-Radix FFT Algorithms, Implementation of FFT Algorithms.

Applications of FFT Algorithms: Efficient computation of the DFT of Two Real Sequences, Efficient computation of the DFT of a 2N-Point Real Sequence, Use of the FFT Algorithm in Linear filtering and Correlation.

A Linear filtering approach to Computation of the DFT: The Goertzel Algorithm, The Chirp-Z Transform Algorithm.

Quantization Effects in the Computation of the DFT: Quantization Errors in the Direct Computation of the DFT, Quantization Errors in FFT Algorithms.

UNIT – 3 **6 Hours**

Implementation of Discrete-Time Systems – 1: Structures for the Realization of Discrete-Time Systems

Structures for FIR Systems: Direct-Form Structures, Cascade-Form Structures, Frequency-Sampling Structures, Lattice Structure.

Structures for IIR Systems: Direct-Form Structures, Signal Flow Graphs and Transposed Structures, Cascade-Form Structures, Parallel-Form Structures, Lattice and Lattice-Ladder Structures for IIR Systems.

UNIT – 4 **6 Hours**

Implementation of Discrete-Time Systems – 2: State-Space System Analysis and Structures: State-Space Descriptions of Systems Characterized by Difference Equations, Solution of the State-Space Equations, Relationships between Input-Output and State-Space Descriptions, State-Space Analysis in the Z-Domain, Additional State-Space Structures.

Representation of Numbers: Fixed-Point Representation of Numbers, Binary Floating-Point Representation of Numbers, Errors Resulting from Rounding and Truncation.

PART – B

UNIT – 5 **6 Hours**

Implementation of Discrete-Time Systems – 3: Quantization of Filter Coefficients: Analysis of Sensitivity to Quantizatior of Filter Coefficients, Quantization of Coefficients in FIR Filters

Round-Off Effects in Digital Filters: Limit-Cycle Oscillations in Recursive Systems, Scaling to Prevent Overflow, Statistical Characterization of Quantization effects in Fixed-Point Realizations of Digital Filters.

UNIT – 6 **7 Hours**

Design of Digital Filters – 1: General Considerations: Causality and its Implications, Characteristics of Practical Frequency-Selective Filters.

Design of FIR Filters: Symmetric And Antisymetric FIR Filters, Design of Linear-Phase FIR Filters Using Windows, Design of Linear-Phase FIR Filters by the Frequency-Sampling Method, Design of Optimum Equiripple Linear- Phase FIR Filters, Design of FIR Differentiators, Design of Hilbert Transformers, Comparison of Design Methods for Linear-Phase FIR filters.

UNIT – 7 **6 Hours**

Design of Digital Filters – 2: Design of IIR Filters from Analog Filters: IIR Filter Design by Approximation of Derivatives, IIR Filter Design by Impulse Invariance, IIR Filter Design by the Bilinear Transformation, The Matched-Z Transformation, Characteristics of commonly used Analog Filters, Some examples of Digital Filters

Designs based on the Bilinear Transformation.

UNIT – 8 **7 Hours**

Design of Digital Filters – 3: Frequency Transformations: Frequency Transformations in the Analog Domain, Frequency Transformations in the Digital Domain.

Design of Digital Filters based on Least-Squares method: Padé Approximations method, Least-Square design methods, FIR least-Squares Inverse (Wiener) Filters, Design of IIR Filters in the Frequency domain.

Text Books:

2. John G. Proakis and Dimitris G. Manolakis: Digital Signal Processing, 3rd Edition, Pearson Education, 2003.
   (Chapters 5, 6, 7 and 8)

Reference Books:

4. Paulo S. R. Diniz, Eduardo A. B. da Silva And Sergio L. Netto: Digital Signal Processing: System Analysis and Design, Cambridge University Press, 2002.
5. Sanjit K. Mitra: Digital Signal Processing: A Computer Based Approach, Tata Mcgraw-Hill, 2001.
6. Alan V Oppenheim and Ronald W Schafer: Digital Signal Processing, PHI, Indian Reprint, 2008.

Semester: I **Year: 2014-2015**

Course Title: Cloud Computing	**Course Code: 14SCS12**
Credits(L:T:P):3:0:1	**Core/Elective: Core**
Type of Course: Lecture & Practical	**Total Contact Hours: 50 Hrs**

COURSE OBJECTIVES

-To learn how to use Cloud Services.
-To implement Virtualization
- To implement Task Scheduling algorithms.
-Apply Map-Reduce concept to applications.
-To build Private Cloud.

Topics:

Module I

Introduction, Cloud Infrastructure

Cloud computing, Cloud computing delivery models and services, Ethical issues, Cloud vulnerabilities, Cloud computing at Amazon, Cloud computing the Google perspective, Microsoft Windows Azure and online services, Open-source software platforms for private clouds, Cloud storage diversity and vendor lock-in, Energy use and ecological impact, Service level agreements, User experience and software licensing. Exercises and problems.

10 Hours

Module II

Cloud Computing: Application Paradigms.

Challenges of cloud computing, Architectural styles of cloud computing, Workflows: Coordination of multiple activities, Coordination based on a state machine model: The Zookeeper, The Map Reduce programming model, A case study: The GrepTheWeb application , Cloud for science and engineering, High-performance computing on a cloud, Cloud computing for Biology research, Social computing, digital content and cloud computing.

10 Hours

Module III

Cloud Resource Virtualization.

Virtualization, Layering and virtualization, Virtual machine monitors, Virtual Machines, Performance and Security Isolation, Full virtualization and paravirtualization, Hardware support for virtualization, Case Study: Xen a VMM based paravirtualization, Optimization of network virtualization, vBlades, Performance comparison of virtual machines, The dark side of virtualization, Exercises and problems.

10 Hours

Module IV

Cloud Resource Management and Scheduling.

Policies and mechanisms for resource management, Application of control theory to task scheduling on a cloud, Stability of a two-level resource allocation architecture, Feedback control based on dynamic thresholds, Coordination of specialized autonomic performance managers, A utility-based model for cloud-based Web services, Resourcing bundling: Combinatorial auctions for cloud resources, Scheduling algorithms for computing clouds, Fair queuing, Start-time fair queuing, Borrowed virtual time, Cloud scheduling subject to deadlines, Scheduling Map Reduce applications subject to deadlines, Resource management and dynamic scaling, Exercises and problems.

10 Hours

Module V

Cloud Security, Cloud Application Development.

Cloud security risks, Security: The top concern for cloud users, Privacy and privacy impact assessment, Trust, Operating system security, Virtual machine Security, Security of virtualization, Security risks posed by shared images, Security risks posed by a management OS, A trusted virtual machine monitor, Amazon web services: EC2 instances, Connecting clients to cloud instances through firewalls, Security rules for application and transport layer protocols in EC2, How to launch an EC2 Linux instance and connect to it, How to use S3 in java, Cloud-based simulation of a distributed trust algorithm, A trust management service, A cloud service for adaptive data streaming, Cloud based optimal FPGA synthesis .Exercises and problems.

10 Hours

LAB EXPERIMENTS

NOTE: Simulate using object oriented programming, any available cloud environment **(Eg; Amazon cloud) and VM ware for resource virtualization.**

1. Create a Collaborative learning environment for a particular learning topic using Google Apps. Google Drive, Google Docs and Google Slides must be used for hosting e-books, important articles and presentations respectively. The instructor must use the Google Sheets to convey the timetable for different events and for analyzing the scores for individual assignment submission.

2. Modeling and simulation Cloud computing environments, including Data Centers, Hosts and Cloudlets and perform VM provisioning using CloudSim: Design a host with two CPU cores, which receives request for hosting two VMs, such that each one requires two cores and plans to host four tasks units. More specifically, tasks t1, t2, t3 and t4 to be hosted in VM1, while t5, t6, t7, and t8 to be hosted in VM2. Implement space-shared allocation policy and time-shared allocation policy. Compare the results.

3. Model a Cloud computing environment having Data center that had 100 hosts. The hosts are to be modeled to have a CPU core (1000 MIPS), 2 GB of RAM and 1 TB of storage. Consider the workload model for this evaluation included provisioning requests for 400 VMs, with each request demanding 1 CPU core (250 MIPS), 256 MB of RAM and 1 GB of storage. Each VM hosts a *web-hosting application service*, whose CPU utilization distribution was generated according to the uniform distribution. Each instance of a webhosting service required 150,000 MIPS or about 10 minutes to complete execution assuming 100% utilization. Simulate Energy-conscious model for power consumption and power management techniques such as Dynamic Voltage and Frequency Scaling (DVFS). Initially, VMs are to be allocated according to requested parameters (4 VMs on each host). The Cloud computing architecture that is to be considered for studying energy conscious resource management techniques/policies included a data center, CloudCoordinator, and Sensor component. The CloudCoordinator and Sensor perform their usual roles. Via the attached Sensors (which are connected with every host), CloudCoordinator must periodically monitor the performance status of active VMs such as load conditions, and processing share. This real time information is to be passed to VMM, which can use it for performing appropriate resizing of VMs and application of DVFS and soft scaling. CloudCoordinator continuously1 has to adapt allocation of VMs by issuing VM migration commands and changing power states of nodes according to its policy and current utilization of resources.

4. Model and simulate the environment consisting of a data center with 10,000 hosts where each host was modeled to have a single CPU core (1200MIPS), 4GB of RAM memory and 2TB of storage. Consider the provisioning policy for VMs as space-shared, which allows one VM to be active in a host at a given instance of time. Make a request from the end-user (through the Datacenter Broker) for creation and instantiation of 50 VMs that had following constraints: 1024MB of physical memory, 1 CPU core and 1GB of storage. The application granularity was modeled to be composed of 300 task units, with each task unit requiring 1,440,000 million instructions (20 minutes in the simulated hosts) to be executed on a host. Minimal data transfer (300 KB) overhead can be considered for the task units (to and from the data center). After the creation of VMs, task units were submitted in small groups of 50 (one for each VM) at inter-arrival delay of 10 minutes.

5. Implement Map Reduce concept for
a. Strassen's Matrix Multiplication for a huge matrix.
b. Computing the average number of citation index a researcher has according to age among some 1 billion journal articles. Consider a network of entities and relationships between them. It is required to calculate a state of each entity on

the basis of properties of the other entities in its neighborhood. This state can represent a distance to other nodes, indication that there is a neighbor
with the certain properties, characteristic of neighborhood density and so on. A network is stored as a set of nodes and each node contains a list of adjacent node IDs. Mapper emits messages for each node using ID of the adjacent node as a key. Reducer must re compute state and rewrite node with the new state. Implement this scenario.

Course Outcomes:

The students should be able to:

-Demonstrate and experiment simple Cloud Applications

-Apply resource allocation, scheduling algorithms.

- Implement Map-Reduce concept.
- Create virtual machines from available physical resources.
- Setup a private cloud.
- Familiarize with Open Stack.

Text Book:

1. Dan C Marinescu: Cloud Computing Theory and Practice. Elsevier(MK) 2013.

REFERENCES:

1. Rajkumar Buyya , James Broberg, Andrzej Goscinski: Cloud Computing Principles and Paradigms, Willey 2014.
2. John W Rittinghouse, James F Ransome:Cloud Computing Implementation, Management and Security, CRC Press 2013.

Semester: I **Year: 2014-2015**

Course Title: Embedded Computing Systems	**Course Code: 14SCS153**
Credits(L:T:P):4:0:0	**Core/Elective: Elective**
Type of Course: Lecture	**Total Contact Hours: 50 Hrs**

COURSE OBJECTIVES

- Provide a general overview of Embedded Systems
- Show current statistics of Embedded Systems
- Design a complete microprocessor-based hardware system
- Design, code, compile, and test real-time software
- Integrate a fully functional system including hardware and software
- Gain the ability to make intelligent choices between hardware/software tradeoffs.

Topics:

MODULE I

Introduction to embedded systems: Embedded systems, Processor embedded into a system, Embedded hardware units and device in a system, Embedded software in a system, Examples of embedded systems, Design process in embedded system, Formalization of system design, Design process and design examples, Classification of embedded systems, skills required for an embedded system designer.

` **7 Hours**

MODULE II

Devices and communication buses for devices network :IO types and example, Serial communication devices, Parallel device ports, Sophisticated interfacing features in device ports, Wireless devices, Timer and counting devices, Watchdog timer, Real time clock, Networked embedded systems, Serial bus communication protocols, Parallel bus device protocols-parallel communication internet using ISA, PCI, PCI-X and advanced buses, Internet enabled systems- network protocols, Wireless and mobile system protocols.

13 Hours

MODULE III

Device drivers and interrupts and service mechanism: Programming-I/O busy-wait approach without interrupt service mechanism, ISR concept, Interrupt sources, Interrupt servicing (Handling) Mechanism, Multiple interrupts, Context and the periods for context switching, interrupt latency and deadline, Classification of processors interrupt service mechanism from Context-saving angle, Direct memory access, Device driver programming.

10 Hours

MODULE IV

Interprocesses communication and synchronization of processes, Threads and tasks: Multiple process in an application, Multiple threads in an application, Tasks, Task states, Task and Data, Clear-cut distinction between functions. ISRS and tasks by their characteristics, concept and semaphores, Shared data, Inter-process communication, Signal function, Semaphore functions, Message Queue functions, Mailbox functions, Pipe functions, Socket functions, RPC functions. **10 Hours**

MODULE V

Real-time operating systems: OS Services, Process management, Timer functions, Event functions, Memory management, Device, file and IO subsystems management, Interrupt routines in RTOS environment and handling of interrupt source calls, Real-time operating systems, Basic design using an RTOS, RTOS task scheduling models, interrupt latency and response of the tasks as performance metrics, OS security issues**. Introduction to embedded**

software development process and tools, Host and target machines, Linking and location software.

10 Hours

Course Outcomes:

The students should be able to:

- Knowledge to distinguish the characteristics of embedded computer systems.
- Ability examines the various vulnerabilities of embedded computer systems.
- Ability to design embedded systems.
- Awareness of the changing landscape in embedded systems

Text Books:

1. **Raj Kamal**, "Embedded Systems: Architecture, Programming, and Design" 2nd edition , Tata McGraw hill-2013

Chapters: Chapter 1.1 to 1.5, 1.8 to 1.12, Chapter 3, 4, 7, 8 and 13.1 to 13.3.

References:

2. **Marilyn Wolf** ,"Computer as Components, Principles of Embedded Computing System Design" 3rd edition , Elsevier-2014 .

Semester: II **Year: 2014-2015**

Course Title: Managing Big Data	Course Code: 14SCS21
Credits(L:T:P):3:0:1	Core/Elective: Core
Type of Course: Lecture & Practical	Total Contact Hours: 50 Hrs

Course Objectives:

- To Understand big data for business intelligence
- To Learn business case studies for big data analytics
- To Understand Nosql big data management
- To manage Big data without SQL
- To understanding map-reduce analytics using Hadoop and related tools

TOPICS:

MODULE I
UNDERSTANDING BIG DATA **10 Hours**

What is big data – why big data –.Data!, Data Storage and Analysis, Comparison with Other Systems, Rational Database Management System , Grid Computing, Volunteer Computing, convergence of key trends – unstructured data – industry examples of big data – web analytics – big data and marketing – fraud and big data – risk and big data – credit risk management – big data and algorithmic trading – big data and healthcare – big data in medicine – advertising and big data – big data technologies – introduction to Hadoop – open source technologies – cloud and big data – mobile business intelligence – Crowd sourcing analytics – inter and trans firewall analytics

MODULE II
NOSQL DATA MANAGEMENT **10 Hours**

Introduction to NoSQL – aggregate data models – aggregates – key-value and document data models – relationships – graph databases – schema less databases – materialized views – distribution models – sharding –– version – Map reduce – partitioning and combining – composing map-reduce calculations

MODULE III
BASICS OF HADOOP **10 Hours**

Data format – analyzing data with Hadoop – scaling out – Hadoop streaming – Hadoop pipes – design of Hadoop distributed file system (HDFS) – HDFS concepts – Java interface – data flow – Hadoop I/O – data integrity – compression – serialization – Avro – file-based data structures

MODULE IV
MAPREDUCE APPLICATIONS **10 Hours**

MapReduce workflows – unit tests with MRUnit – test data and local tests – anatomy of MapReduce job run – classic Map-reduce – YARN – failures in classic Map-reduce and YARN – job scheduling – shuffle and sort – task execution – MapReduce types – input formats – output formats

MODULE V
HADOOP RELATED TOOLS **10 Hours**

Hbase – data model and implementations – Hbase clients – Hbase examples –praxis. Cassandra – Cassandra data model – cassandra examples – cassandra clients –Hadoop integration. Pig – Grunt – pig data model – Pig Latin – developing and testing Pig Latin scripts. Hive – data types and file formats – HiveQL data definition – HiveQL data manipulation – HiveQL queries.

LAB Experiments

Exercise 1 --- HDFS

Start by reviewing HDFS. You will find that its composition is similar to your local Linux file system. You will use the hadoop fs command when interacting with HDFS.

1. Review the commands available for the Hadoop Distributed File System:
2. Copy file foo.txt from local disk to the user's directory in HDFS
3. Get a directory listing of the user's home directory in HDFS
4. Get a directory listing of the HDFS root directory
5. Display the contents of the HDFS file user/fred/bar.txt
6. Move that file to the local disk, named as baz.txt
7. Create a directory called input under the user's home directory
8. Delete the directory input old and all its contents
9. Verify the copy by listing the directory contents in HDFS:

Exercise 2 --- MapReduce

1. Create a JOB and submit to cluster
2. Track the job information
3. Terminate the job
4. Counters in MR Jobs with example
5. Map only Jobs and generic map examples
6. Distributed cache example
7. Combiners, Secondary sorting and Job chain examples

Exercise 3 --- MapReduce (Programs)

Using movie lens data

1. List all the movies and the number of ratings
2. List all the users and the number of ratings they have done for a movie
3. List all the Movie IDs which have been rated (Movie Id with at least one user rating it)
4. List all the Users who have rated the movies (Users who have rated at least one movie)
5. List of all the User with the max, min, average ratings they have given against any movie
6. List all the Movies with the max, min, average ratings given by any user

Exercise4 – Extract facts using Hive

Hive allows for the manipulation of data in HDFS using a variant of SQL. This makes it excellent for transforming and consolidating data for load into a relational database. In this exercise you will use HiveQL to filter and aggregate click data to build facts about user's movie preferences. The query results will be saved in a staging table used to populate the Oracle Database.

The moveapp_log_json table contains an activity column. Activity states are as follows:

1. RATE_MOVIE
2. COMPLETED_MOVIE
3. PAUSE_MOVIE
4. START_MOVIE
5. BROWSE_MOVIE
6. LIST_MOVIE
7. SEARCH_MOVIE
8. LOGIN
9. LOGOUT
10. INCOMPLETE_MOVIE

```
hive> SELECT * FROM movieapp_log_json LIMIT 5;
hive> drop table movieapp_log_json;
hive> CREATE EXTERNAL TABLE movieapp_log_json (
custId INT,
movieId INT,
genreId INT,
time STRING,
recommended STRING,
activity INT,
rating INT,
price FLOAT
)
ROW FORMAT SERDE 'org.apache.hadoop.hive.contrib.serde2.JsonSerde'
LOCATION '/user/oracle/moviework/applog/';

hive> SELECT * FROM movieapp_log_json LIMIT 20;

hive> SELECT MIN(time), MAX(time) FROM movieapp_log_json
```

1. PURCHASE_MOVIE
Hive maps queries into Map Reduce jobs, simplifying the process of querying large datasets in HDFS. HiveQL statements can be mapped to phases of the Map Reduce framework. As illustrated in the following figure, selection and transformation operations occur in map tasks, while aggregation is handled by reducers. Join operations are flexible: they can be performed in the reducer or mappers depending on the size of the leftmost table.
1. Write a query to select only those clicks which correspond to starting, browsing, completing, or purchasing movies. Use a CASE statement to transform the RECOMMENDED column into integers where 'Y' is 1 and 'N' is 0. Also, ensure GENREID is not null. Only include the first 25 rows.

2. Write a query to select the customer ID, movie ID, recommended state and most recent rating for each movie.

3. Load the results of the previous two queries into a staging table. First, create the staging table:

4. Next, load the results of the queries into the staging table.

Exercise 5 Extract sessions using Pig

While the SQL semantics of HiveQL are useful for aggregation and projection, some analysis is better described as the flow of data through a series of sequential operations. For these situations, Pig Latin provides a convenient way of implementing data flows over data stored in HDFS. Pig Latin statements are translated into a sequence of Map Reduce jobs on the execution of any STORE or DUMP command. Job construction is optimized to exploit as much parallelism as possible, and much like Hive, temporary storage is used to hold intermediate results. As with Hive, aggregation occurs largely in the reduce
tasks. Map tasks handle Pig's FOREACH and LOAD, and GENERATE statements. The EXPLAIN command will show the execution plan for any Pig Latin script. As of Pig 0.10, the ILLUSTRATE command will provide sample results for each stage of the execution plan.

In this exercise you will learn basic Pig Latin semantics and about the fundamental types in Pig Latin, Data Bags and Tuples.

1. Start the Grunt shell and execute the following statements to set up a dataflow with the click stream data. Note: Pig Latin statements are assembled into Map Reduce jobs which are launched at execution of a DUMP or STORE statement.

2. Group the log sample by movie and dump the resulting bag.

3. Add a GROUP BY statement to the sessionize.pig script to process the click stream data into user sessions.

Course Outcomes:
The students should be able to:

- Describe big data and use cases from selected business domains
- Explain NoSQL big data management
- Install, configure, and run Hadoop and HDFS
- Perform map-reduce analytics using Hadoop
- Use Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data Analytics

TEXT BOOKS:

1. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012.
2. Eric Sammer, "Hadoop Operations", O'Reilley, 2012.

REFERENCES:

1. Vignesh Prajapati, Big data analytics with R and Hadoop, SPD 2013.
2. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.
3. Lars George, "HBase: The Definitive Guide", O'Reilley, 2011.
4. Alan Gates, "Programming Pig", O'Reilley, 2011.

Semester: II **Year: 2014-2015**

Course Title: Advances in Computer Networks	Course Code: 14SCS22
Credits(L:T:P):3:0:1	Core/Elective: Core
Type of Course: Lecture & Practical	Total Contact Hours: 50 Hrs

Course Objectives:

- To become familiar with the basics of Computer Networks
- To understand various Network architectures
- Concepts of fundamental protocols
- To understand the network traffic, congestion, controlling and resource allocation.

Topics:

MODULE I

Foundation

Building a Network, Requirements, Perspectives, Scalable Connectivity, Cost-Effective Resource sharing, Support for Common Services, Manageability, Protocol layering, Performance, Bandwidth and Latency, Delay X Bandwidth Product, Perspectives on Connecting, Classes of Links, Reliable Transmission, Stop-and-Wait , Sliding Window, Concurrent Logical Channels.

T1: **Chapter 1.1, 1.2, 1.5.1, 1.5.2**., **2.1, 2.5** **T2**: **Chapter 4** **10 Hours**

MODULE II

Internetworking- I

Switching and Bridging, Datagram's, Virtual Circuit Switching, Source Routing, Bridges and LAN Switches, Basic Internetworking (IP), What is an Internetwork ?, Service Model, Global Addresses, Datagram Forwarding in IP, sub netting and classless addressing, Address Translation(ARP), Host Configuration(DHCP), Error Reporting(ICMP), Virtual Networks and Tunnels.

T1: Chapter 3.1, 3.2, **10 Hours**

MODULE III

Internetworking- II

Network as a Graph, Distance Vector(RIP), Link State(OSPF), Metrics, The Global Internet, Routing Areas, Routing among Autonomous systems(BGP), IP Version 6(IPv6), Mobility and Mobile IP

T1: Chapter 3.3, 4.1.1,4.1.3 **T2**:Chapter 13.1 to 13.18 , Ch 18. **10 Hours**

MODULE IV

End-to-End Protocols

Simple Demultiplexer (UDP), Reliable Byte Stream(TCP), End-to-End Issues, Segment Format, Connecting Establishment and Termination, Sliding Window Revisited, Triggering Transmission, Adaptive Retransmission, Record Boundaries, TCP Extensions, Queuing Disciplines, FIFO, Fair Queuing, TCP Congestion Control, Additive Increase/ Multiplicative Decrease, Slow Start, Fast Retransmit and Fast Recovery.

T1: Chapter 5.1, 5.2.1 to 5.2.8, 6.2, 6.3 **10 Hours**

MODULE V

Congestion Control and Resource Allocation

Congestion-Avoidance Mechanisms, DEC bit, Random Early Detection (RED), Source-Based Congestion Avoidance. The Domain Name System(DNS),Electronic Mail(SMTP,POP,IMAP,MIME),World Wide Web(HTTP),Network Management(SNMP) .

T1: Chapter 6.4 **T2**: Chapter 23.1 to 23.16, Chapter 24, Chapter 25, Chapter 27.1 to 27.8 **10 Hours**

Laboratory Work:

PART A: Implement the following using C/C++:

1. Write a program to transfer the contents of a requested file from server to the client using TCP/IP Sockets (using TCP/IP Socket programming).
2. Write a program to archive Traffic management at Flow level by implementing Closed Loop Control technique. (Leaky Bucket Algorithm)
3. Write a program to implement dynamic routing strategy in finding optimal path for data transmission. (Bellman ford algorithm).
4. Write a program to implement Link State Routing (Dijkstra Algorithm).
5. Write a program for implementing the error detection technique while data transfer in unreliable network code using CRC (16-bits) Technique.
6. Write a program for providing security for transfer of data in the network. (RSA Algorithm)
7. Write a program for encrypting 64 bit playing text using DES algorithm.

PART B: Simulation Programs using OPNET /NS2 or any other equivalent software

1. Simulate a 3 node point to point network with duplex links between them. Set the Queue size and vary the bandwidth and find the number of packets dropped.
2. Simulate a four-node point-to-point network, and connect the links as follows: n0->n2, n1->n2 and n2->n3. Apply TCP agent changing the parameters and determine the number of packets sent/received by TCP/UDP
3. Simulate the different types of internet traffic such as FTP and TELNET over network and analyze the throughput.

Course Outcomes:

The students should be able to:

- List and classify network services, protocols and architectures, explain why they are layered.
- Choose key Internet applications and their protocols, and apply to develop their own applications (e.g. Client Server applications, Web Services) using the sockets API.
- Explain develop effective communication mechanisms using techniques like connection establishment, queuing theory, recovery Etc.
- Explain various congestion control techniques.

Text books:

1. **T1: Larry Peterson and Bruce S Davis** "Computer Networks :A System Approach" 5th Edition , Elsevier -2014
2. **T2: Douglas E Comer, "**Internetworking with TCP/IP, Principles, Protocols and Architecture" 6th Edition, PHI - 2014

References:

1. **Uyless Black** "Computer Networks, Protocols , Standards and Interfaces" 2nd Edition - PHI
2. **Behrouz A Forouzan** "TCP/IP Protocol Suite" 4th Edition – Tata McGraw-Hill

Semester: II **Year: 2014-2015**

Course Title: Advanced Algorithms	**Course Code: 14SCS23**
Credits(L:T:P):4:0:0	**Core/Elective: Core**
Type of Course: Lecture	**Total Contact Hours: 50 Hrs**

COURSE OBJECTIVES

- To learn the graph search algorithms.
- To study network flow and linear programming problems.
- To learn the hill climbing and dynamic programming design techniques.
- To develop recursive backtracking algorithms.
- To get an awareness of NP completeness and randomized algorithms.

Topics:

MODULE I

Review of Analysis Techniques: Growth of Functions: Asymptotic notations; Standard notations and common functions; Recurrences and Solution of Recurrence equations- The substitution method, The recurrence – tree method, The master method; Amortized Analysis: Aggregate, Accounting and Potential Methods.

10 Hours

MODULE II

Graph Algorithms: Bellman - Ford Algorithm; Single source shortest paths in a DAG; Johnson's Algorithm for sparse graphs; Flow networks and Ford-Fulkerson method; Maximum bipartite matching.
Polynomials and the FFT: Representation of polynomials; The DFT and FFT; Efficient implementation of FFT.

10 Hours

MODULE III

Number -Theoretic Algorithms: Elementary notions; GCD; Modular Arithmetic; Solving modular linear equations; The Chinese remainder theorem; Powers of an element; RSA cryptosystem; Primality testing; Integer factorization.

10 Hours

MODULE IV

String-Matching Algorithms: Naïve string Matching; Rabin - Karp algorithm; String matching with finite automata; Knuth-Morris-Pratt algorithm; Boyer – Moore algorithms.

10 Hours

MODULE V

Probabilistic and Randomized Algorithms: Probabilistic algorithms; Randomizing deterministic algorithms, Monte Carlo and Las Vegas algorithms; Probabilistic numeric algorithms.

10 Hours

Course Outcomes:

Upon completion of the course, the students will be able to

- Design and apply iterative and recursive algorithms.
- Design and implement optimization algorithms in specific applications.
- Design appropriate shared objects and concurrent objects for applications.

TEXT BOOKS:

1. T. H Cormen, C E Leiserson, R L Rivest and C Stein: Introduction to Algorithms, 3rd Edition, Prentice-Hall of India, 2010.
2. Kenneth A. Berman, Jerome L. Paul: Algorithms, Cengage Learning, 2002.

REFERENCE BOOKS:

1. Ellis Horowitz, Sartaj Sahni, S.Rajasekharan: Fundamentals of Computer Algorithms, 2nd Edition, Universities press, 2007.

Semester: II **Year: 2014-2015**

Course Title: Web Services	**Course Code: 14SCS251**
Credits(L:T:P):4:0:0	**Core/Elective: Elective**
Type of Course: Lecture	**Total Contact Hours: 50 Hrs**

Course objectives:

- To provide an in-depth knowledge of Web Services.
- To understand the fundamental concepts of Web services.
- To understand the fundamental concepts of WSDL Web Services.
- To design Web service Architecture.
- To Study Building Blocks of Web services.

TOPICS:

MODULE I

Middleware: Understanding the middle ware, RPC and Related Middle ware, TP Monitors, Object Brokers, Message-Oriented Middleware. **10 Hours**

MODULE II

Web Services: Web Services Technologies, Web Services Architecture. **10 Hours**

MODULE III

Basic Web Services Technology: WSDL Web Services Description Language, UDDI Universal Description Discovery and Integration, Web Services at work interactions between the Specifications, Related Standards.

10 Hours

MODULE IV

Service Coordination Protocols: Infrastructure for Coordination Protocols, WS- Coordination, WS-Transaction, Rosetta Net and Other Standards Related to Coordination Protocols. **10 Hours**

MODULE V

Service Composition: Basic of Service Composition, A New Chance of Success for Composition, Services Composition Models, Dependencies between Coordination and Composition, BPEL: Business Process Execution Language for Web Services, Outlook, Applicability of the Web Services, Web services as a Problem and a Solution : AN Example.

10 Hours

Course Outcomes:

The students should be able to:

- Bind and unbind services in UDDI.
- Develop WSDL document
- Implement web service client to call public service.
- Implement a service and exposing it as public service.

Text Books:

1. Gustavo Alonso, Fabio Casati, Harumi Kuno, Vijay Machiraju: Web Services(Concepts ,Architectures and Applications), Springer International Edition 2009.

Semester: II **Year: 2014-2015**

Course Title: Information And Network Security	Course Code: 14SCS252
Credits(L:T:P):4:0:0	Core/Elective: Elective
Type of Course: Lecture	Total Contact Hours: 50 Hrs

Course Objectives:

- To understand the fundamentals of Cryptography
- To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity.
- To understand the various key distribution and management schemes.
- To understand how to deploy encryption techniques to secure data in transit across data networks
- To design security applications in the field of Information technology

TOPICS:

MODULE I

Classical Encryption Techniques

Symmetric Cipher Model, Cryptography, Cryptanalysis and Brute-Force Attack, Substitution Techniques, Caesar Cipher, Monoalphabetic Cipher, Playfair Cipher, Hill Cipher, Polyalphabetic Cipher, One Time Pad. **Block Ciphers and the data encryption standard:** Traditional block Cipher structure, stream Ciphers and block Ciphers, Motivation for the feistel Cipher structure, the feistel Cipher, The data encryption standard, DES encryption, DES decryption, A DES example, results, the avalanche effect, the strength of DES, the use of 56-Bit Keys, the nature of the DES algorithm, timing attacks, Block cipher design principles, number of rounds, design of function F, key schedule algorithm.

10 Hours

MODULE II

Public-Key Cryptography and RSA: Principles of public-key cryptosystems. Public-key cryptosystems. Applications for public-key cryptosystems, requirements for public-key cryptosystems. public-key cryptanalysis. The RSA algorithm, description of the algorithm, computational aspects, the security of RSA. **Other Public-Key Cryptosystems:** Diffie-hellman key exchange, The algorithm, key exchange protocols, man in the middle attack, Elgamal Cryptographic systems, Elliptic curve arithmetic, abelian groups, elliptic curves over real numbers, elliptic curves over Zp, elliptic curves overGF(2m), Elliptic curve cryptography, Analog of Diffie-hellman key exchange, Elliptic curve encryption/ decryption, security of Elliptic curve cryptography, Pseudorandom number generation based on an asymmetric cipher, PRNG based on RSA. **10 Hours**

MODULE III

Key Management and Distribution: Symmetric key distribution using Symmetric encryption, A key distribution scenario, Hierarchical key control, session key lifetime, a transparent key control scheme, Decentralized key control, controlling key usage, Symmetric key distribution using asymmetric encryption, simple secret key distribution, secret key distribution with confidentiality and authentication, A hybrid scheme, distribution of public keys, public announcement of public keys, publicly available directory, public key authority, public keys certificates, X-509 certificates. Certificates, X-509 version 3, public key infrastructure .**User Authentication:** Remote user Authentication principles, Mutual Authentication, one way Authentication, remote user Authentication using Symmetric encryption, Mutual Authentication, one way Authentication, Kerberos, Motivation , Kerberos version 4, Kerberos version 5, Remote user Authentication using Asymmetric encryption, Mutual Authentication, one way Authentication, federated identity management, identity management, identity federation, personal identity verification.

10 Hours

MODULE IV

Wireless network security: Wireless security, Wireless network threats, Wireless network measures, mobile device security, security threats, mobile device security strategy, IEEE 802.11 Wireless LAN overview, the Wi-Fi alliance, IEEE 802 protocol architecture. Security, IEEE 802.11i services, IEEE 802.11i phases of operation, discovery phase, Authentication phase, key management phase, protected data transfer phase, the IEEE 802.11i pseudorandom function, .
Web Security Considerations: Web Security Threats, Web Traffic Security Approaches. **Secure Sockets Layer:** SSL Architecture, SSL Record Protocol, Change Cipher Spec Protocol, Alert Protocol, and shake Protocol, Cryptographic

Computations. **Transport Layer Security:** Version Number, Message Authentication Code, Pseudorandom Functions, Alert Codes, Cipher Suites, Client Certificate Types, Certificate Verify And Finished Messages, Cryptographic Computations, Padding. **HTTPS** Connection Initiation, Connection Closure. **Secure Shell (SSH)** Transport Layer Protocol, User Authentication Protocol, Connection Protocol.

10 Hours

MODULE V

Electronic Mail Security: Pretty good privacy, notation, operational; description, S/MIME, RFC5322, Multipurpose internet mail extensions, S/MIME functionality, S/MIME messages, S/MIME certificate processing, enhanced security services, Domain keys identified mail, internet mail architecture, E-Mail threats, DKIM strategy, DKIM functional flow. **IP Security:** IP Security overview, applications of IPsec, benefits of IPsec, Routing applications, IPsec documents, IPsec services, transport and tunnel modes, IP Security policy, Security associations, Security associations database, Security policy database, IP traffic processing, Encapsulating Security payload, ESP format, encryption and authentication algorithms, Padding, Anti replay service, transport and tunnel modes, combining security associations, authentication plus confidentiality, basic combinations of security associations, internet key exchange, key determinations protocol, header and payload formats, cryptographic suits. **10 Hours**

Course Outcomes:

The students be able to

- Analyze the vulnerabilities in any computing system and hence be able to design a
- security solution.
- Identify the security issues in the network and resolve it.
- Evaluate security mechanisms using rigorous approaches, including theoretical.

Text Books:

1. William Stallings: Cryptography and Network Security, Pearson 6th edition. 2013

References

1. V k Pachghare: Cryptography and Information Security, PHE ,2013.

Semester: II **Year: 2014-2015**

Course Title : Pattern Recognition	Course Code: 14SCS253
Credits(L:T:P):4:0:0	Core/Elective: Elective
Type of Course: Lecture	Total Contact Hours: 50 Hrs

Course Objectives:
- To study the mathematical morphology necessary for Pattern recognition.
- To introduce the student to various Pattern recognition techniques.
- To study the Representation and description and feature extraction.
- To study the principles of decision trees and clustering in pattern recognition.

TOPICS:

MODULE I

Introduction: Definition of PR, Applications, Datasets for PR, Different paradigms for PR, Introduction to probability, events, random variables, Joint distributions and densities, moments. Estimation minimum risk estimators, problems.

10 Hours

MODULE II

Representation: Data structures for PR, Representation of clusters, proximity measures, size of patterns, Abstraction of Data set, Feature extraction, Feature selection, Evaluation. **10 Hours**

MODULE III

Nearest Neighbor based classifiers & Bayes classifier: Nearest neighbor algorithm, variants of NN algorithms, use of NN for transaction databases, efficient algorithms, Data reduction, prototype selection, Bayes theorem, minimum error rate classifier, estimation of probabilities, estimation of probabilities, comparison with NNC, Naive Bayes classifier, Basyessian belief network. **10 Hours**

MODULE IV

Decision Trees: Introduction, DT for PR, Construction of DT, Splitting at the nodes, Over-fitting & Pruning, Examples.

10 Hours

MODULE V

Clustering: Hierarchical (Agglomerative, single/complete/average linkage, wards, Partitional (Forgy's, k-means, Iso-data), clustering large data sets, examples. **10 Hours**

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to
- Develop and analyze decision tress.
- Design the nearest neighbor classifier.
- Develop algorithms for Pattern Recognition.

Text Books:
1. Pattern Recognition (An Introduction) , V Susheela Devi, M Narsimha Murthy, Universities Press, ISBN 978-81-7371-725-3,2011.
2. Pattern Recognition & Image Analysis, Earl Gose, Richard Johnsonbaugh, Steve Jost. PHI ISBN-81-203-1484-0, 1996.

References

1. Duda R. O., P.E. Hart, D.G. Stork., Pattern Classification, John Wiley and sons, 2000.

Semester: IV **Year: 2014-2015**

Course Title: Machine Learning Techniques	**Course Code: 14SCS41**
Credits(L:T:P):3:0:1	**Core/Elective: Core**
Type of Course: Lecture & Practical	**Total Contact Hours: 50 Hrs**

COURSE OBJECTIVES:

- To understand the basic concepts of learning and decision trees.
- To understand the neural networks and genetic algorithms
- To understand the Bayesian techniques
- To understand the instant based learning
- To understand the analytical learning and reinforced learning

TOPICS:

MODULE I

INTRODUCTION, CONCEPT LEARNING AND DECISION TREES

Learning Problems – Designing Learning systems, Perspectives and Issues – Concept Learning – Version Spaces and Candidate Elimination Algorithm – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search. **10 Hrs**

MODULE II

NEURAL NETWORKS AND GENETIC ALGORITHMS

Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evolution and Learning. **10 Hrs**

MODULE III

BAYESIAN AND COMPUTATIONAL LEARNING

Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network – EM Algorithm – Probably Learning – Sample Complexity for Finite and Infinite Hypothesis Spaces – Mistake Bound Model. **10 Hrs**

MODULE IV

INSTANT BASED LEARNING AND LEARNING SET OF RULES

K- Nearest Neighbor Learning – Locally Weighted Regression – Radial Basis Functions – Case-Based Reasoning – Sequential Covering Algorithms – Learning Rule Sets – Learning First Order Rules – Learning Sets of First Order Rules – Induction as Inverted Deduction – Inverting Resolution **10 Hrs**

MODULE V

ANALYTICAL LEARNING AND REINFORCED LEARNING

Perfect Domain Theories – Explanation Based Learning – Inductive-Analytical Approaches - FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning **10 Hrs**

LABORATORY WORK

(The following tasks can be implemented in a language of your choice or any tools available)

1) Implement the CANDIDATE – ELIMINATION algorithm. Show how it is used to learn from training examples and hypothesize new instances in Version Space.
2) Implement the FIND–S algorithm. Show how it can be used to classify new instances of target concepts. Run the experiments to deduce instances and hypothesis consistently.

3) Implement the ID3 algorithm for learning Boolean–valued functions for classifying the training examples by searching through the space of a Decision Tree.
4) Design and implement the Back-propagation algorithm by applying it to a learning task involving an application like FACE RECOGNITION.
5) Design and implement Naïve Bayes Algorithm for learning and classifying TEXT DOCUMENTS.

COURSE OUTCOMES:

On Completion of the course, the students will be able to

- Choose the learning techniques with this basic knowledge.
- Apply effectively neural networks and genetic algorithms for appropriate applications.
- Apply bayesian techniques and derive effectively learning rules.
- Choose and differentiate reinforcement and analytical learning techniques

TEXT BOOK:

1. Tom M. Mitchell, "Machine Learning", McGraw-Hill Education (INDIAN EDITION), 2013.

REFERENCES:

2. Ethem Alpaydin, "Introduction to Machine Learning", 2^{nd} Ed., PHI Learning Pvt. Ltd., 2013.
3. T. Hastie, R. Tibshirani, J. H. Friedman, "The Elements of Statistical Learning", Springer; 1st edition, 2001.

ANALOG ELECTRONIC CIRCUITS
(Common to EC/TC/EE/IT/BM/ML)

Sub Code	:	**10ES32**	**IA Marks**	:	**25**
Hrs/ Week	:	**04**	**Exam Hours**	:	**03**
Total Hrs.	:	**52**	**Exam Marks**	:	**100**

PART – A

UNIT 1:
Diode Circuits: Diode Resistance, Diode equivalent circuits, Transition and diffusion capacitance, Reverse recovery time, Load line analysis, Rectifiers, Clippers and clampers. **6 Hours**

UNIT 2:
Transistor Biasing: Operating point, Fixed bias circuits, Emitter stabilized biased circuits, Voltage divider biased, DC bias with voltage feedback, Miscellaneous bias configurations, Design operations, Transistor switching networks, PNP transistors, Bias stabilization. **6 Hours**

UNIT 3:
Transistor at Low Frequencies: BJT transistor modeling, CE Fixed bias configuration, Voltage divider bias, Emitter follower, CB configuration, Collector feedback configuration, Analysis of circuits r_e model; analysis of CE configuration using h- parameter model; Relationship between h-parameter model of CE,CC and CE configuration. **7 Hours**

UNIT 4:
Transistor Frequency Response: General frequency considerations, low frequency response, Miller effect capacitance, High frequency response, multistage frequency effects. **7 Hours**

PART – B

UNIT 5:
(a) General Amplifiers: Cascade connections, Cascode connections, Darlington connections. **3 Hours**
(b) Feedback Amplifier: Feedback concept, Feedback connections type, Practical feedback circuits. Design procedures for the feedback amplifiers. **4 Hours**

UNIT 6:
Power Amplifiers: Definitions and amplifier types, series fed class A amplifier, Transformer coupled Class A amplifiers, Class B amplifier operations, Class B amplifier circuits, Amplifier distortions. Designing of Power amplifiers. **7 Hours**

UNIT 7:
Oscillators: Oscillator operation, Phase shift Oscillator, Wienbridge Oscillator, Tuned Oscillator circuits, Crystal Oscillator. (BJT Version Only) Simple design methods of Oscillators. **6 Hours**

UNIT 8:
FET Amplifiers: FET small signal model, Biasing of FET, Common drain common gate configurations, MOSFETs, FET amplifier networks.
6 Hours

TEXT BOOK:
1. **"Electronic Devices and Circuit Theory",** Robert L. Boylestad and Louis Nashelsky, PHI/Pearson Eduication. 9TH Edition.

REFERENCE BOOKS:
1. **'Integrated Electronics',** Jacob Millman & Christos C. Halkias, Tata - McGraw Hill, 2nd Edition, 2010
2. **"Electronic Devices and Circuits",** David A. Bell, PHI, 4th Edition, 2004
3. "**Analog Electronics Circuits: A Simplified Approach"**, U.B. Mahadevaswamy, Pearson/Saguine, 2007.

LOGIC DESIGN
(Common to EC/TC/EE/IT/BM/ML)

Sub Code	**:**	**10ES33**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:
Principles of combinational logic-1: Definition of combinational logic, Canonical forms, Generation of switching equations from truth tables,

UNIT 6:

Power Amplifiers: Definitions and amplifier types, series fed class A amplifier, Transformer coupled Class A amplifiers, Class B amplifier operations, Class B amplifier circuits, Amplifier distortions. Designing of Power amplifiers. **7 Hours**

UNIT 7:

Oscillators: Oscillator operation, Phase shift Oscillator, Wienbridge Oscillator, Tuned Oscillator circuits, Crystal Oscillator. (BJT Version Only) Simple design methods of Oscillators. **6 Hours**

UNIT 8:

FET Amplifiers: FET small signal model, Biasing of FET, Common drain common gate configurations, MOSFETs, FET amplifier networks.

6 Hours

TEXT BOOK:

1. **"Electronic Devices and Circuit Theory",** Robert L. Boylestad and Louis Nashelsky, PHI/Pearson Eduication. 9^{TH} Edition.

REFERENCE BOOKS:

1. **'Integrated Electronics',** Jacob Millman & Christos C. Halkias, Tata - McGraw Hill, 2^{nd} Edition, 2010
2. **"Electronic Devices and Circuits",** David A. Bell, PHI, 4^{th} Edition, 2004
3. "**Analog Electronics Circuits: A Simplified Approach"**, U.B. Mahadevaswamy, Pearson/Saguine, 2007.

LOGIC DESIGN
(Common to EC/TC/EE/IT/BM/ML)

Sub Code	**:**	**10ES33**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:

Principles of combinational logic-1: Definition of combinational logic, Canonical forms, Generation of switching equations from truth tables,

Karnaugh maps-3, 4 and 5 variables, Incompletely specified functions (Don't Care terms), Simplifying Max term equations. **6 Hours**

UNIT 2:

Principles of combinational Logic-2: Quine-McCluskey minimization technique- Quine-McCluskey using don't care terms, Reduced Prime Implicant Tables, Map entered variables. **7 Hours**

UNIT 3:

Analysis and design of combinational logic - I: General approach, Decoders-BCD decoders, Encoders. **6 Hours**

UNIT 4:

Analysis and design of combinational logic - II: Digital multiplexers-Using multiplexers as Boolean function generators. Adders and subtractors-Cascading full adders, Look ahead carry, Binary comparators. Design methods of building blocks of combinational logics.

7 Hours

PART – B

UNIT 5:

Sequential Circuits – 1: Basic Bistable Element, Latches, SR Latch, Application of SR Latch, A Switch Debouncer, The $\bar{S}\,\bar{R}$ Latch, The gated SR Latch, The gated D Latch, The Master-Slave Flip-Flops (Pulse-Triggered Flip-Flops): The Master-Slave SR Flip-Flops, The Master-Slave JK Flip-Flop, Edge Triggered Flip-Flop: The Positive Edge-Triggered D Flip-Flop, Negative-Edge Triggered D Flip-Flop. **7 Hours**

UNIT 6:

Sequential Circuits – 2: Characteristic Equations, Registers, Counters - Binary Ripple Counters, Synchronous Binary counters, Counters based on Shift Registers, Design of a Synchronous counters, Design of a Synchronous Mod-6 Counter using clocked JK Flip-Flops Design of a Synchronous Mod-6 Counter using clocked D, T, or SR Flip-Flops **7 Hours**

UNIT 7:

Sequential Design - I: Introduction, Mealy and Moore Models, State Machine Notation, Synchronous Sequential Circuit Analysis and Design.

6 Hours

UNIT 8:

Sequential Design - II: Construction of state Diagrams, Counter Design.
6 Hours

TEXT BOOKS:

1. **"Digital Logic Applications and Design"**, John M Yarbrough, Thomson Learning, 2001.
2. **"Digital Principles and Design ",** Donald D Givone, Tata McGraw Hill Edition, 2002.

REFERENCE BOOKS:

1. **"Fundamentals of logic design",** Charles H Roth, Jr; Thomson Learning, 2004.
2. **"Logic and computer design Fundamentals",** Mono and Kim, Pearson, Second edition, 2001.
3. **"Logic Design",** Sudhakar Samuel, Pearson/Saguine, 2007

NETWORK ANALYSIS
(Common to EC/TC/EE/IT/BM/ML)

Sub Code	**:**	**10ES34**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:

Basic Concepts: Practical sources, Source transformations, Network reduction using Star – Delta transformation, Loop and node analysis With linearly dependent and independent sources for DC and AC networks, Concepts of super node and super mesh. **7 Hours**

UNIT 2:

Network Topology: Graph of a network, Concept of tree and co-tree, incidence matrix, tie-set, tie-set and cut-set schedules, Formulation of equilibrium equations in matrix form, Solution of resistive networks, Principle of duality**.** **7 Hours**

UNIT 3:

Network Theorems – 1: Superposition, Reciprocity and Millman's theorems. **6 Hours**

transform representation of discrete time signals. Sampling theorm and Nyquist rate. **7 Hours**

UNIT 7:

Z-Transforms – 1: Introduction, Z – transform, properties of ROC, properties of Z – transforms, inversion of Z – transforms.

6 Hours

UNIT 8:

Z-transforms – 2: Transform analysis of LTI Systems, unilateral Z-Transform and its application to solve difference equations. **6 Hours**

TEXT BOOK

1. **Simon Haykin,** "Signals and Systems", John Wiley India Pvt. Ltd., 2nd Edn, 2008.
2. **Michael Roberts,** "Fundamentals of Signals & Systems", 2nd ed, Tata McGraw-Hill, 2010.

REFERENCE BOOKS:

1. **Alan V Oppenheim, Alan S, Willsky and A Hamid Nawab,** "Signals and Systems" Pearson Education Asia / PHI, 2nd edition, 1997. Indian Reprint 2002.
2. **H. P Hsu, R. Ranjan**, "Signals and Systems", Scham's outlines, TMH, 2006.
3. **B. P. Lathi**, "Linear Systems and Signals", Oxford University Press, 2005.
4. **Ganesh Rao and Satish Tunga**, "Signals and Systems", Pearson/Sanguine Technical Publishers, 2004.

FUNDAMENTALS OF HDL
(Common to EC/TC/IT/BM/ML)

Sub Code	**:**	**10EC45**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:

Introduction: Why HDL? , A Brief History of HDL, Structure of HDL Module, Operators, Data types, Types of Descriptions, simulation and synthesis, Brief comparison of VHDL and Verilog

7 Hours

UNIT 2:
Data –Flow Descriptions: Highlights of Data-Flow Descriptions, Structure of Data-Flow Description, Data Type – Vectors. **6 Hours**

UNIT 3:
Behavioral Descriptions: Behavioral Description highlights, structure of HDL behavioral Description, The VHDL variable –Assignment Statement, sequential statements. **6 Hours**

UNIT 4:
Structural Descriptions: Highlights of structural Description, Organization of the structural Descriptions, Binding, state Machines, Generate, Generic, and Parameter statements.

7 Hours

PART – B

UNIT 5:
Procedures, Tasks, and Functions: Highlights of Procedures, tasks, and Functions, Procedures and tasks, Functions.
Advanced HDL Descriptions: File Processing, Examples of File Processing
7 Hours

UNIT 6:
Mixed –Type Descriptions: Why Mixed-Type Description? VHDL User-Defined Types, VHDL Packages, Mixed-Type Description examples
6 Hours

UNIT 7:
Mixed –Language Descriptions: Highlights of Mixed-Language Description, How to invoke One language from the Other, Mixed-language Description Examples, Limitations of Mixed-Language Description.
7 Hours

UNIT 8:
Synthesis Basics: Highlights of Synthesis, Synthesis information from Entity and Module, Mapping Process and Always in the Hardware Domain.
6 Hours

TEXT BOOKS:
1. **HDL Programming (VHDL and Verilog)**- Nazeih M.Botros- John Weily India Pvt. Ltd. 2008.

REFERENCE BOOKS:
1. **Fundamentals of HDL** – Cyril P.R. Pearson/Sanguin 2010.
2. **VHDL** -Douglas perry-Tata McGraw-Hill.
3. **A Verilog HDL Primer**- J.Bhaskar – BS Publications
4. **Circuit Design with VHDL**-Volnei A.Pedroni-PHI.

MICROCONTROLLERS LAB
(Common to EC/TC/EE/IT/BM/ML)

Sub Code	**:**	**10ESL47**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**03**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**42**	**Exam Marks**	**:**	**50**

I. PROGRAMMING

1. Data Transfer - Block move, Exchange, Sorting, Finding largest element in an array.
2. Arithmetic Instructions - Addition/subtraction, multiplication and division, square, Cube – (16 bits Arithmetic operations – bit addressable).
3. Counters.
4. Boolean & Logical Instructions (Bit manipulations).
5. Conditional CALL & RETURN.
6. Code conversion: BCD – ASCII; ASCII – Decimal; Decimal - ASCII; HEX - Decimal and Decimal - HEX .
7. Programs to generate delay, Programs using serial port and on-Chip timer / counter.

Note: Programming exercise is to be done on both 8051 & MSP430.

II. INTERFACING:

Write C programs to interface 8051 chip to Interfacing modules to develop single chip solutions.

8. Simple Calculator using 6 digit seven segment displays and Hex Keyboard interface to 8051.
9. Alphanumeric LCD panel and Hex keypad input interface to 8051.
10. External ADC and Temperature control interface to 8051.
11. Generate different waveforms Sine, Square, Triangular, Ramp etc. using DAC interface to 8051; change the frequency and amplitude.
12. Stepper and DC motor control interface to 8051.
13. Elevator interface to 8051.

HDL LAB
(Common to EC/TC/IT/BM/ML)

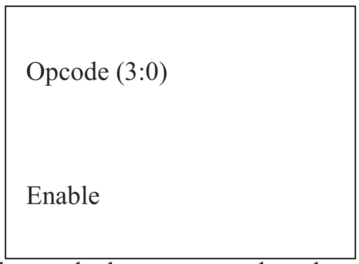
Sub Code	**:**	**10ECL48**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**03**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**42**	**Exam Marks**	**:**	**50**

Note: Programming can be done using any compiler. Download the programs on a FPGA/CPLD boards such as Apex/Acex/Max/Spartan/Sinfi/TK Base or equivalent and performance testing may be done using 32 channel pattern generator and logic analyzer apart from verification by simulation with tools such as Altera/Modelsim or equivalent.

PROGRAMMING (using VHDL /Verilog)

1. Write HDL code to realize all the logic gates
2. Write a HDL program for the following combinational designs
   a. 2 to 4 decoder
   b. 8 to 3 (encoder without priority & with priority)
   c. 8 to 1 multiplexer
   d. 4 bit binary to gray converter
   e. Multiplexer, de-multiplexer, comparator.
2. Write a HDL code to describe the functions of a Full Adder Using three modeling styles.

3. Write a model for 32 bit ALU using the schematic diagram shown below
A (31:0) B (31:0)



- ALU should use combinational logic to calculate an output based on the four bit op-code input.
- ALU should pass the result to the out bus when enable line in high, and tri-state the out bus when the enable line is low.
- ALU should decode the 4 bit op-code according to the given in example below.

OPCODE	ALU OPERATION
1.	A + B
2.	A – B
3.	A Complement
4.	A * B
5.	A AND B
6.	A OR B
7.	A NAND B
8.	A XOR B

4. Develop the HDL code for the following flip-flops, SR, D, JK, T.
5. Design 4 bit binary, BCD counters (Synchronous reset and Asynchronous reset) and “any sequence” counters

INTERFACING (at least four of the following must be covered using VHDL/Verilog)

1. Write HDL code to display messages on the given seven segment display and LCD and accepting Hex key pad input data.

2. Write HDL code to control speed, direction of DC and Stepper motor.

3. Write HDL code to accept 8 channel Analog signal, Temperature sensors and display the data on LCD panel or Seven segment display.

4. Write HDL code to generate different waveforms (Sine, Square, Triangle, Ramp etc.,) using DAC change the frequency and amplitude.

5. Write HDL code to simulate Elevator operations
6. Write HDL code to control external lights using relays.

DIGITAL SIGNAL PROCESSING

Subject Code	: **10EC52**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

Discrete Fourier Transforms (DFT): Frequency domain sampling and reconstruction of discrete time signals. DFT as a linear transformation, its relationship with other transforms. **6 Hours**

UNIT - 2

Properties of DFT, multiplication of two DFTs- the circular convolution, additional DFT properties. **6 Hours**

UNIT - 3

Use of DFT in linear filtering, overlap-save and overlap-add method. Direct computation of DFT, need for efficient computation of the DFT (FFT algorithms). **7 Hours**

UNIT - 4

Radix-2 FFT algorithm for the computation of DFT and IDFT–decimation-in-time and decimation-in-frequency algorithms. Goertzel algorithm, and chirp-z transform. **7 Hours**

PART – B

UNIT - 5

IIR filter design: Characteristics of commonly used analog filters – Butterworth and Chebysheve filters, analog to analog frequency transformations. **6 Hours**

UNIT - 6

Implementation of discrete-time systems: Structures for IIR and FIR systems-direct form I and direct form II systems, cascade, lattice and parallel realization. **7 Hours**

UNIT - 7

FIR filter design: Introduction to FIR filters, design of FIR filters using - Rectangular, Hamming, Bartlet and Kaiser windows, FIR filter design using frequency sampling technique. **6 Hours**

UNIT - 8

Design of IIR filters from analog filters (Butterworth and Chebyshev) - impulse invariance method. Mapping of transfer functions: Approximation of derivative (backward difference and bilinear transformation) method, Matched z transforms, Verification for stability and linearity during mapping

7 Hours

TEXT BOOK:

1. **Digital signal processing – Principles Algorithms & Applications**, Proakis & Monalakis, Pearson education, 4th Edition, New Delhi, 2007.

REFERENCE BOOKS:

1. **Discrete Time Signal Processing**, Oppenheim & Schaffer, PHI, 2003.
2. **Digital Signal Processing**, S. K. Mitra, Tata Mc-Graw Hill, 3rd Edition, 2010.
3. **Digital Signal Processing**, Lee Tan: Elsivier publications, 2007

ANALOG COMMUNICATION

Subject Code	: **10EC53**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

RANDOM PROCESS: Random variables: Several random variables. Statistical averages: Function of Random variables, moments, Mean, Correlation and Covariance function: Principles of autocorrelation function, cross – correlation functions. Central limit theorem, Properties of Gaussian process. **7 Hours**

UNIT - 2

AMPLITUDE MODULATION: Introduction, AM: Time-Domain description, Frequency – Domain description. Generation of AM wave: square law modulator, switching modulator. Detection of AM waves: square law detector, envelop detector. Double side band suppressed carrier modulation (DSBSC): Time-Domain description, Frequency-Domain representation, Generation of DSBSC waves: balanced modulator, ring modulator. Coherent detection of DSBSC modulated waves. Costas loop.

7 Hours

TEXT BOOKS:

1. **Communication Systems**, Simon Haykins, 5^{th} Edition, John Willey, India Pvt. Ltd, 2009.
2. **An Introduction to Analog and Digital Communication**, Simon Haykins, John Wiley India Pvt. Ltd., 2008

REFERENCE BOOKS:

1. **Modern digital and analog Communication systems** B. P. Lathi, Oxford University Press., 4^{th} ed, 2010,
2. **Communication Systems**, Harold P.E, Stern Samy and A Mahmond, Pearson Edn, 2004.
3. **Communication Systems**: Singh and Sapre**:** Analog and digital TMH 2^{nd} , Ed 2007.

MICROWAVES AND RADAR

Subject Code	: **10EC54**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

MICROWAVE TRANSMISSION LINES: Introduction, transmission lines equations and solutions, reflection and transmission coefficients, standing waves and SWR, line impedance and line admittance. Smith chart, impedance matching using single stubs, Microwave coaxial connectors.

7 Hours

UNIT - 2

MICROWAVE WAVEGUIDES AND COMPONENTS: Introduction, rectangular waveguides, circular waveguides, microwave cavities, microwave hybrid circuits, directional couplers, circulators and isolators.

6 Hours

UNIT - 3

MICROWAVE DIODES,

Transfer electron devices: Introduction, GUNN effect diodes – GaAs diode, RWH theory, Modes of operation, Avalanche transit time devices: READ diode, IMPATT diode, BARITT diode, Parametric amplifiers

Other diodes: PIN diodes, Schottky barrier diodes. **7 Hours**

UNIT - 4

Microwave network theory and passive devices. Symmetrical Z and Y parameters, for reciprocal Networks, S matrix representation of multi port networks. **6 Hours**

PART – B

UNIT - 5

Microwave passive devices, Coaxial connectors and adapters, Phase shifters, Attenuators, Waveguide Tees, Magic tees. **6 Hours**

UNIT - 6

STRIP LINES: Introduction, Microstrip lines, Parallèle strip lines, Coplanar strip lines, Shielded strip Lines. **6 Hours**

UNIT - 7

AN INTRODUCTION TO RADAR: Basic Radar, The simple form of the Radar equation, Radar block diagram, Radar frequencies, application of Radar, the origins of Radar. **7 Hours**

UNIT - 8

MTI AND PULSE DOPPLER RADAR: Introduction to Doppler and MTI Radar, delay line Cancellers, digital MTI processing, Moving target detector, pulse Doppler Radar. **7 Hours**

TEXT BOOKS:

1. **Microwave Devices and circuits**- Liao / Pearson Education.
2. **Introduction to Radar systems**-Merrill I Skolnik, 3rd Ed, TMH, 2001.
3. **Microwave Engineering** – Annapurna Das, Sisir K Das TMH Publication, 2nd , 2010.

REFERENCE BOOK:

1. **Microwave Engineering** – David M Pozar, John Wiley India Pvt. Ltd., 3rd Edn, 2008.

INFORMATION THEORY AND CODING

Subject Code	: **10EC55**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1
INFORMATION THEORY: Introduction, Measure of information, Average information content of symbols in long independent sequences, Average information content of symbols in long dependent sequences. Mark-off statistical model for information source, Entropy and information rate of mark-off source. **7 Hours**

UNIT - 2
SOURCE CODING: Encoding of the source output, Shannon's encoding algorithm. Communication Channels, Discrete communication channels, Continuous channels. **6 Hours**

UNIT - 3
FUNDAMENTAL LIMITS ON PERFORMANCE: Source coding theorem, Huffman coding, Discrete memory less Channels, Mutual information, Channel Capacity. **7 Hours**

UNIT - 4
Channel coding theorem, Differential entropy and mutual information for continuous ensembles, Channel capacity Theorem. **6 Hours**

PART – B

UNIT - 5
INTRODUCTION TO ERROR CONTROL CODING: Introduction, Types of errors, examples, Types of codes Linear Block Codes: Matrix description, Error detection and correction, Standard arrays and table look up for decoding. **7 Hours**

UNIT - 6
Binary Cycle Codes, Algebraic structures of cyclic codes, Encoding using an (n-k) bit shift register, Syndrome calculation. BCH codes. **6 Hours**

UNIT - 7
RS codes, Golay codes, Shortened cyclic codes, Burst error correcting codes. Burst and Random Error correcting codes. **7 Hours**

UNIT - 8
Convolution Codes, Time domain approach. Transform domain approach. **6 Hours**

TEXT BOOKS:
1. **Digital and analog communication systems**, K. Sam Shanmugam, John Wiley India Pvt. Ltd, 1996.
2. **Digital communication**, Simon Haykin, John Wiley India Pvt. Ltd, 2008.

REFERENCE BOOKS:
1. **ITC and Cryptography**, Ranjan Bose, TMH, II edition, 2007
2. **Digital Communications** - Glover and Grant**;** Pearson Ed. 2^{nd} Ed 2008.

FUNDAMENTALS OF CMOS VLSI

Subject Code	: **10EC56**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1
BASIC MOS TECHNOLOGY: Integrated circuit's era. Enhancement and depletion mode MOS transistors. nMOS fabrication. CMOS fabrication. Thermal aspects of processing. BiCMOS technology. Production of E-beam masks. **3 Hours**

MOS TRANSISTOR THEORY: Introduction, MOS Device Design Equations, The Complementary CMOS Inverter – DC Characteristics, Static Load MOS Inverters, The Differential Inverter, The Transmission Gate, Tristate Inverter**.** **4 Hours**

UNIT - 8

TESTABILITY: Performance parameters. Layout issues. I/O pads. Real estate. System delays. Ground rules for design. Test and testability.

7 Hours

TEXT BOOKS:

1. **CMOS VLSI Design – A Circuits and Systems Perspective. 3rd Edition. N.H. Weste and David Harris. Addison-Wesley, 2005. (Refer to** http://www.cmosvlsi.com**).**
2. **Principles of CMOS VLSI Design: A Systems Perspective**, Neil H. E. Weste, K. Eshragian, and ??? 3rd edition, Pearson Education (Asia) Pvt. Ltd., 200?. (Shift to the latest edition.).
3. **Basic VLSI Design** - Douglas A. Pucknell & Kamran Eshraghian, PHI 3rd Edition (original Edition – 1994), 2005.

REFERENCE BOOKS:

1. R. Jacob Baker. CMOS Circuit Design, Layout and Simulation. John Wiley India Pvt. Ltd, 2008.
2. **Fundamentals of Semiconductor Devices**, M. K. Achuthan and K. N. Bhat, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2007.
3. **CMOS Digital Integrated Circuits: Analysis and Design**, Sung-Mo Kang & Yusuf Leblebici, 3rd Edition, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2007.
4. **Analysis and Design of Digital Integrated Circuits** - D.A Hodges, H.G Jackson and R.A Saleh. 3rd Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2007.

DIGITAL SIGNAL PROCESSING LABORATORY

Subject Code	: **10ECL57**	IA Marks	: 25
No. of Practical Hrs/Week	: 03	Exam Hours	: 03
Total no. of Practical Hrs.	: 42	Exam Marks	: 50

A LIST OF EXPERIMENTS USING MATLAB / SCILAB / OCTAVE / WAB

3. Verification of Sampling theorem.
4. Impulse response of a given system
5. Linear convolution of two given sequences.
6. Circular convolution of two given sequences

7. Autocorrelation of a given sequence and verification of its properties.
8. Cross correlation of given sequences and verification of its properties.
9. Solving a given difference equation.
10. Computation of N point DFT of a given sequence and to plot magnitude and phase spectrum.
11. Linear convolution of two sequences using DFT and IDFT.
12. Circular convolution of two given sequences using DFT and IDFT
13. Design and implementation of FIR filter to meet given specifications.
14. Design and implementation of IIR filter to meet given specifications.

B. LIST OF EXPERIMENTS USING DSP PROCESSOR

1.Linear convolution of two given sequences.
2.Circular convolution of two given sequences.
3.Computation of N- Point DFT of a given sequence
4.Realization of an FIR filter (any type) to meet given specifications .The input can be a signal from function generator / speech signal.
5.Audio applications such as to plot time and frequency (Spectrum) display of Microphone output plus a cosine using DSP. Read a wav file and match with their respective spectrograms
6.Noise: Add noise above 3kHz and then remove; Interference suppression using 400 Hz tone.
7.Impulse response of first order and second order system

REFERENCE BOOKS:

1. **Digital signal processing using MATLAB -** Sanjeet Mitra, TMH, 2001
2. **Digital signal processing using MATLAB** - J. G. Proakis & Ingale, MGH, 2000
3. **Digital Signal Processors**, B. Venkataramani and Bhaskar, TMH,2002

ANALOG COMMUNICATION LAB + LIC LAB

Subject Code	: **10ECL58**	IA Marks	: 25
No. of Practical Hrs/Week	: 03	Exam Hours	: 03
Total no. of Practical Hrs.	: 42	Exam Marks	: 50

EXPERIMENTS USING DESCERTE COMPONENTS and LABVIEW - 2009 CAN BE USED FOR VERIFICATION AND TESTING.

1. Second order active LPF and HPF
2. Second order active BPF and BE
3. Schmitt Trigger Design and test a Schmitt trigger circuit for the given values of UTP and LTP

VI SEMESTER

DIGITAL COMMUNICATION

Subject Code	: **10EC61**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

Basic signal processing operations in digital communication. Sampling Principles: Sampling Theorem, Quadrature sampling of Band pass signal, Practical aspects of sampling and signal recovery. **7 Hours**

UNIT - 2

PAM, TDM. Waveform Coding Techniques, PCM, Quantization noise and SNR, robust quantization. **6 Hours**

UNIT - 3

DPCM, DM, applications. Base-Band Shaping for Data Transmission, Discrete PAM signals, power spectra of discrete PAM signals. **7 Hours**

UNIT - 4

ISI, Nyquist's criterion for distortion less base-band binary transmission, correlative coding, eye pattern, base-band M-ary PAM systems, adaptive equalization for data transmission. **6 Hours**

PART – B

UNIT - 5

DIGITAL MODULATION TECHNIQUES: Digital Modulation formats, Coherent binary modulation techniques, Coherent quadrature modulation techniques. Non-coherent binary modulation techniques. **6 Hours**

UNIT - 6

Detection and estimation, Model of DCS, Gram-Schmidt Orthogonalization procedure, geometric interpretation of signals, response of bank of correlators to noisy input. **6 Hours**

UNIT - 7

Detection of known signals in noise, correlation receiver, matched filter receiver, detection of signals with unknown phase in noise. **7 Hours**

UNIT - 8

Spread Spectrum Modulation: Pseudo noise sequences, notion of spread spectrum, direct sequence spread spectrum, coherent binary PSK, frequency hop spread spectrum, applications. **7 Hours**

TEXT BOOK:

1. **Digital communications**, Simon Haykin, John Wiley India Pvt. Ltd, 2008.

REFERENCE BOOKS:

1. **Digital and Analog communication systems,** Simon Haykin, John Wildy India Lts, 2008
2. **An introduction to Analog and Digital Communication**, K. Sam Shanmugam, John Wiley India Pvt. Ltd, 2008.
3. **Digital communications** - Bernard Sklar: Pearson education 2007

MICROPROCESSOR

Subject Code	: **10EC62**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

8086 PROCESSORS: Historical background, The microprocessor-based personal computer system, 8086 CPU Architecture, Machine language instructions, Instruction execution timing. **6 Hours**

UNIT - 2

INSTRUCTION SET OF 8086: Assembler instruction format, data transfer and arithmetic, branch type, loop, NOP & HALT, flag manipulation, logical and shift and rotate instructions. Illustration of these instructions with example programs, Directives and operators. **6 Hours**

UNIT - 3

BYTE AND STRING MANIPULATION: String instructions, REP Prefix, Table translation, Number format conversions, Procedures, Macros, Programming using keyboard and video display. **7 Hours**

UNIT - 4

8086 INTERRUPTS: 8086 Interrupts and interrupt responses, Hardware interrupt applications, Software interrupt applications, Interrupt examples.
7 Hours

Stability problem. Effect of feedback an amplifier poles. Stability study using Bode plots. Frequency compensation. SPICE examples. **7 Hours**

UNIT - 6

Operational Amplifiers: The two stage CMOS Op-amp, folded cascade CMOS op-amp, 741 op-amp circuit, DC analysis of the 741, small signal analysis of 741, gain, frequency response and slew rate of 741. Data Converters. A-D and D-A converters. **6 Hours**

UNIT – 7 & 8

Digital CMOS circuits. Overview. Design and performance analysis of CMOS inverter. Logic Gate Circuits. Pass-transistor logic. Dynamic Logic Circuits. SPICE examples. **12 Hours**

TEXT BOOK:

1. **"Microelectronic Circuits",** Adel Sedra and K.C. Smith, 5^{th} Edition, Oxford University Press, Interantional Version, 2009.

REFERENCE BOOK:

1. "**Fundamentals of Microelectronics**" , Behzad Razavi, John Wiley India Pvt. Ltd, 2008.
2. **"Microelectronics – Analysis and Design"**, Sundaram Natarajan,
3. Tata McGraw-Hill, 2007

ANTENNAS AND PROPAGATION

Subject Code	: **10EC64**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

ANTENNA BASICS: Introduction, basic Antenna parameters, patterns, beam area, radiation intensity, beam efficiency, diversity and gain, antenna apertures, effective height, bandwidth, radiation, efficiency, antenna temperature and antenna filed zones.

7 Hours

UNIT - 2

POINT SOURCES AND ARRAYS: Introduction, point sources, power patterns, power theorem, radiation intensity, filed patterns, phase patterns. Array of two isotropic point sources. Endfire array and Broadside array.

6 Hours

UNIT - 3

ELECTRIC DIPOLES AND THIN LINEAR ANTENNAS: Introduction, short electric dipole, fields of a short dipole(no derivation of field components), radiation resistance of short dipole, radiation resistances of lambda/2 Antenna, thin linear antenna, micro strip arrays, low side lobe arrays, long wire antenna, folded dipole antennas. **7 Hours**

UNIT - 4

LOOP, SLOT, PATCH AND HORN ANTENNA: Introduction, small loop, comparison of far fields of small loop and short dipole, loop antenna general case, far field patterns of circular loop, radiation resistance, directivity, slot antenna, Babinet's principle and complementary antennas, impedance of complementary and slot antennas, patch antennas.

8 Hours

PART – B

UNIT – 5 & 6

ANTENNA TYPES: Horn antennas, rectangular horn antennas, Helical Antenna, Yagi-Uda array, corner reflectors, parabolic reflectors, log periodic antenna, lens antenna, antenna for special applications – sleeve antenna, turnstile antenna, omni directional antennas, antennas for satellite antennas for ground penetrating radars, embedded antennas, ultra wide band antennas, plasma antenna, high-resolution data, intelligent antennas, antenna for remote sensing.

12 Hours

UNIT - 7 & 8

RADIO WAVE PROPAGATION: Introduction, Ground wave propagation, free space propagation, ground reflection, surface wave, diffraction.
TROPOSPHERE WAVE PROPAGATION: Troposcopic scatter, Ionosphere propagation, electrical properties of the ionosphere, effects of earth's magnetic field. **10 Hours**

TEXT BOOKS:

1. **Antennas and Wave Propagation**, John D. Krauss, 4th Edn,McGraw-Hill International edition, 2010.
2. **Antennas and Wave Propagation** - Harish and Sachidananda: Oxford Press 2007.

REFERENCE BOOKS:

1. **Antenna Theory Analysis and Design** - C A Balanis, 3rd Edn, John Wiley India Pvt. Ltd, 2008.
2. **Antennas and Propagation for Wireless Communication Systems** - Sineon R Saunders, John Wiley, 2003.
3. **Antennas and wave propagation -** G S N Raju: Pearson Education 2005.

OPERATING SYSTEMS

Subject Code	: **10EC65**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

INTRODUCTION AND OVERVIEW OF OPERATING SYSTEMS: Operating system, Goals of an O.S, Operation of an O.S, Resource allocation and related functions, User interface related functions, Classes of operating systems, O.S and the computer system, Batch processing system, Multi programming systems, Time sharing systems, Real time operating systems, distributed operating systems. **6 Hours**

UNIT - 2

STRUCTURE OF THE OPERATING SYSTEMS: Operation of an O.S, Structure of the supervisor, Configuring and installing of the supervisor, Operating system with monolithic structure, layered design, Virtual machine operating systems, Kernel based operating systems, and Microkernel based operating systems. **7 Hours**

TEXT BOOKS:

1. **Antennas and Wave Propagation**, John D. Krauss, 4th Edn,McGraw-Hill International edition, 2010.
2. **Antennas and Wave Propagation** - Harish and Sachidananda: Oxford Press 2007.

REFERENCE BOOKS:

1. **Antenna Theory Analysis and Design** - C A Balanis, 3rd Edn, John Wiley India Pvt. Ltd, 2008.
2. **Antennas and Propagation for Wireless Communication Systems** - Sineon R Saunders, John Wiley, 2003.
3. **Antennas and wave propagation -** G S N Raju: Pearson Education 2005.

OPERATING SYSTEMS

Subject Code	: **10EC65**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

INTRODUCTION AND OVERVIEW OF OPERATING SYSTEMS: Operating system, Goals of an O.S, Operation of an O.S, Resource allocation and related functions, User interface related functions, Classes of operating systems, O.S and the computer system, Batch processing system, Multi programming systems, Time sharing systems, Real time operating systems, distributed operating systems. **6 Hours**

UNIT - 2

STRUCTURE OF THE OPERATING SYSTEMS: Operation of an O.S, Structure of the supervisor, Configuring and installing of the supervisor, Operating system with monolithic structure, layered design, Virtual machine operating systems, Kernel based operating systems, and Microkernel based operating systems. **7 Hours**

UNIT - 3

PROCESS MANAGEMENT: Process concept, Programmer view of processes, OS view of processes, Interacting processes, Threads, Processes in UNIX, Threads in Solaris. **6 Hours**

UNIT - 4

MEMORY MANAGEMENT: Memory allocation to programs, Memory allocation preliminaries, Contiguous and noncontiguous allocation to programs, Memory allocation for program controlled data, kernel memory allocation. **7 Hours**

PART – B

UNIT - 5

VIRTUAL MEMORY: Virtual memory basics, Virtual memory using paging, Demand paging, Page replacement, Page replacement policies, Memory allocation to programs, Page sharing, UNIX virtual memory. **6 Hours**

UNIT - 6

FILE SYSTEMS: File system and IOCS, Files and directories, Overview of I/O organization, Fundamental file organizations, Interface between file system and IOCS, Allocation of disk space, Implementing file access, UNIX file system. **7 Hours**

UNIT - 7

SCHEDULING: Fundamentals of scheduling, Long-term scheduling, Medium and short term scheduling, Real time scheduling, Process scheduling in UNIX. **6 Hours**

UNIT - 8

MESSAGE PASSING: Implementing message passing, Mailboxes, Inter process communication in UNIX. 7 Hours

TEXT BOOK:

1. **"Operating Systems - A Concept based Approach"**, D. M. Dhamdhare, TMH, 3rd Ed, 2010.

REFERENCE BOOK:

1. **Operating Systems Concepts**, Silberschatz and Galvin, John Wiley India Pvt. Ltd, 5th Edition, 2001.
2. **Operating System – Internals and Design Systems**, Willaim Stalling, Pearson Education, 4th Ed, 2006.
3. **Design of Operating Systems,** Tennambhaum, TMH, 2001.

POWER ELECTRONICS

Subject Code	: **10EC73**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1
Introduction, Applications of power electronics, Power semiconductor devices, Control characteristics, Types of power electronics circuits, Peripheral effects. **6 Hours**

UNIT - 2
POWER TRANSISTOR: Power BJT's, Switching characteristics, Switching limits, Base derive control, Power MOSFET's, Switching characteristics, Gate drive, IGBT's, Isolation of gate and base drives.
6 Hours

UNIT - 3
INTRODUCTION TO THYRISTORS: Principle of operation states anode-cathode characteristics, Two transistor model. Turn-on Methods, Dynamic Turn-on and turn-off characteristics, Gate characteristics, Gate trigger circuits, di / dt and dv / dt protection, Thyristor firing circuits.
7 Hours

UNIT - 4
CONTROLLED RECTIFIERS: Introduction, Principles of phase controlled converter operation, 1φ fully controlled converters, Duel converters, 1 φ semi converters (all converters with R & RL load).
7 Hours

PART – B

UNIT - 5
Thyristor turn off methods, natural and forced commutation, self commutation, class A and class B types, Complementary commutation, auxiliary commutation, external pulse commutation, AC line commutation, numerical problems. **7 Hours**

UNIT - 6
AC VOLTAGE CONTROLLERS: Introduction, Principles of on and off control, Principles of phase control, Single phase controllers with restive loads and Inductive loads, numerical problems.
6 Hours

UNIT - 7

DC CHOPPERS: Introduction, Principles of step down and step up choppers, Step down chopper with RL loads, Chopper classification, Switch mode regulators – buck, boost and buck – boost regulators. **6 Hours**

UNIT - 8

INVERTORS: Introduction, Principles of operation, Performance parameters, 1φ bridge inverter, voltage control of 1φ invertors, current source invertors, Variable DC link inverter.

7 Hours

TEXT BOOKS:

1. **"Power Electronics" -** M. H. Rashid 3rd edition, PHI / Pearson publisher 2004.
2. **"Power Electronics" -** M. D. Singh and Kanchandani K.B. TMH publisher, 2nd Ed. 2007.

REFERENCE BOOKS:

1. **"Power Electronics, Essentials and Applications", L Umanand,** John Wiley India Pvt. Ltd, 2009.
2. **"Power Electronics"** , Daniel W. Hart, McGraw Hill, 2010.
3. **"Power Electronics**", V Nattarasu and R.S. Anandamurhty, **Pearson/Sanguine Pub. 2006.**

EMBEDED SYSTEM DESIGN

Subject Code	: **10EC74**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT 1:

Introduction to Embedded System: Introducing Embedded Systems, Philosophy, Embedded Systems, Embedded Design and Development Process. **5 Hours**

UNIT 2:

The Hardware Side: An Introduction, The Core Level, Representing Information, Understanding Numbers, Addresses, Instructions, Registers-A

UNIT - 7

DC CHOPPERS: Introduction, Principles of step down and step up choppers, Step down chopper with RL loads, Chopper classification, Switch mode regulators – buck, boost and buck – boost regulators. **6 Hours**

UNIT - 8

INVERTORS: Introduction, Principles of operation, Performance parameters, 1φ bridge inverter, voltage control of 1φ invertors, current source invertors, Variable DC link inverter.

7 Hours

TEXT BOOKS:

1. **"Power Electronics" -** M. H. Rashid 3rd edition, PHI / Pearson publisher 2004.
2. **"Power Electronics" -** M. D. Singh and Kanchandani K.B. TMH publisher, 2nd Ed. 2007.

REFERENCE BOOKS:

1. **"Power Electronics, Essentials and Applications", L Umanand,** John Wiley India Pvt. Ltd, 2009.
2. **"Power Electronics"** , Daniel W. Hart, McGraw Hill, 2010.
3. **"Power Electronics**", V Nattarasu and R.S. Anandamurhty, **Pearson/Sanguine Pub. 2006.**

EMBEDED SYSTEM DESIGN

Subject Code	: **10EC74**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT 1:

Introduction to Embedded System: Introducing Embedded Systems, Philosophy, Embedded Systems, Embedded Design and Development Process. **5 Hours**

UNIT 2:

The Hardware Side: An Introduction, The Core Level, Representing Information, Understanding Numbers, Addresses, Instructions, Registers-A

First Look, Embedded Systems-An Instruction Set View, Embedded Systems-A Register View, Register View of a Microprocessor
The Hardware Side: Storage Elements and Finite-State Machines (2 hour)
The concepts of State and Time, The State Diagram, Finite State Machines-A Theoretical Model.

8 Hours

UNIT 3:

Memories and the Memory Subsystem: Classifying Memory, A General Memory Interface, ROM Overview, Static RAM Overview, Dynamic RAM Overview, Chip Organization, Terminology, A Memory Interface in Detail, SRAM Design, DRAM Design, DRAM Memory Interface, The Memory Map, Memory Subsystem Architecture, Basic Concepts of Caching, Designing a Cache System, Dynamic Memory Allocation.

7 Hours

UNIT 4:

Embedded Systems Design and Development : System Design and Development, Life-cycle Models, Problem Solving-Five Steps to Design, The Design Process, Identifying the Requirements, Formulating the Requirements Specification, The System Design Specification, System Specifications versus System Requirements, Partitioning and Decomposing a System, Functional Design, Architectural Design, Functional Model versus Architectural Model, Prototyping, Other Considerations, Archiving the Project. **6 Hours**

PART – B

UNIT 5 & 6:

Real-Time Kernels and Operating Systems: Tasks and Things, Programs and Processes, The CPU is a resource, Threads – Lightweight and heavyweight, Sharing Resources, Foreground/Background Systems, The operating System, The real time operating system (RTOS), OS architecture, Tasks and Task control blocks, memory management revisited.

12 Hours

UNIT 7 & 8:

Performance Analysis and Optimization: Performance or Efficiency Measures, Complexity Analysis, The methodology, Analyzing code, Instructions in Detail, Time, etc. – A more detailed look, Response Time, Time Loading, Memory Loading, Evaluating Performance, Thoughts on Performance Optimization, Performance Optimization, Tricks of the Trade, Hardware Accelerators, Caches and Performance.

12 Hours

TEXT BOOK:

1. **Embedded Systems – A contemporary Design Tool,** James K. Peckol, John Weily India Pvt. Ltd, 2008.

REFERENCE BOOKS:

1. **Embedded Systems: Architecture and Programming,** Raj Kamal, TMH. 2008.
2. **Embedded Systems Architecture – A Comprehensive Guide for Engineers and Programmers**, Tammy Noergaard, Elsevier Publication, 2005.
3. **Programming for Embedded Systems**, Dreamtech Software Team, John Wiley India Pvt. Ltd, 2008.

VLSI LAB

Subject Code	: **10ECL77**	IA Marks	: 25
No. of Practical Hrs/Week	: 03	Exam Hours	: 03
Total no. of Practical Hrs.	: 42	Exam Marks	: 50

(Wherever necessary Cadence/Synopsis/Menta Graphics tools <u>must be</u> used)

PART - A
DIGITAL DESIGN

ASIC-DIGITAL DESIGN FLOW

1. Write Verilog Code for the following circuits and their Test Bench for **verification**, observe the waveform and **synthesize** the code with technological library with given Constraints*. Do the initial timing verification with gate level simulation.

1. An inverter
2. A Buffer
3. Transmission Gate
4. Basic/universal gates
5. Flip flop -RS, D, JK, MS, T
6. Serial & Parallel adder
7. 4-bit counter [Synchronous and Asynchronous counter]
8. Successive approximation register [SAR]

** An appropriate constraint should be given*

VIII SEMESTER
WIRELESS COMMUNICATION

Subject Code	: **10EC81**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1
Introduction to wireless telecommunication systems and Networks, History and Evolution Different generations of wireless cellular networks 1G, 2g,3G and 4G networks. **6 Hours**

UNIT - 2
Common Cellular System components, Common cellular network components, Hardware and software, views of cellular networks, 3G cellular systems components, Cellular component identification Call establishment. **7 Hours**

UNIT - 3
Wireless network architecture and operation, Cellular concept Cell fundamentals, Capacity expansion techniques, Cellular backbone networks, Mobility management, Radio resources and power management Wireless network security. **7 Hours**

UNIT - 4
GSM and TDMA techniques, GSM system overview, GSM Network and system Architecture, GSM channel concepts, GSM identifiers **6 Hours**

PART – B

UNIT - 5
GSM system operation, Traffic cases, Cal handoff, Roaming, GSM protocol architecture. TDMA systems. **6 Hours**

UNIT - 6
CDMA technology, CDMA overview, CDMA channel concept CDMA operations. **6 Hours**

UNIT - 7
Wireless Modulation techniques and Hardware, Characteristics of air interface, Path loss models, wireless coding techniques, Digital modulation

techniques, OFDM, UWB radio techniques, Diversity techniques, Typical GSM Hardware. **7 Hours**

UNIT - 8

Introduction to wireless LAN 802.11X technologies, Evolution of Wireless LAN Introduction to 802.15X technologies in PAN Application and architecture Bluetooth Introduction to Broadband wireless MAN, 802.16X technologies. **7 Hours**

TEXT BOOK:

1. **Wireless Telecom Systems and networks**, Mullet: Thomson Learning 2006.

REFERENCE BOOKS:

1. **Mobile Cellular Telecommunication**, Lee W.C.Y, MGH, 2nd, 2009.
2. **Wireless communication** - D P Agrawal: 2nd Edition Thomson learning 2007.
3. **Fundamentals of Wireless Communication**, David Tse, Pramod Viswanath, Cambridge 2005.
4. S. S. Manvi, M. S. Kakkasageri, "**Wireles and Mobile Network concepts and protocols**", John Wiley India Pvt. Ltd, 1st edition, 2010.
5. "**Wireless Communication – Principles & Practice**" , T.S. Rappaport, PHI 2001.

DIGITAL SWITCHING SYSTEMS

Subject Code	: **10EC82**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

Developments of telecommunications, Network structure, Network services, terminology, Regulation, Standards. Introduction to telecommunications transmission, Power levels, Four wire circuits, Digital transmission, FDM, TDM, PDH and SDH, Transmission performance.

7 Hours

UNIT - 7

DESIGN OF RTSS – GENERAL INTRODUCTION: Introduction, Specification documentation, Preliminary design, Single-program approach, Foreground/background, Multi-tasking approach, Mutual exclusion, Monitors. **6 Hours**

UNIT - 8

RTS DEVELOPMENT METHODOLOGIES: Introduction, Yourdon Methodology, Requirement definition for Drying Oven, Ward and Mellor Method, Hately and Pirbhai Method. **6 Hours**

TEXT BOOKS:

1. **Real - Time Computer Control- An Introduction**, Stuart Bennet, 2nd Edn. Pearson Education. 2005.

REFERENCE BOOKS:

1. **Real-Time Systems Design and Analysis**, Phillip. A. Laplante, second edition, PHI, 2005.
2. **Real-Time Systems Development**, Rob Williams, Elsevier. 2006.
3. **Embedded Systems**, Raj Kamal, Tata Mc Graw Hill, India, 2005.

IMAGE PROCESSING

Subject Code	: **10EC763**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

DIGITAL IMAGE FUNDAMENTALS: What is Digital Image Processing. fundamental Steps in Digital Image Processing, Components of an Image processing system, elements of Visual Perception. **6 Hours**

UNIT - 2

Image Sensing and Acquisition, Image Sampling and Quantization, Some Basic Relationships between Pixels, Linear and Nonlinear Operations.
6 Hours

UNIT - 3

IMAGE TRANSFORMS: Two-dimensional orthogonal & unitary transforms, properties of unitary transforms, two dimensional discrete Fourier transform. **7 Hours**

UNIT - 4

Discrete cosine transform, sine transform, Hadamard transform, Haar transform, Slant transform, KL transform. **7 Hours**

PART – B

UNIT - 5

IMAGE ENHANCEMENT: Image Enhancement in Spatial domain, Some Basic Gray Level Trans -formations, Histogram Processing, Enhancement Using Arithmetic/Logic Operations. **7 Hours**

UNIT - 6

Basics of Spatial Filtering Image enhancement in the Frequency Domain filters, Smoothing Frequency Domain filters, Sharpening Frequency Domain filters, homomorphic filtering. **6 Hours**

UNIT - 7

Model of image degradation/restoration process, noise models, Restoration in the Presence of Noise, Only-Spatial Filtering Periodic Noise Reduction by Frequency Domain Filtering, Linear Position-Invariant Degradations, inverse filtering, minimum mean square error (Weiner) Filtering,

7 Hours

UNIT - 8

Color Fundamentals. Color Models, Pseudo color Image Processing., processing basics of full color image processing

6 Hours

TEXT BOOK:

1. **"Digital Image Processing"**, Rafael C.Gonzalez, Richard E. Woods, etl , TMH , 2nd Edition 2010.

REFERENCE BOOKS:

1. **"Fundamentals of Digital Image Processing"**, Anil K. Jain, Pearson Education, 2001.
2. **"Digital Image Processing and Analysis"**, B. Chanda and D. Dutta Majumdar, PHI, 2003.

UNIT - 7

PROTOCOL PERFORMANCE TESTING: SDL based performance testing of TCP, OSPF, Interoperability testing, SDL based interoperability testing of CSMA/CD and CSMA/CA protocol using bridge, Scalability testing.

7 Hours

UNIT - 8

PROTOCOL SYNTHESIS: Synthesis methods, interactive synthesis algorithms, automatic synthesis algorithm, automatic synthesis of SDL from MSC protocol re synthesis. **6 Hours**

TEXT BOOK:

1. **Communication Protocol Engineering**, P. Venkatarm and S. S. Manvi, PHI, 2004.

REFERENCES BOOKS:

1. **The Internet and its Protocols**, Adrian Farrel, Elsevier, 2006.
2. **TCP/IP Protocol Stack**, B A Forouzan, TMH, 2006.

ELECTIVE –V (GROUP E)
MULTIMEDIA COMMUNICATIONS

Subject Code	: **10EC841**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

MULTIMEDIA COMMUNICATIONS: Introduction, multimedia information representation, multimedia networks, multimedia applications, media types, communication modes, network types, multipoint conferencing, network QoS application QoS. **6 Hours**

UNIT - 2

MULTIMEDIA INFORMATION REPRESENTATION: Introduction, digital principles, text, images, audio, video. **7 Hours**

UNIT - 3

TEXT AND IMAGE COMPRESSION: Introduction, compression principles, text compression, image compression.

6 Hours

UNIT - 4
AUDIO AND VIDEO COMPRESSION: Introduction, audio compression, DPCM, ADPCM, APC, LPC, video compression, video compression principles, H.261, H.263, MPEG, MPEG-1, MPEG-2, and MPEG-4.
7 Hours

PART – B

UNIT - 5
MULTIMEDIA INFORMATION NETWORKS: Introduction, LANs, Ethernet, Token ring, Bridges, FDDI High-speed LANs, LAN protocol.
6 Hours

UNIT - 6
THE INTERNET: Introduction, IP Datagrams, Fragmentation, IP Address, ARP and RARP, QoS Support, IPv8. **7 Hours**

UNIT - 7
BROADBAND ATM NETWORKS: Introduction, Cell format, Switfh and Protocol Architecture ATM LANs. **6 Hours**

UNIT - 8
TRANSPORT PROTOCOL: Introduction, TCP/IP, TCP, UDP, RTP and RTCP. **7 Hours**

TEXT BOOK:

1. **Multimedia Communications: Applications, Networks, Protocols and Standards**, Fred Halsall, Pearson Education, Asia, Second Indian reprint 2002.

REFERENCE BOOKS:

1. **Multimedia Information Networking**, Nalin K. Sharda, PHI, 2003.
2. **"Multimedia Fundamentals: Vol 1 - Media Coding and Content Processing"**, Ralf Steinmetz, Klara Narstedt, Pearson Education, 2004.
3. **"Multimedia Systems Design"**, Prabhat K. Andleigh, Kiran Thakrar, PHI, 2004.

UNIT 6

Embedded System Components:

Firmware components, RTOS system software mechanisms, Software application components.

Debugging Components:

Execptions assert, Checking return codes, Single-step debugging, kernel scheduler traces, Test access ports, Trace ports, Power-On self test and diagnostics, External test equipment, Application-level debugging.

7 Hours

UNIT 7

Performance Tuning:

Basic concepts of drill-down tuning, hardware – supported profiling and tracing, Building performance monitoring into software, Path length, Efficiency, and Call frequency, Fundamental optimizations. **6 Hours**

UNIT 8

High availability and Reliability Design:

Reliability and Availability, Similarities and differences, Reliability, Reliable software, Available software, Design trade offs, Hierarchical applications for Fail-safe design.

Design of RTOS – PIC microcontroller. **(Chap 13 of book Myke Predko)**

7 Hours

REFERENCE BOOKS:

1. "**Real-Time Embedded Systems and Components"** Sam Siewert, Cengage Learning India Edition, 2007.
2. " **Programming and Customizing the PIC microcontroller"** , Myke Predko, 3rd Ed, TMH, 2008

GSM

Subject Code	: **10EC843**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

GSM ARCHITECTURE AND INTERFACES: Introduction, GSM frequency bands, GSM PLMN, Objectives of a GSM PLMN, GSM PLMN Services, GSM Subsystems, GSM Subsystems entities, GSM interfaces, The radio interface (MS to BSC), A_{bits} interface (BTS to BSC), A interface (BSC

to MSC), Interfaces between other GSM entities, Mapping of GSM layers onto OSI layers. **6 Hours**

UNIT - 2

RADIO LINK FEATURES IN GSM SYSTEMS: Introduction, Radio link measurements, Radio link features of GSM, Dynamic power control, Discontinuous transmission (DTX), SFH, Future techniques to reduce interface in GSM, Channel borrowing, Smart antenna. **7 Hours**

UNIT - 3

GSM LOGICAL CHANNELS AND FRAME STRUCTURE: Introduction, GSM logical channels, Allowed logical channel combinations, TCH multi frame for TCH/H, CCH multi frame, GSM frame structure, GSM bursts, Normal burst, Synchronization burst, Frequency correction channel burst, Access burst, Data encryption in GSM, Mobility management, Location registration, Mobile identification. **7 Hours**

UNIT - 4

SPEECH CODING IN GSM: Introduction, Speech coding methods, Speech code attributes, Transmission bit rate, Delay, Complexity, Quality, LPAS, ITU-T standards, Bit rate, Waveform coding, Time domain waveform coding, Frequency domain waveform coding, Vocoders, Full-rate vocoder, Half-rate vocoder. MESSAGES, SERVICES, AND CALL FLOWS IN GSM: Introduction, GSM PLMN services.

7 Hours

PART – B

UNIT - 5

GSM messages, MS-BS interface, BS to MSC messages on the A interface, MSC to VLR and HLR, GSM call setup by an MS, Mobile-Terminated call, Call release, Handover. Data services, Introduction, Data interworking, GSM data services, Interconnection for switched data, Group 3 fax, Packet data on the signaling channel, User-to-user signaling, SMS, GSM GPRS.

6 Hours

UNIT - 6

PRIVACY AND SECURITY IN GSM: Introduction, Wireless security requirements, Privacy of communications, Authentication requirements, System lifetime requirements, Physical requirements, SIM cards, Security algorithms for GSM, Token-based authentication, Token-based registration, Token-based challenge.

6 Hours

UNIT - 7

PLANNING AND DESIGN OF A GSM WIRELESS NETWORK: Introduction, Tele traffic models, Call model, Topology model, Mobility in

cellular / PCS networks, Application of a fluid flow model, Planning of a wireless network, Radio design for a cellular / PCS network, Radio link design, Coverage planning, Design of a wireless system, Service requirements, Constraints for hardware implementation, Propagation path loss, System requirements, Spectral efficiency of a wireless system, Receiver sensitivity and link budget, Selection of modulation scheme, Design of TDMA frame, Relationship between delay spread and symbol rate, Design example for a GSM system.

7 Hours

UNIT - 8

MANAGEMENT OF GSM NETWORKS: Introduction, Traditional approaches to NM, TMN, TMN layers, TMN nodes, TMN interface, TMN management services, Management requirements for wireless networks, Management of radio resources, Personal mobility management, Terminal mobility, Service mobility management, Platform-centered management, SNMP, OSI systems management, NM interface and functionality, NMS functionality, OMC functionality, Management of GSM network, TMN applications, GSM information model, GSM containment tree, Future work items.

7 Hours

TEXT BOOK:

1. **"Principles of Applications of GSM"**, Vijay K. Garg & Joseph E. Wilkes, Pearson education/ PHI, 1999.

REFERENCE BOOKS:

1. **GSM: Evolution towards 3rd Generation Systems**, (Editor), Z. Zvonar Peter Jung, Karl Kammerlander Springer; 1st edition 1998
2. **GSM & UMTS: The Creation of Global Mobile Communication,** Friedhelm Hillebrand, John Wiley & Sons; 2001.

ADHOC WIRELESS NETWORKS

Subject Code	: **10EC844**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

AD HOC NETWORKS: Introduction, Issues in Ad hoc wireless networks, Ad hoc wireless internet. **6 Hours**

10EE35 ELECTRICAL and ELECTRONIC MEASUREMENTS and INSTRUMENTATION

Subject Code	:	**10EE35**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART – A

UNIT 1:

1-(a) Units and Dimensions: Review of fundamental and derived units. S.I. units. Dimensional equations, problems. **3 Hours**

1-(b) Measurement of Resistance: Wheatstone's bridge, sensitivity, limitations. Kelvin's double bridge. Earth resistance, measurement by fall of potential method and by using Megger. **3 Hours**

UNIT 2:

Measurement of Inductance and Capacitance: Sources and detectors, Maxwell's inductance bridge, Maxwell's inductance &capacitance bridge,Hay's bridge, Anderson's bridge, Desauty's bridge, Schering bridge. Shielding of bridges. Problems. **07 Hours**

UNIT 3:

Extension of Instrument Ranges: Shunts and multipliers. Construction and theory of instrument transformers, Equations for ratio and phase angle errors of C.T. and P.T (derivations excluded). Turns compensation, illustrative examples (excluding problems on turns compensation),Silsbees's method of testing CT. **07 Hours**

UNIT 4:

Measurement of Power and Energy: Dynamometer wattmeter. UPF and LPF wattmeters, Measurement of real and reactive power in three-phase circuits. Induction type energy meter — construction, theory, errors, adjustments and calibration. Principle of working of electronic energy meter. 0**6 Hours**

PART – B

UNIT 5:

(a) Construction and operation of electro-dynamometer single-phase power factor meter. Weston frequency meter and phase sequence indicator. 0**4 Hours**

(b) Electronic Instruments: Introduction. True RMS responding voltmeter. Electronic multimeters. Digital voltmeters. Q meter. 0**4 Hours**

UNIT 6:

Dual trace oscilloscope — front panel details of a typical dual trace oscilloscope. Method of measuring voltage, current, phase, frequency and period. Use of Lissajous patterns. Working of a digital storage oscilloscope. Brief note on current probes. 0**6 Hours**

UNIT 7:

Transducers: Classification and selection of transducers. Strain gauges. LVDT. Measurement of temperature and pressure. Photo-conductive and photo-voltaic cells.

0**6 Hours**

UNIT 8:

(a) Interfacing resistive transducers to electronic circuits. Introduction to data acquisition systems.
2 Hours

(b) Display Devices and Signal Generators: X-Y recorders. Nixie tubes. LCD and LED display. Signal generators and function generators. 0**4 Hours**

Text Books

1. **Electrical and Electronic Measurements and Instrumentation,** A. K. Sawhney, Dhanpatrai and Sons, New Delhi.
2. **Modern Electronic Instrumentation and Measuring Techniques,** Cooper D. and A.D. Heifrick, PHI, 2009 Edition.

References

1. **Electronic Instrumentation and Measurement,** David A. Bell, oxford Publication ,2nd Edition, 2009.
2. **Electrical Measurements and Measuring Instruments,** Golding and Widdies, Pitman

10EE36 ELECTRIC POWER GENERATION

Subject Code	:	10EE36	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART – A

UNIT 1:
Sources of Electrical Power: Wind, solar, fuel cell, tidal, geo-thermal, hydro-electric, thermal-steam, diesel, gas, nuclear power plants (block diagram approach only). Concept of co-generation. Combined heat and power distributed generation. 06 **Hours**

UNIT 2:
Diesel electric plants. Gas turbine plants. Mini, micro, and bio generation. Concept of distributed generation. 06 **Hours**

UNIT 3:
(a) Hydro Power Generation: Selection of site. Classification of hydro-electric plants. General arrangement and operation. Hydroelectric plant power station structure and control. 5 **Hours**
(b) Thermal Power Generation: Introduction. Main parts of a thermal power plant. Working. Plant layout. **3 Hours**

UNIT 4:
Nuclear Power Station: Introduction. Pros and cons of nuclear power generation. Selection of site, cost, components of reactors. Description of fuel sources. Safety of nuclear power reactor. **6 Hours**

PART – B

UNIT 5 and 6:
(a) Economics Aspects: Introduction. Terms commonly used in system operation. Diversity factor, load factor, plant capacity factor, plant use factor, plant utilization factor and loss factor, load duration curve. Cost of generating station, factors influencing the rate of tariff designing, tariff, types of tariff**.** Power factor improvement.
(b) Substations: Introduction, types, Bus bar arrangement schemes, Location of substation equipment. Reactors and capacitors. Interconnection of power stations. 1**4 Hours**

UNIT 7 and 8 :
Grounding Systems: Introduction, grounding systems. Neutral grounding. Ungrounded system.
Resonant grounding. Solid grounding, reactance grounding, resistance grounding. Earthing transformer. Neutral grounding transformer. **12 Hours**

Text Books

1. **Power System Engineering,** A. Chakrabarti, M. L. Soni, and P.V. Gupta, Dhanpat Rai and Co.,NewDelhi.

2. **Electric Power Generation, Transmission and Distribution,** S. N. Singh, PHI, 2nd Edition,2009.

References

1. **Elements of Electrical Power System Design,** M. V. Deshpande, PHI,2010

10ES42 MICROCONTROLLERS
(Common to EC/TC/EE/IT/BM/ML)

Sub Code	**:**	**10ES42**	***IA Marks***	**:**	**25**
Hrs/ Week	**:**	**04**	Exam Hours	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

UNIT 1:
Microprocessors and microcontroller. Introduction, Microprocessors and Microcontrollers, RISC & CISC CPU Architectures, Harvard & Von-Neumann CPU architecture, Computer software.
The 8051 Architecture: Introduction, Architecture of 8051, Pin diagram of 8051, Memory organization, External Memory interfacing, Stacks.

6 Hours

UNIT 2:
Addressing Modes: Introduction, Instruction syntax, Data types, Subroutines, Addressing modes: Immediate addressing , Register addressing, Direct addressing, Indirect addressing, relative addressing, Absolute addressing, Long addressing, Indexed addressing, Bit inherent addressing, bit direct addressing.

Instruction set: Instruction timings, 8051 instructions: Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Subroutine instructions, Bit manipulation instruction.

6H**ours**

UNIT 3:
8051 programming: Assembler directives, Assembly language programs and Time delay calculations.

6 Hours

UNIT 4:
8051 Interfacing and Applications: Basics of I/O concepts, I/O Port Operation, Interfacing 8051 to LCD, Keyboard, parallel and serial ADC, DAC, Stepper motor interfacing and DC motor interfacing and programming

6 Hours

UNIT 5:

8051 Interrupts and Timers/counters: Basics of interrupts, 8051 interrupt structure, Timers and Counters, 8051 timers/counters, programming 8051 timers in assembly and C .

6 Hours

UNIT 6:

8051 Serial Communication: Data communication, Basics of Serial Data Communication, 8051 Serial Communication, connections to RS-232, Serial communication Programming in assembly and C.8255A Programmable Peripheral Interface:, Architecture of 8255A, I/O addressing,, I/O devices interfacing with 8051 using 8255A. **6 Hours**

Course Aim – The MSP430 microcontroller is ideally suited for development of low-power embedded systems that must run on batteries for many years. There are also applications where MSP430 microcontroller must operate on energy harvested from the environment. This is possible due to the ultra- low power operation of MSP430 and the fact that it provides a complete system solution including a RISC CPU, flash memory, on-chip data converters and on-chip peripherals.

UNIT 7:

Motivation for MSP430microcontrollers – Low Power embedded systems, On-chip peripherals (analog and digital), low-power RF capabilities. Target applications (Single-chip, low cost, low power, high performance system design).

2 Hours

MSP430 RISC CPU architecture, Compiler-friendly features, Instruction set, Clock system, Memory subsystem. Key differentiating factors between different MSP430 families.

2 Hours

Introduction to Code Composer Studio (CCS v4). Understanding how to use CCS for Assembly, C, Assembly+C projects for MSP430 microcontrollers. Interrupt programming.

2 **Digital I/O – I/O ports** programming using C and assembly, Understanding the muxing scheme of the MSP430 pins. **2 Hours**

UNIT 8:

On-chip peripherals. Watchdog Timer, Comparator, Op-Amp, Basic Timer, Real Time Clock (RTC), ADC, DAC, SD16, LCD, DMA.

2 Hours

Using the Low-power features of MSP430. Clock system, low-power modes, Clock request feature, Low-power programming and Interrupt.

2 Hours

Interfacing LED, LCD, External memory. Seven segment LED modules interfacing. Example – Real-time clock.

2 Hours

Case Studies of applications of MSP430 - Data acquisition system, Wired Sensor network, Wireless sensor network with Chipcon RF interfaces.

3 Hours

TEXT BOOKS:

1. "The 8051 Microcontroller and Embedded Systems – using assembly and C "-, **Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; PHI, 2006 / Pearson, 2006**
2. "MSP430 Microcontroller Basics", **John Davies, Elsevier, 2010**

REFERENCE BOOKS:

1. "The 8051 Microcontroller Architecture, Programming & Applications", **2e Kenneth J. Ayala ;, Penram International, 1996 / Thomson Learning 2005.**
2. **"**The 8051 Microcontroller", **V.Udayashankar and MalikarjunaSwamy, TMH, 2009**
3. MSP430 Teaching CD-ROM, **Texas Instruments, 2008 (can be requested** http://www.uniti.in **)**
4. Microcontrollers: Architecture, Programming, Interfacing and System Design",**Raj Kamal, "Pearson Education, 2005**

10EE45 POWER ELECTRONICS

Subject Code	:	10EE45	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART – A

UNIT 1:

Power Semiconductor Devices:

Introduction to semiconductors, Power Electronics, Power semiconductor devices, Control Characteristics. Types of power electronic converters and industrial applications-Drives, Electrolysis, Heating, Welding, Static Compensators, SMPS, HVDC power transmission, Thyristorized tap changers and Circuit breakers.

7 hours

UNIT 2:

Power Transistors: Power BJT's – switching characteristics, switching limits, base drive control. Power MOSFET's and IGBT's –characteristics, gate drive , di/dt and dv/dt limitations. Isolation of gate and base drives. Simple design of gate and base drives. **6 Hours**

UNIT 3:

Thyristors

Introduction, Two Transistor Model, characteristics-static and dynamic. di/dt and dv/dt protection. Ratings of thyristors. Thyristor types. Series and parallel operation of Thyristors. Thyristor firing circuits. Design of firing circuits using UJT, R, R-C circuits. Analysis of firing circuits using operational amplifiers and digital IC's. **7 Hours**

UNIT 4:

Commutation Techniques: Introduction. Natural Commutation. Forced commutation- self-commutation, impulse commutation, resonant pulse commutation and complementary commutation. **6 Hours**

PART – B

UNIT 5:

Controlled Rectifiers: Introduction. Principle of phase controlled converter operation. Single- phase semi-converters. Full converters. Three-phase half-wave converters. Three-phase full-wave converters. **7 Hours**

UNIT 6:

Choppers: Introduction. Principle of step-down and step-up chopper with R-L load. Performance parameters. Chopper classification. Analysis of impulse commutated thyristor chopper (only qualitative analysis) **6 Hours**

UNIT 7:

Inverters: Introduction. Principle of operation. Performance parameters. Single-phase bridge inverters. Threephase inverters. Voltage control of single-phase inverters – single pulse width, multiple pulse width, and sinusoidal pulse width modulation. Current source inverters. **7 Hours**

1

UNIT 8:

(a) AC Voltage Controllers: Introduction. Principle of ON-OFF and phase control. Single-phase, bi-directional controllers with resistive and R-L loads.

(b) Electromagnetic Compatibility: Introduction, effect of power electronic converters and remedial measures.

6 Hours

Text Book:

1. **Power Electronics,** M.H.Rashid, , Pearson, 3rd Edition, 2006.
2. **Power Electronics,** M.D. Singh and Khanchandani K.B., T.M.H., 2nd Edition,2001

References

1. **Power Electronics Essentials and Applications**,L.Umanand, Wiley India Pvt Ltd,Reprint,2010
2. **Thyristorised Power Controllers,** G.K. Dubey, S.R. Doradla, A. Joshi and R.M.K. Sinha, New Age International Publishers.
3. **Power Electronics – Converters, Applications and Design,** Ned Mohan, Tore M. Undeland, and William P. Robins, Third Edition, John Wiley and Sons,2008.
4. **Power Electronics: A Simplified Approach,** R.S. Ananda Murthy and V. Nattarasu, pearson/Sanguine Technical Publishers.

MICROCONTROLLERS LAB

(Common to EC/TC/EE/IT/BM/ML)

Sub Code	**:**	**10ESL47**	***IA Marks***	**:**	**25**
Hrs/ Week	**:**	**03**	Exam Hours	**:**	**03**
Total Hrs.	**:**	**42**	**Exam Marks**	**:**	**50**

I. PROGRAMMING

1. Data Transfer - Block move, Exchange, Sorting, Finding largest element in an array.
2. Arithmetic Instructions - Addition/subtraction, multiplication and division, square, Cube – (16 bits Arithmetic operations – bit addressable).
3. Counters.
4. Boolean & Logical Instructions (Bit manipulations).

5. Conditional CALL & RETURN.

6. Code conversion: BCD – ASCII; ASCII – Decimal; Decimal - ASCII; HEX - Decimal and Decimal - HEX .

7. Programs to generate delay, Programs using serial port and on-Chip timer / counter.

Note: Programming exercise is to be done on both 8051 & MSP430.

II. INTERFACING:

Write C programs to interface 8051 chip to Interfacing modules to develop single chip solutions.

8. Simple Calculator using 6 digit seven segment displays and Hex Keyboard interface to 8051.

9. Alphanumeric LCD panel and Hex keypad input interface to 8051.

10. External ADC and Temperature control interface to 8051.

11. Generate different waveforms Sine, Square, Triangular, Ramp etc. using DAC interface to 8051; change the frequency and amplitude.
12. Stepper and DC motor control interface to 8051.
13. Elevator interface to 8051.

10EEL48 POWER ELECTRONICS LAB

Subject Code	:	**10EEL48**	**IA Marks**	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

1. Static characteristics of SCR.
2. Static characteristics of MOSFET and IGBT.
3. SCR turn-on circuit using synchronized UJT relaxation oscillator.
4. SCR Digital triggering circuit for a single-phase controlled rectifier and A.C. voltage controller.
5. Single-phase controlled full-wave rectifier with *R* and *R-L* loads.
6. A.C. voltage controller using TRIAC and DIAC combination connected to *R* and *R-L* loads.
7. Speed control of a separately excited D.C. motor using an IGBT or MOSFET chopper.
8. Speed control of D.C. motor using single semi converter
9. Speed control of a stepper motor.
10. Speed control of universal motor using A.C. voltage controller.
11. MOSFET OR IGBT based single-phase full-bridge inverter connected to R load.
12. Study of commutation using LC circuits and auxiliary circuits.

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10EEL57 MEASUREMENTS AND CIRCUIT SIMULATION LABORATORY

Subject Code	:	**10EEL57**	**IA Marks**	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

1. Measurement of low resistance using Kelvin's double bridge.
2. Measurement of cable insulation and earth resistance using Meggar
3. Measurement of inductance using Maxwell Inductance-Capacitance bridge & determination of Q-factor
4. Measurement of capacitance using De-Sauty's bridge & determination of dissipation factor.
5. M easurement of active and reactive power in balanced 3-phase circuit using two-watt meter method.
6. Adjustment & calibration of 1-phase energy meter
7. Determination of ratio & phase angle error in CT.
8. a) Inverting, non-inverting & scale changing of signals using op -amps
   b) RC phase shift oscillator using op amps (Both using simulation package)
9. RC coupled amplifier-frequency response for variation of bias & coupling using simulation package
10. Rectifier circuits-Bridge rectifier, diode clipping & clamping circuits using simulation package.
11. Schmitt –trigger- inverting and non-inverting.
    12 Signal generator- triangular, saw tooth and rectangular wave generation
    Note: All experiments, except 5,6 and 7, are to be carried out by using components and verify the result by using a simulation package.

10EE61 POWER SYSTEM ANALYSIS AND STABILITY

Subject Code	:	**10EE61**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

REPRESENTATION OF POWER SYSTEM COMPONENTS: Circuit models of Transmission line, Synchronous machines, Transformers and load. Single line diagram, impedance and reactance diagrams. Per unit system, per unit impedance diagram of power system. **8 Hours**

UNIT - 2

SYMMETRICAL 3 - PHASE FAULTS: Analysis of Synchronous machines and Power system. Transients on a transmission line, Short-Circuit currents and the reactance of synchronous machines with and without load . **6 Hours**

UNIT - 3 & 4

SYMMETRICAL COMPONENTS: Introduction, analysis of unbalanced load against balanced Three-phase supply, neutral shift. Resolution of unbalanced phasors into their symmetrical components, Phase shift of symmetrical components in star-delta transformer bank, Power in terms of symmetrical components**,** Analysis of balanced and unbalanced loads against unbalanced 3 phase supply, Sequence impedances and networks of power system elements (alternator, transformer and transmission line) Sequence networks of power systems. Measurement of sequence impedance of synchronous generator.

12 Hours

Part - B

UNIT - 5 & 6

UNSYMMETRICAL FAULTS: L-G, L-L, L-L-G faults on an unbalanced alternator with and without fault impedance. Unsymmetrical faults on a power system with and without fault impedance. Open conductor faults in power system. **14 Hours**

UNIT - 7

STABILITY STUDIES: Introduction**,** Steady state and transient stability. Rotor dynamics and the swing equation. Equal area criterion for transient stability evaluation and its applications. **8 Hours**

UNIT – 8

UNBALANCED OPERATION OF THREE PHASE INDUCTION MOTRORS: Analysis of three phase induction motor with one line open., Analysis of three phase induction motor with unbalanced voltage. **4 Hours**

TEXT BOOKS:

1. **Elements of Power System Analysis**, W.D.Stevenson, TMH,4th Edition
2. **Modern Power System Analysis**,.I. J. Nagrath and D.P.Kothari- TMH, 3rd Edition,2003.
3. **Symmetrical Components and Short Circuit Studies,** Dr.P.N.Reddy, Khanna Publishers

REFERENCE BOOKS:

1. **Power System Analysis**, Hadi Sadat, TMH,2nd Edition.
2. **Power system Analysis**, R.Bergen, and Vijay Vittal, Pearson publications, 2nd edition, 2006.
3. **Computer Aided Power system analysis**, G.L., Kusic, PHI.Indian Edition, 2010 .
4. **Power System Analysis**,W.D.Stevenson & Grainger,TMH, First Edition, 2003.

10EE62 SWITCHGEAR & PROTECTION

Subject Code	:	**10EE62**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

SWITCHES AND FUSES: Introduction, energy management of power system, definition of switchgear, switches - isolating, load breaking and earthing. Introduction to fuse**,** fuse law, cut -off characteristics,: Time current characteristics, fuse material, HRC fuse, liquid fuse, Application of fuse

4 Hours

UNIT - 2

PRINCIPLES OF CIRCUIT BREAKERS: Introduction, requirement of a circuit breakers, difference between an isolator and circuit breaker, basic principle of operation of a circuit breaker, phenomena of arc, properties of arc, initiation and maintenance of arc, arc interruption theories - slepian's theory and energy balance theory**,** Restriking voltage, recovery voltage, Rate of rise of Restriking voltage, DC circuit breaking, AC circuit breaking, current chopping, capacitance switching, resistance switching, Rating of Circuit breakers.

10 Hours

UNIT - 3 & 4

CIRCUITS BREAKERS: Air Circuit breakers – Air break and Air blast Circuit breakers, oil Circuit breakers - Single break, double break, minimum OCB, SF_6 breaker - Preparation of SF_6 gas, Puffer and non Puffer type of SF_6 breakers. Vacuum circuit breakers - principle of operation and constructional details. Advantages and disadvantages of different types of Circuit breakers, Testing of Circuit breakers, Unit testing, synthetic testing, substitution test, compensation test and capacitance test.

LIGHTNING ARRESTERS: Causes of over voltages – internal and external, lightning, working principle of different types of lightning arresters. Shield wires.

12 Hours

PART - B

UNIT - 5

PROTECTIVE RELAYING: Requirement of Protective Relaying, Zones of protection, primary and backup protection, Essential qualities of Protective Relaying, Classification of Protective Relays

4 Hours

UNIT - 6

INDUCTION TYPE RELAY: Non-directional and directional over current relays, IDMT and Directional characteristics. Differential relay – Principle of operation, percentage differential relay, bias characteristics, distance relay – Three stepped distance protection, Impedance relay, Reactance relay, Mho relay, Buchholz relay, Negative Sequence relay, Microprocessor based over current relay – block diagram approach.

10 Hours

UNIT - 7 & 8

PROTECTION SCHEMES: Generator Protection - Merz price protection, prime mover faults, stator and rotor faults, protection against abnormal conditions – unbalanced loading, loss of excitation, over speeding. Transformer Protection - Differential protection, differential relay with harmonic restraint, Inter turn faults Induction motor protection - protection against electrical faults such as phase fault, ground fault, and abnormal operating conditions such as single phasing, phase reversal, over load. **12 Hours**

TEXT BOOKS:

1. **Switchgear & Protection** Sunil S.Rao,,Khanna Publishers,13th Edition,2008.
2. **Power System Protection & Switchgear,** Badriram & Viswa Kharma ,TMH,1st edition, 2001.
3. **Fundamentals of Power System protection,** Y G. Painthankar and S R Bhide,PHI, 2009.

REFERENCE BOOKS:

1. **A Course in Electrical Power,** Soni, Gupta & Bhatnagar, Dhanapatirai.
2. **Power System Protection & Switchgear,** Ravindarnath & Chandra -New age Publications.
3 **Electrical Power,** Dr S. L. Uppal, Khanna Publishers.
4. **Handbook of Switchgears**, BHEL,TMH, 5th reprint,2008.

10EE664 OBJECT ORIENTED PROGRAMMING USING C ++

Subject Code	:	**10EE664**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
PRINCIPLES OF OBJECT-ORIENTED PROGRAMMING: Review of Procedure Oriented Programming, Basic concepts of Object Oriented Programming – Object, Class, Encapsulation, Inheritance, Polymorphism; Benefits of OOPs, Applications of OOP's. **4 Hours**

UNIT - 2
THE BASIC LANGUAGE C++: A comparison of C and C++, Structure of C++ program with Class, Preprocessor directives, C++ Statements – Input/Output, Comments, Tokens, Keywords, Identifiers, Constants, Data types – string, pointer, reference, boole, enumeration, array, complex number; typedef names, type compatibility, type conversion, qualifier – const, volatile; Operators in C++, Operator Precedence and Operator Overloading; C++ expressions – New and Delete. **6 Hours**

UNIT - 3
FUNCTIONS IN C++: Introduction, The main() function, Function prototype, Call by reference, Return by reference, Inline functions, Default arguments, const Arguments, Function Overloading, Friend and Virtual functions, pointer to functions. **8 hours**

UNIT - 4
CLASSES AND OBJECTS: Introduction – declaration and definition of a Class, defining member functions, C++ program with a Class, Making an outside function Inline, Nesting of member functions, Arrays within a class, Static data members, static member functions, Objects – global & local objects, scope & lifetime, memory allocation for objects, dynamically allocated objects, pointers to objects, arrays of objects, function arguments with objects, returning objects; const member functions. **8 Hours**

PART - B

UNIT - 5
CONSTRUCTORS AND DESTRUCTORS: Introduction, Constructors, Parameterized Constructors, Multiple constructors in a class, Constructors with default arguments, Dynamic initialization of objects, Copy constructor, Constructing two-dimensional arrays, const Objects, Destructors. **4 Hours**

UNIT - 6
OPERATOR OVERLOADING AND TYPE CONVERSION: Introduction, Defining operator overloading, Overloading unary operators, Overloading binary operators, Overloading binary operators using Friends, Rules for overloading operators, overloading a comma operator, overloading the output operator , Type conversion. **7 Hours**

UNIT - 7
INHERITANCE: Introduction, Defining derived classes, Single inheritance, Making a private member Inheritable, Multilevel inheritance, Multiple inheritance, Hierarchical inheritance, Hybrid inheritance, Virtual base classes, Abstract classes, Constructors & Destructors in base & derived classes. **6 Hours**

UNIT - 8
POINTER, VIRTUAL FUNCTIONS AND POLYMORPHISM: Introduction, Pointers, Pointers to Objects, this pointer, Pointers to derived classes, type-checking pointers, pointers to members, Virtual functions, Pure virtual functions.

MANAGING CONSOLE I/O AND FILE I/O: C++ streams, C++ stream classes, examples of formatted and unformatted I/O operations, Classes for file stream operations, Methods of Opening and Closing a File, Examples of Opening file using constructor open(), file modes (simple programming exercises). **9 Hours**

TEXT BOOKS:

1. **Object Oriented Programming with C++-** Balagurusamy, E, TMH,4th edition, 2008.
2. **C++, The Complete Reference -**Herbert Schildt**,** , TMH, 4th edition
3. **Object Oriented Programming with C++**, Farrell,Cengage Learning,First Edition,2008.

REFERENCE BOOKS:

1. **The C++ programming language,**Bjarne Stroustrup, Pearson Education, 3rd edition,2006.
2. **Objected oriented programming with C++,**Bhave, Pearson Education, First Edition,2006.

10EE72 ELECTRICAL POWER UTILIZATION

Subject Code	:	**10EE72**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

HEATING AND WELDING: Advantages and methods of electric of heating, resistance ovens, induction heating, dielectric heating, the arc furnace, heating of building. Electric welding, resistance and arc welding, control devices and welding equipment. **10 Hours**

UNIT - 2

ELECTROLYTIC PROCESS: Fundamental principles, extraction, refining of metals and electroplating. Factors affecting electro deposition process, power supply for electrolytic process. **6 Hours**

UNIT - 3 & 4

ILLUMINATION: Laws of illumination, lighting calculation, factory lighting, flood lighting, street lighting, different types of lamps-incandescent, fluorescent, vapor, CFL and LED lamps and their working, comparision, Glare and its remedy. **10 Hours**

PART - B

UNIT - 5, 6 & 7

ELECTRIC TRACTION: Introduction, requirements of an ideal traction,systems of traction, speed time curve, tractive effort,co-efficient of adhesion, selection of traction motors, method of speed control, energy saving by series parallel control, ac traction equipment. AC series motor, characteristics, regenerative braking, linear induction motor and their use. AC traction, diesel electric equipment, trains lighting system, specific energy, factors affecting specific energy consumption. **20 Hours**

UNIT - 8

INTRODUCTION TO ELECTRIC AND HYBRID VEHICLES: Configuration and performance of electrical vehicles, traction motor characteristics, tractive effort, transmission requirement, vehicle performance and energy consumption. **6 Hours**

TEXT BOOKS:

1. **Utilization Of Electric Energy,**E Openshaw Taylor, 12th Impression,2009,Universities Press.
2. **Modern Electric, Hybrid Electric and Fuel Cell Vehicles**, Mehrdad, Ehsani, Yimin Gao, Sabastien. E. Gay, Ali Emadi- CRC Press.

REFERENCE BOOKS:

1. **A Course in Electrical Power**, Soni Gupta and Bhatnager-Dhanapat Rai & sons.
3. **Electrical Power,** Dr. S.L.Uppal, Khanna Publications

10EE73 HIGH VOLTAGE ENGINEERING

Subject Code	:	**10EE73**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
INTRODUCTION: Introduction to HV technology, need for generating high voltages in laboratory. Industrial applications of high voltage, Electrostatic precipitation, separation, painting and printing.
6Hours

UNIT - 2 & 3
BREAKDOWN PHENOMENA: Classification of HV insulating media. Properties of important HV insulating media under each category. Gaseous dielectrics,Ionization: primary and secondary ionization processes. Criteria for gaseous insulation breakdown based on Townsend's theory. Limitations of Townsend's theory. Streamer's theory breakdown in non uniform fields. Corona discharges. Breakdown in electro negative gases. Paschen's law and its significance. Time lags of Breakdown. Breakdown in solid dielectrics: Intrinsic Breakdown, avalanche breakdown, thermal breakdown, and electro mechanic breakdown. Breakdown of liquid dielectrics: Suspended particle theory, electronic Breakdown, cavity breakdown (bubble's theory), electro convection breakdown. **12 Hours**

UNIT - 4
GENERATION OF HV AC AND DC VOLTAGE: HV AC-HV transformer; Need for cascade connection and working of transformers units connected in cascade. Series resonant circuit- principle of operation and advantages. Tesla coil. HV DC- voltage doubler circuit, cock croft- Walton type high voltage DC set. Calculation of high voltage regulation, ripple and optimum number of stages for minimum voltage drop. **8 Hours**

Part - B

UNIT - 5
GENERATION OF IMPULSE VOLTAGE AND CURRENT: Introduction to standard lightning and switching impulse voltages. Analysis of single stage impulse generator-expression for Output impulse voltage. Multistage impulse generator working of Marx impulse. Rating of impulse generator. Components of multistage impulse generator. Triggering of impulse generator by three electrode gap arrangement. Trigatron gap and oscillograph time sweep circuits. Generation of switching impulse voltage. Generation of high impulse current. **6 Hours**

UNIT - 6
MEASUREMENT OF HIGH VOLTAGES: Electrostatic voltmeter-principle, construction and limitation. Chubb and Fortescue method for HV AC measurement. Generating voltmeter- Principle, construction. Series resistance micro ammeter for HV DC measurements. Standard sphere gap measurements of HV AC, HV DC, and impulse voltages; Factors affecting the measurements. Potential dividers-resistance dividers capacitance dividers mixed RC potential dividers. Measurement of high impulse currents-Rogogowsky coil and Magnetic Links. **10 Hours**

UNIT - 7

NON-DESTRUCTIVE INSULATION TESTING TECHNIQUES: Dielectric loss and loss angle measurements using Schering Bridge, Transformer ratio Arms Bridge. Need for discharge detection and PD measurements aspects. Factor affecting the discharge detection. Discharge detection methods-straight and balanced methods. **6 Hours**

UNIT - 8

HIGH VOLTAGE TESTS ON ELECTRICAL APPARATUS: Definitions of terminologies, tests on isolators, circuit breakers, cables insulators and transformers. **4 Hours**

TEXT BOOKS:

1. **High Voltage Engineering**, M.S.Naidu and Kamaraju- 4th Edition, THM, 2008.
2. **High Voltage Engineering Fundamentals**, E.Kuffel and W.S. Zaengl, 2nd Edition, Elsevier Press, 2005.
3. **High Voltage Engineering** ,C.L.Wadhwa, New Age International Private limited, 1995.

REFERENCE BOOKS:

1.**High Voltage Engineering Theory and Practice,** Mazen Abdel-Salam, Hussein Anis, Ahdab El-Morshedy, Roshdy Radwan, 2nd Edn(Revised & Expanded) Marcel-Dekker Publishers(Special Indian Edn.).

10EE752 PROGRAMMABLE LOGIC CONTROLLERS

Subject Code	:	**10EE752**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUTION: Introduction to Programmable logic controller (PLC), role in automation (SCADA), advantages and disadvantages, hardware, internal architecture, sourcing and sinking, characteristics of I/O devices, list of input and output devices, examples of applications. I/O processing, input/output units, signal conditioning, remote connections, networks, processing inputs I/O addresses. **7 Hours**

UNIT - 2

ROGRAMMING: Ladder programming- ladder diagrams, logic functions, latching, multiple outputs, entering programs, functional blocks, programme examples like location of stop and emergency switches **8 Hours**

UNIT - 3 & 4

PROGRAMMING LANGUAGES: Instruction list, sequential functions charts & structured text, jump and call subroutines**.** **10 Hours**

PART - B

UNIT - 5

INTERNAL RELAYS: ladder programmes, battery- backed relays, one - shot operation, set and reset, master control relay. **5 Hours**

UNIT - 6 & 7

Timers and counters: Types of timers, programming timers, ON and OFF- delay timers, pulse timers, forms of counter, programming, up and down counters, timers with counters, sequencer. **12 Hours**

UNIT - 8

Shift register and data handling: shift registers, ladder programs, registers and bits, data handling, arithmetic functions, temperature control and bottle packing applications. **10 Hours**

Note: Programming is to be with reference to only Mitsubhish PLC

TEXT BOOKS:

1. **Programmable Logic controllers-**W Bolton, 5th edition, Elsevier- newness, 2009.
2. **Programmable logic controllers - principles and applications”-**John W Webb, Ronald A Reis, Pearson education, 5th edition, 2nd impression, 2007.

REFERENCE BOOKS:

1. **Programmable Controller Theory and Applications**,L. A Bryan, E. A Bryan, An industrial text company publication, 2nd edition, 1997.
2. **Programmable Controllers, An Engineers Guide**-E. A Paar, newness, 3rd edition, 2003.

10EE836 RENEWABLE ENERGY SOURCES

Subject Code	:	**10EE836**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

UNIT - 1

ENERGY SOURCES: Introduction, Importance of Energy Consumption as Measure of Prosperity, Per Capita Energy Consumption, Classification of Energy Resources; Conventional Energy Resources - Availability and their limitations; Non-Conventional Energy Resources – Classification, Advantages, Limitations; Comparison of Conventional and Non-Conventional Energy Resources; World Energy Scenario; Indian Energy Scenario. **4 Hours**

UNIT - 2

SOLAR ENERGY BASICS: Introduction, Solar Constant, Basic Sun-Earth Angles – definitions and their representation, Solar Radiation Geometry (numerical problems), Estimation of Solar Radiation of Horizontal and Tilted Surfaces (numerical problems); Measurement of Solar Radiation Data – Pyranometer and Pyrheliometer. **6 Hours**

UNIT - 3

SOLAR THERMAL SYSTEMS: Principle of Conversion of Solar Radiation into Heat, Solar Water Heaters (Flat Plate Collectors), Solar Cookers – Box type, concentrating dish type, Solar driers, Solar Still, Solar Furnaces, Solar Green Houses. **6 Hours**

UNIT - 4

SOLAR ELECTRIC SYSTEMS: Solar Thermal Electric Power Generation – Solar Pond and Concentrating Solar Collector (parabolic trough, parabolic dish, Central Tower Collector). Advantages and Disadvantages; Solar Photovoltaic – Solar Cell fundamentals, characteristics, classification, construction of module, panel and array. Solar PV Systems – stand-alone and grid connected; Applications – Street lighting, Domestic lighting and Solar Water pumping systems. **7 Hours**

ENERGY STORAGE: Introduction, Necessity of Energy Storage, and Methods of Energy Storage (classification and brief description using block diagram representation only). **3 Hours**

PART - B

UNIT - 5

WIND ENERGY: Introduction, Wind and its Properties, History of Wind Energy, Wind Energy Scenario – World and India. Basic principles of Wind Energy Conversion Systems (WECS), Classification of WECS, Parts of WECS, Derivation for Power in the wind, Electrical Power Output and Capacity Factor of WECS, Wind site selection consideration, Advantages and Disadvantages of WECS. **8 Hours**

UNIT - 6

BIOMASS ENERGY: Introduction, Photosynthesis process, Biomass fuels, Biomass conversion technologies, Urban waste to Energy Conversion, Biomass Gasification, Biomass to Ethanol Production, Biogas production from waste biomass, factors affecting biogas generation, types of biogas plants – KVIC and Janata model; Biomass program in India. **6 Hours**

UNIT - 7

ENERGY FROM OCEAN: Tidal Energy – Principle of Tidal Power, Components of Tidal Power Plant (TPP), Classification of Tidal Power Plants, Estimation of Energy – Single basin and Double basin type TPP (no derivations. Simple numerical problems), Advantages and Limitations of TPP. Ocean Thermal Energy Conversion (OTEC): Principle of OTEC system, Methods of OTEC power generation – Open Cycle (Claude cycle), Closed Cycle (Anderson cycle) and Hybrid cycle (block diagram description of OTEC); Site-selection criteria, Biofouling, Advantages & Limitations of OTEC. **6 Hours**

UNIT - 8

EMERGING TECHNOLOGIES: Fuel Cell, Small Hydro Resources, Hydrogen Energy, and Wave Energy. (Principle of Energy generation using block diagrams, advantages and limitations). **6 Hours**

TEXT BOOKS:

1. **Non-Conventional Sources of Energy,** Rai, G. D, Khanna Publishers, 4th Edition, 2007
2. **Non-Conventional Energy Resources,** Khan, B. H., TMH, 2nd Edition.

REFERENCE BOOK:

1. **Fundamentals of Renewable Energy Systems,** Mukherjee, D and Chakrabarti, S., New Age International Publishers, 2005.

MATERIAL SCIENCE AND METALLURGY

Subject Code	**: 10ME32A /42A**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Crystal Structure: BCC, FCC and HCP Structures, coordination number and atomic packing factors, crystal imperfections -point line and surface imperfections. Atomic Diffusion: Phenomenon, Ficks laws of diffusion, factors affecting diffusion.

06 Hours

UNIT - 2

Mechanical Behaviour: Stress-strain diagram showing ductile and brittle behaviour of materials, linear and non linear elastic behaviour and properties, mechanical properties in plastic range, yield strength offset yield strength, ductility, ultimate tensile strength, toughness. Plastic deformation of single crystal by slip and twinning.

06 Hours

UNIT - 3

Fracture: Type I, Type II and Type III.

Creep: Description of the phenomenon with examples. three stages of creep, creep properties, stress relaxation.

Fatigue: Types of fatigue loading with examples, Mechanism of fatigue, fatigue properties, fatigue testing and S-N diagram.

07 Hours

UNIT - 4

Solidification: Mechanism of solidification, Homogenous and Heterogeneous nucleation, crystal growth, cast metal structures.

Phase Diagram I: Solid solutions Hume Rothary rule substitutional, and interstitial solid solutions, intermediate phases, Gibbs phase rule.

07 Hours

PART - B

UNIT - 5

Phase Diagram II: Construction of equilibrium diagrams involving complete and partial solubility, lever rule. Iron carbon equilibrium diagram description of phases, solidification of steels and cast irons, invariant reactions.

06 Hours

UNIT - 6

Heat treating of metals: TTT curves, continuous cooling curves, annealing and its types. normalizing, hardening, tempering, martempering, austempering, hardenability, surface hardening methods like carburizing, cyaniding, nitriding, flame hardening and induction hardening, age hardening of aluminium-copper alloys.

07 Hours

UNIT - 7

Ferrous and non ferrous materials: Properties, Composition and uses of

- Grey cast iron, malleable iron, SG iron and steel
- Copper alloys-brasses and bronzes.
  Aluminium alloys-Al-Cu,Al-Si,Al-Zn alloys.

06 Hours

UNIT - 8

Composite Materials: Definition, classification, types of matrix materials & reinforcements, fundamentals of production of FRP's and MMC's advantages and application of composites.

07 Hours

TEXT BOOKS:

1. **Foundations of Materials Science and Engineering,** Smith, 4^{th} Edition McGraw Hill, 2009
2. **Materials Science, Shackleford., & M. K. Muralidhara,** Pearson Publication – 2007.

REFERENCE BOOKS:

1. **An Introduction to Metallurgy; Alan Cottrell**, Universities Press India Oriental Longman Pvt. Ltd., 1974.
2. **Engineering Materials Science**, W.C.Richards, PHI, 1965
3. **Physical Metallurgy**; Lakhtin, Mir Publications
4. **Materials Science and Engineering,** V.Raghavan , PHI, 2002
5. **Elements of Materials Science and Engineering,** H. VanVlack, Addison-Wesley Edn., 1998
6. **Materials Science and Engineering,** William D. Callister Jr., John Wiley & Sons. Inc, 5^{th} Edition, 2001.
7. **The Science and Engineering of Materials,** Donald R. Askland and Pradeep.P. Phule, Cengage Learning, 4^{lh} Ed., 2003.

MECHANICAL MEASUREMENTS AND METROLOGY

Subject Code	**: 10ME32B /42B**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART- A

UNIT-1

Standards of measurement: Definition and Objectives of metrology, Standards of length-International prototype meter, Imperial standard yard, Wave length standard, subdivision of standards, line and

end standard, calibration of end bars (Numerical), Slip gauges, Wringing phenomena, Indian Standards (M-81, M-12), Numerical problems on building of slip gauges.

06 Hours

UNIT-2

System of Limits, Fits, Tolerance and Gauging: Definition of tolerance, Specification in assembly, Principle of interchangeability and selective assembly limits of size, Indian standards, concept of limits of size and tolerances, compound tolerances, accumulation of tolerances, definition of fits, types of fits and their designation (IS 919-1963), geometrical tolerance, positional-tolerances, hole basis system, shaft basis system, classification of gauges, brief concept of design of gauges (Taylor's principles), Wear allowance on gauges, Types of gauges-plain plug gauge, ring gauge, snap gauge, limit gauge and gauge materials.

07 Hours

UNIT-3

Comparators and Angular measurement: Introduction to comparators, characteristics, classification of comparators, mechanical comparators-Johnson Mikrokator, sigma comparators, dial indicator, optical comparators-principles, Zeiss ultra optimeter, electric and electronic comparators-principles, LVDT, pneumatic comparators, back pressure gauges, solex comparators. Angular measurements, bevel protractor, sine principle and use of sine bars, sine centre, use of angle gauges (numericals on building of angles), clinometers.

07 Hours

UNIT-4:

Interferometer and screw thread, gear measurement: Interferometer, interferometry, autocollimator. Optical flats. Terminology of screw threads, measurement of major diameter, minor diameter, pitch, angle and effective diameter of screw threads by 2 - wire and 3 -wire methods, best size wire. Tool maker's microscope, gear tooth terminology, use of gear tooth vernier caliper and micrometer.

06 Hours

PART-B

UNIT-5:

Measurements and measurement systems: Definition, significance of measurement, generalized measurement system, definitions and concept of accuracy, precision, calibration, threshold, sensitivity, hysterisis, repeatability, linearity, loading effect, system response-times delay. Errors in measurement, classification of errors. Transducers, transfer efficiency, primary and secondary transducers, electrical, mechanical, electronic transducers, advantages of each type transducers.

07 Hours

UNIT-6

Intermediate modifying and terminating devices: Mechanical systems, inherent problems, electrical intermediate modifying devices, input circuitry, ballast circuit, electronic amplifiers and telemetry. Terminating devices, mechanical, cathode ray oscilloscope, oscillographs, X-Y plotters.

06 Hours

UNIT-7

Measurement of force, torque and pressure: Principle, analytical balance, platform balance, proving ring. Torque measurement, Prony brake, hydraulic dynamometer. Pressure measurements, principle, use of elastic members, Bridgeman gauge, McLeod gauge, Pirani gauge. **06 Hours**

UNIT-8

Temperature and strain measurement: Resistance thermometers, thermocouple, law of thermo couple, materials used for construction, pyrometer, optical pyrometer. Strain measurements, strain gauge, preparation and mounting of strain gauges, gauge factor, methods of strain measurement.

07 Hours

TEXT BOOKS:

1. **Mechanical Measurements,** Beckwith Marangoni and Lienhard, Pearson Education, 6th Ed., 2006.
2. **Engineering Metrology,** R.K. Jain, Khanna Publishers, 1994.

REFERENCE BOOKS:

1. **Engineering Metrology,** I.C. Gupta, Dhanpat Rai Publications, Delhi.
2. **Mechanical Measurements,** R.K. Jain Khanna Publishers, 1994
3. **Industrial Instrumentation,** Alsutko, Jerry. D. Faulk, Cengage Asia Pvt. Ltd. 2002.
4. **Measurement Systems Applications and Design,** Ernest O. Doebelin, 5th Ed., McGraw Hill Book Co.
5. **Metrology & Measurement,** Anand K. Bewoor & Vinay A. Kulkarni, Tata McGraw Hill Pvt. Ltd., New-Delhi

MANUFACTURING PROCESS – I
(FUNDAMENTALS OF FOUNDRY & WELDING)

Subject Code	**: 10ME35**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

CASTING PROCESS

UNIT - 1

Introduction: Concept of Manufacturing process, its importance. Classification of Manufacturing processes. Introduction to Casting process & steps involved. Varieties of components produced by casting process. Advantages & Limitations of casting process.

Patterns: Definition, functions, Materials used for pattern, various pattern allowances and their importance. Classification of patterns, BIS color coding of Patterns.

Binder: Definition, Types of binder used in moulding sand.

Additives: Need, Types of additives used and their properties..

06 Hours

UNIT - 2

Sand Moulding : Types of base sand, requirement of base sand. Moulding sand mixture ingredients for different sand mixtures. Method used for sand moulding, such as Green sand, dry sand and skin dried moulds.

Cores: Definition, Need, Types. Method of making cores, Binders used, core sand moulding.

Concept of Gating & Risers. Principle and types.

Fettling and cleaning of castings. Basic steps, Casting defects, Causes, features and remedies.

Moulding Machines : Jolt type, Squeeze type, Jolt & Squeeze type and Sand slinger.

07 Hours

UNIT - 3

Special moulding Process: Study of important moulding processes, No bake moulds, Flaskless moulds, Sweep mould, CO_2 mould, Shell mould, Investment mould.

Metal moulds: Gravity die-casting, Pressure die casting, Centrifugal casting, Squeeze Casting, Slush casting, Thixo-casting and Continuous Casting Processes.

07 Hours

UNIT - 4

Melting Furnaces: Classification of furnaces. Constructional features & working principle of coke fired, oil fired and Gas fired pit furnace, Resistance furnace, Coreless Induction furnace, Electric Arc Furnace, Cupola furnace.

06 Hours

PART – B

WELDING

UNIT - 5

Welding process: Definition, Principles, Classification, Application, Advantages & limitations of welding.

Arc Welding: Principle, Metal Arc welding **(MAW)**, Flux Shielded Metal Arc Welding **(FSMAW)**, Inert Gas Welding **(TIG & MIG)** Submerged Arc Welding **(SAW)** and Atomic Hydrogen Welding processes. **(AHW)**

Gas Welding: Principle, Oxy – Acetylene welding, Chemical Reaction in Gas welding, Flame characteristics. Gas torch construction & working. Forward and backward welding.

07 Hours

UNIT - 6

Special types of welding: Resistance welding **-** principles, Seam welding, Butt welding, Spot welding and projection welding.

Friction welding, Explosive welding, Thermit welding, Laser welding and Electron beam welding.

07 Hours

UNIT - 7

Metallurgical aspect, in welding : Structure of welds, Formation of different zones during welding. Heat affected zone **(HAZ).** Parameters affecting **HAZ**. Effect of carbon content on structure and properties of steel. Shrinkage in welds & Residual stresses.

Concept of electrodes, Filler rod and fluxes. Welding defects – Detection causes & remedy.

06 Hours

UNIT - 8

Principles of soldering & brazing: Parameters involved & Mechanism. Different Types of Soldering & Brazing Methods.

Inspection Methods – Methods used for Inspection of casting and welding. Visual, Magnetic particle, Fluorescent particle, Ultrasonic, Radiography, Eddy current, Holography methods of Inspection.

06 Hours

TEXT BOOKS:

1. **"Manufacturing Process-I",** Dr.K.Radhakrishna, Sapna Book House, 5th Revised Edition 2009.
2. **"Manufacturing & Technology**: Foundry Forming and Welding", P.N.Rao, 3rd Ed., Tata McGraw Hill, 2003.

REFERENCE BOOKS:

1. **"Process and Materials of Manufacturing**", Roy A Lindberg, 4th Ed. Pearson Edu. 2006.
2. **"Manufacturing Technology**", Serope Kalpakjian, Steuen. R. Sechmid, Pearson Education Asia, 5th Ed. 2006.

COMPUTER AIDED MACHINE DRAWING

Subject Code	**:10ME36A/10ME46A**	**IA Marks**	**25**
Hours/Week	**: 04(1 Hrs. Theory & 3 Hrs Practical)**	**Exam Hours**	**03**
Total Hours	**: 52**	**Exam Marks**	**100**

Introduction:
Review of graphic interface of the software. Review of basic sketching commands and navigational commands. Starting a new drawing sheet. Sheet sizes. Naming a drawing, Drawing units, grid and snap.

02 Hours

PART-A

UNIT - 1
Sections of Solids: Sections of Pyramids, Prisms, Cubes, Tetrahedrons, Cones and Cylinders resting only on their bases (No problems on axis inclinations, spheres and hollow solids). True shape of sections.
Orthographic Views: Conversion of pictorial views into orthographic projections. of **simple machine parts** with or without section. (Bureau of Indian Standards conventions are to be followed for the drawings) Hidden line conventions. Precedence of lines.

08 Hours

UNIT - 2
Thread Forms: Thread terminology, sectional views of threads. ISO Metric (Internal & External) BSW (Internal & External) square and Acme. Sellers thread, American Standard thread.
Fasteners: Hexagonal headed bolt and nut with washer (assembly), square headed bolt and nut with washer (assembly) simple assembly using stud bolts with nut and lock nut. Flanged nut, slotted nut, taper and split pin for locking, counter sunk head screw, grub screw, Allen screw.

08 Hours

PART-B

UNIT - 3

Keys & Joints :

Parallel key, Taper key, Feather key, Gibhead key and Woodruff key

Riveted Joints: Single and double riveted lap joints, butt joints with single/double cover straps (Chain and Zigzag, using snap head rivets). cotter joint (socket and spigot), knuckle joint (pin joint) for two rods.

08 Hours

UNIT - 4

Couplings:

Split Muff coupling, Protected type flanged coupling, pin (bush) type flexible coupling, Oldham's coupling and universal coupling (Hooks' Joint)

08 Hours

PART - C
Assembly Drawings
(Part drawings should be given)

1. Plummer block (Pedestal Bearing)
2. Rams Bottom Safety Valve
3. I.C. Engine connecting rod
4. Screw jack (Bottle type)
5. Tailstock of lathe
6. Machine vice
7. Tool Head of a shaper

18 Hours

TEXT BOOKS:

1. **'A Primer on Computer Aided Machine Drawing-2007'**, Published by VTU, Belgaum.
2. **'Machine Drawing'**, N.D.Bhat & V.M.Panchal

REFERENCE BOOKS:

1. **'A Text Book of Computer Aided Machine Drawing'**, S. Trymbaka Murthy, CBS Publishers, New Delhi, 2007
2. **'Machine Drawing'**, K.R. Gopala Krishna, Subhash Publication.

3. **'Machine Drawing with Auto CAD'**, Goutam Pohit & Goutham Ghosh, 1st Indian print Pearson Education, 2005
4. **'Auto CAD 2006, for engineers and designers'**, Sham Tickoo. Dream tech 2005
5. **'Machine Drawing'**, N. Siddeshwar, P. Kanniah, V.V.S. Sastri, published by Tata McGraw Hill,2006

NOTE:

Internal assessment: 25 Marks

All the sheets should be drawn in the class using software. Sheet sizes should be A3/A4. All sheets must be submitted at the end of the class by taking printouts.

Scheme of Examination:

Two questions to be set from each Part-A, Part-B and Part-C

Student has to answer one question each from Part-A and Part-B for 20 marks each. And one question from Part-C for 60 marks.

i.e. PART-A 1 x 20 = 20 Marks
PART-B 1 x 20 = 20 Marks
PART-C 1 x 60 = 60 Marks

Total = 100 Marks

FLUID MECHANICS

Subject Code	**: 10ME36B / 46B**	**IA Marks**	**25**
Hours/Week	**: 04**	**Exam Hours**	**03**
Total Hours	**: 52**	**Exam Marks**	**100**

PART – A

UNIT-1

Properties of Fluids: Introduction, Types of fluid, Properties of fluids, viscosity, thermodynamic properties, surface tension, capillarity, vapour pressure and cavitation

06 Hours

UNIT-2

Fluid Statistics: Fluid pressure at a point, Pascal's law, pressure variation in a static fluid, absolute, gauge, atmospheric and vacuum pressures, simple manometers and differential manometers. Total pressure and center of pressure on submerged plane surfaces; horizontal, vertical and inclined plane surfaces, curved surface submerged in liquid.

07 Hours

UNIT-3

Buoyancy and Fluid Kinematics:

Buoyancy, center of buoyancy, metacentre and metacentric height, conditions of equilibrium of floating and submerged bodies, determination of Metacentric height experimentally and theoretically.

Kinematics: Types of fluid flow, continuity equation in 2D and 3D (Cartesian Co-ordinates only), velocity and acceleration, velocity potential function and stream function.

07 Hours

UNIT-4

Fluid Dynamics: Introduction equation of motion, Euler's equation of motion, Bernoulli's equation from first principles and also from Euler's equation, limitations of Bernoulli's equation.

06 Hours

PART-B

UNIT-5

Fluid Flow Measurements : Venturimeter, orificemeter, pitot-tube, vertical orifice, V-Notch and rectangular notches.

Dimensional Analysis : Introduction, derived quantities, dimensions of physical quantities, dimensional homogeneity, Rayleigh's method, Buckingham π theorem, dimensionless numbers, similitude, types of similitudes.

07 Hours

UNIT-6

Flow through pipes : Minor losses through pipes. Darey's and Chezy's equation for loss of head due to friction in pipes. HGL and TEL.

06 Hours

UNIT-7

Laminar flow and viscous effects : Reyonold's number, critical Reynold's number, laminar flow through circular pipe-Hagen Poiseille's equation, laminar flow between parallel and stationary plates.

06 Hours

UNIT-8

Flow past immersed bodies : Drag, Lift, expression for lift and drag, boundary layer concept, displacement, momentum and energy thickness. Introduction to compressible flow : Velocity of sound in a fluid, Mach number, Mach cone, propagation of pressure waves in a compressible fluid.

07 Hours

TEXT BOOKS:

1. **Fluid Mechanics,** Oijush.K.Kundu, IRAM COCHEN, ELSEVIER, 3rd Ed. 2005.
2. **Fluid Mechanics**, Dr. Bansal, R.K.Lakshmi Publications, 2004.

REFERENCE BOOKS:

1. **Fluid Mechanics and hydraulics,** Dr.Jagadishlal: Metropolitan Book Co-Ltd., 1997.
2. **Fluid Mechanics (SI Units),** Yunus A. Cengel John M.Oimbala, 2nd Ed., Tata McGraw Hill, 2006.
3. **Fluid Mechanics,** John F.Douglas, Janul and M.Gasiosek and john A.Swaffield, Pearson Education Asia, 5th ed., 2006
4. **Fluid Mechanics and Fluid Power Engineering**, Kumar.D.S, Kataria and Sons., 2004
5. **Fluid Mechanics** -. Merle C. Potter, Elaine P.Scott. Cengage learning

METALLOGRAPHY AND MATERIAL TESTING LABORATORY

Subject Code	**: 10MEL37A / 47A**	**IA Marks**	**: 25**
Hours/Week	**: 03**	**Exam Hours**	**: 03**
Total Hours	**: 48**	**Exam Marks**	**: 50**

PART – A

1. Preparation of specimen for Metallograpic examination of different engineering materials. Identification of microstructures of plain carbon steel, tool steel, gray C.I, SG iron, Brass, Bronze & composites.
2. Heat treatment: Annealing, normalizing, hardening and tempering of steel. Hardness studies of heat-treated samples.
3. To study the wear characteristics of ferrous, non-ferrous and composite materials for different parameters.
4. Non-destructive test experiments like,
   (a). Ultrasonic flaw detection
   (b). Magnetic crack detection
   (c). Dye penetration testing. To study the defects of Cast and Welded specimens

PART – B

1. Tensile, shear and compression tests of metallic and non metallic specimens using Universal Testing Machine
2. Torsion Test
3. Bending Test on metallic and nonmetallic specimens.
4. Izod and Charpy Tests on M.S, C.I Specimen.
5. Brinell, Rockwell and Vickers's Hardness test.
6. Fatigue Test.

Scheme of Examination:

ONE question from part -A: **20** Marks
ONE question from part -B: 20 Marks
Viva -Voice: 10 Marks

Total : 50 Marks

MECHANICAL MEASUREMENTS AND METROLOGY LABORATORY

Subject Code	**: 10MEL37B / 47B**	**IA Marks**	**: 25**
Hours/Week	**: 03**	**Exam Hours**	**: 03**
Total Hours	**: 48**	**Exam Marks**	**: 50**

PART-A: MECHANICAL MEASUREMENTS

1. Calibration of Pressure Gauge
2. Calibration of Thermocouple
3. Calibration of LVDT
4. Calibration of Load cell
5. Determination of modulus of elasticity of a mild steel specimen using strain gauges.

PART-B: METROLOGY

1. Measurements using Optical Projector / Toolmaker Microscope.
2. Measurement of angle using Sine Center / Sine bar / bevel protractor
3. Measurement of alignment using Autocollimator / Roller set
4. Measurement of cutting tool forces using
    a) Lathe tool Dynamometer
    b) Drill tool Dynamometer.
5. Measurement of Screw thread Parameters using Two wire or Three-wire method.
6. Measurements of Surface roughness, Using Tally Surf/Mechanical Comparator
7. Measurement of gear tooth profile using gear tooth vernier /Gear tooth micrometer
8. Calibration of Micrometer using slip gauges
9. Measurement using Optical Flats

Scheme of Examination:

ONE question from part -A: **20** Marks
ONE question from part -B: 20 Marks
Viva -Voice: 10 Marks

Total : 50 Marks

FOUNDRY AND FORGING LABORATORY

Subject Code	**: 10MEL38A / 48A**	**IA Marks**	**: 25**
Hours/Week	**: 03**	**Exam Hours**	**: 03**
Total Hours	**: 48**	**Exam Marks**	**: 50**

PART – A

1. Testing of Moulding sand and Core sand

Preparation of sand specimens and conduction of the following tests:

1 Compression, Shear and Tensile tests on Universal Sand Testing Machine.
2 Permeability test
3 Core hardness & Mould hardness tests.
4 Sieve Analysis to find Grain Fineness number of Base Sand
5 Clay content determination in Base Sand

PART – B

2. Foundry Practice

Use of foundry tools and other equipments.
Preparation of moulds using two moulding boxes using patterns or without patterns. (Split pattern, Match plate pattern and Core boxes).
Preparation of one casting (Aluminum or cast iron-Demonstration only)

PART – C

3. Forging Operations :

- Calculation of length of the raw material required to do the model.
- Preparing minimum three forged models involving upsetting, drawing and bending operations.
- Out of these three models, at least one model is to be prepared by using Power Hammer.

Scheme of Examination:

One question is to be set from Part-A: 10 marks
One question is to be set from either
Part-B or Part-C: 30 marks
Calculation part in case of forging is made compulsory

Calculation (Forging)	+ Foundry Model = 05 +25 = 30 Marks
Calculation (Forging)	+ Forging Model = 05 +25 = 30 Marks

Viva-Voce	:	**10** marks.
Total	:	**50** Marks**.**

MACHINE SHOP

Subject Code	**: 10MEL38B / 48B**	**IA Marks**	**: 25**
Hours/Week	**: 03**	**Exam Hours**	**: 03**
Total Hours	**: 48**	**Exam Marks**	**: 50**

PART – A

Preparation of three models on lathe involving Plain turning, Taper turning, Step turning, Thread cutting, Facing, Knurling, Drilling, Boring, Internal Thread cutting and Eccentric turning.

PART – B

Cutting of V Groove/ dovetail / Rectangular groove using a shaper.
Cutting of Gear Teeth using Milling Machine.

Scheme of Examination:

ONE question from part -A:	**30** Marks
ONE question from part -B:	**10** Marks
Viva -Voice:	**10** Marks
Total :	**50** Marks

APPLIED THERMODYNAMICS

Subject Code	**: 10ME43**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART-A

UNIT - 1

Combustion thermodynamics: Theoretical (Stoichiometric) air and excess air for combustion of fuels. Mass balance, actual combustion. Exhaust gas analysis. A./ F ratio, Energy balance for a chemical reaction, enthalpy of formation, enthalpy and internal energy of combustion, Combustion efficiency, adiabatic flow temperature.

07 Hours

UNIT- 2

Gas power cycle: Air Standard cycles: Carnot, Otto, Diesel, Dual and Stirling cycles, P-V and T-S diagrams, description, efficiencies and mean effective pressures, Comparison of Otto, Diesel and dual cycles.

06 Hours

UNIT - 3

I.C. Engine: Testing of two stroke and four stroke SI and CI engines for performance Related numerical problems, heat balance, Motoring Method, Willian's line method, swinging field dynamometer, Morse test.

06 Hours

UNIT - 4

Vapour Power Cycles: Carnot vapour power cycles, drawbacks as a reference cycle, Simple Rankine cycle, description, T- S diagram, analysis for performance , comparison of Carnot and Rankine cycles. Effects of pressure and temperature on Rankine cycle performance. Actual vapour power cycles. Ideal and practical regenerative Rankine cycle, open and closed feed water heaters, Reheat Rankine cycle.

07 Hours

PART-B

UNIT - 5

Reciprocating Compressors: Operation of a single stage reciprocating compressors, work input through P-V diagram and steady state steady flow analysis. Effect of clearance and volumetric efficiency. Adiabatic, isothermal and mechanical efficiencies. Multistage compressor, saving in work, optimum intermediate pressure, inter- cooling, minimum work for compression.

06 Hours

UNIT - 6

Gas turbine and Jet propulsion: Classification of Gas turbines, Analysis of open cycle gas turbine cycle. Advantages and disadvantages of closed cycle. Methods to improve thermal efficiency, Jet propulsion and Rocket propulsion.

07 Hours

UNIT - 7

Refrigeration: Vapour compression refrigeration system ; description, analysis, refrigerating effect, capacity , power required, units of refrigeration, COP , Refrigerants and their desirable properties. Air cycle refrigeration;

reversed Carnot cycle, reversed Brayton cycle, Vapour absorption refrigeration system, steam jet refrigeration.

06 Hours

UNIT - 8

Psychometry: Atmospheric air and psychometric properties; Dry bulb temperature, wet bulb temperature, dew point temperature; partial pressures, specific and relative humidities and the relation between the two enthalpy and adiabatic saturation temperature. Construction and use of psychometric chart . Analysis of various processes; heating, cooling , dehumidifying and humidifying. Adiabatic mixing of moist air. Summer and winter air conditioning.

07 Hours

Data Hand Book :

1. **Thermodynamic data hand book,** B.T. Nijaguna.
2. **Properties of Refrigerant & Psychometric** (tables & Charts in SI Units), Dr. S.S. Banwait, Dr. S.C. Laroiya, Birla Pub. Pvt. Ltd., Delhi, 2008

TEXT BOOKS:

1. **Basic and applied Thermodynamics**, P.K. Nag, 2nd Ed., Tata McGraw Hill Pub.Co,2002
2. **Applied Thermodynamics**, Rajput, Laxmi Publication
3. **Applied Thermodynamics**, B.K. Venkanna, Swati B. Wadavadagi, PHI, New Delhi, 2010

REFERENCE BOOKS:

1. **Thermodynamics , An engineering approach**, Yunus, A. Cengel and Michael A.Boies, 6th Ed., Tata McGraw Hill pub. Co., 2002,
2. **Fundamental of Classical Thermodynamics,** G.J. Van Wylen and R.E. Sontang Wiley eastern.

KINEMATICS OF MACHINES

Subject Code	**: 10ME44**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Introduction: Definitions Link or element, kinematic pairs, Degrees of freedom, Grubler's criterion (without derivation), Kinematic chain, Mechanism, Structure, Mobility of Mechanism, Inversion, Machine.

Kinematic Chains and Inversions: Inversions of Four bar chain; Single slider crank chain and Double slider crank chain.

07 Hours

UNIT - 2

Mechanisms: Quick return motion mechanisms-Drag link mechanism, Whitworth mechanism and Crank and slotted lever Mechanism.

Straight line motion mechanisms Peaucellier's mechanism and Robert's mechanism. Intermittent Motion mechanisms -Geneva wheel mechanism and Ratchet and Pawl mechanism. Toggle mechanism, Pantograph, Ackerman steering gear mechanism.

06 Hours

UNIT - 3

Velocity and Acceleration Analysis of Mechanisms (Graphical Methods)

Velocity and acceleration analysis of Four Bar mechanism, slider crank mechanism and Simple Mechanisms by vector polygons: Relative velocity and acceleration of particles .in a common link, relative velocity and accelerations of coincident Particles on separate links- Coriolis component of acceleration. Angular velocity and angular acceleration of links, velocity of rubbing.

07 Hours

UNIT - 4

Velocity Analysis by Instantaneous Center Method: Definition, Kennedy's Theorem, Determination of linear and angular velocity using instantaneous center method

Klein's Construction: Analysis of velocity and acceleration of single slider crank mechanism.

06 Hours

PART – B

UNIT - 5

Velocity and Acceleration Analysis of Mechanisms (Analytical Methods): Analysis of four bar chain and slider crank chain using analytical expressions. (Use of complex algebra and vector algebra)

06 Hours

UNIT - 6

Spur Gears: Gear terminology, law of gearing, Characteristics of involute action, Path of contact. Arc of contact, Contact ratio of spur, helical, bevel and worm gears, Interference in involute gears. Methods of avoiding interference, Back lash. Comparison of involute and cycloidal teeth. Profile Modification.

07 Hours

UNIT - 7

Gear Trains: Simple gear trains, Compound gear trains for large speed. reduction, Epicyclic gear trains, Algebraic and tabular methods of finding velocity ratio of epicyclic gear trains. Tooth load and torque calculations in epicyclic gear trains.

07 Hours

UNIT - 8

Cams: Types of cams, Types of followers. Displacement, Velocity and, Acceleration time curves for cam profiles. Disc cam with reciprocating follower having knife-edge, roller and flat-face follower, Disc cam with oscillating roller follower. Follower motions including SHM, Uniform velocity, uniform acceleration and retardation and Cycloidal motion.

06 Hours

TEXT BOOKS:

1. **"Theory of Machines",** Rattan S.S, Tata McGraw-Hill Publishing Company Ltd., New Delhi, and 3rd edition -2009.
2. **"Theory of Machines",** Sadhu Singh, Pearson Education (Singapore) Pvt. Ltd, Indian Branch New Delhi, 2nd Edi. 2006

REFERENCE BOOKS:

1. **"Theory of Machines & Mechanisms**", J.J. Uicker, , G.R. Pennock, J.E. Shigley. OXFORD 3rd Ed. 2009.
2. **Mechanism and Machine theory**, Ambekar, PHI, 2007

Graphical Solutions may be obtained either on the Graph Sheets or on the Answer Book itself.

MANUFACTURING PROCESS – II
(Metal Removing Process)

Subject Code	**: 10ME45**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Theory of Metal Cutting: Single point cutting tool nomenclature, geometry. Mechanics of Chip Formation, Types of Chips. Merchants circle diagram and analysis, Ernst Merchant's solution, shear angle relationship, problems of Merchant's analysis. Tool Wear and Tool failure, tool life. Effects of cutting parameters on tool life. Tool Failure Criteria, Taylor's Tool Life equation. Problems on tool life evaluation.

07 Hours

UNIT - 2

Cutting Tool Materials: Desired properties and types of cutting tool materials – HSS, carbides coated carbides, ceramics. Cutting fluids. Desired properties, types and selection. Heat generation in metal cutting, factors

affecting heat generation. Heat distribution in tool and work piece and chip. Measurement of tool tip temperature.

07 Hours

UNIT - 3

Turning (Lathe), Shaping and Planing Machines: Classification, constructional features of Turret and Capstan Lathe. Tool Layout, shaping Machine, Planing Machine, Driving mechanisms of lathe, shaping and planing machines, Different operations on lathe, shaping machine and planing machine. Simple problems on machining time calculations

07 Hours

UNIT - 4

Drilling machines: Classification, constructional features, drilling & related operations. Types of drill & drill bit nomenclature, drill materials.
Introduction to CNC machines- Principles of operation. Axes of NC machine-Coordinate systems. Basics of Manual part programming methods.

06 Hours

PART – B

UNIT - 5

Milling machines: Classification, constructional features, milling cutters nomenclature, milling operations, up milling and down milling concepts. Various milling operations.
Indexing: Simple, compound, differential and angular indexing calculations. Simple problems on simple and compound indexing.

06 Hours

UNIT - 6

Grinding machines: Types of abrasives, Grain size, bonding process, grade and structure of grinding wheels, grinding wheel types. Classification, constructional features of grinding machines (Centerless, cylindrical and surface grinding). Selection of grinding wheel. Grinding process parameters. Dressing and truing of grinding wheels.

07 Hours

UNIT - 7:

Broaching process - Principle of broaching. Details of a broach. Types of broaching machines-constructional details. Applications. Advantages and Limitations.

Finishing and other Processes Lapping and Honing operations – Principles, arrangement of set up and application. Super finishing process, polishing, buffing operation and application.

06 Hours

UNIT - 8

Non-traditional machining processes: Need for non traditional machining, Principle, equipment & operation of Laser Beam, Plasma Arc Machining, Electro Chemical Machining, Ultrasonic Machining, Abrasive Jet Machining, Water Jet Machining, Electron Beam Machining, Electron Discharge Machining and Plasma Arc Machining.

06 Hours

TEXT BOOKS:

1. **Workshop Technology,** Hazara Choudhry, Vol-II, Media Promoters & Publishers Pvt. Ltd. 2004
2. **Production Technology,** R.K.Jain, Khanna Publications, 2003.
3. **Production Technology,** HMT, Tata Mc Graw Hill, 2001.

REFERENCE BOOKS:

1. **Manufacturing Science**, Amitabha Ghosh and Mallik, affiliated East West Press, 2003.
2. **Fundamentals of Metal Machining and Machine Tools,** G. Boothroyd, McGraw Hill, 2000.

DESIGN OF MACHINE ELEMENTS-I

Subject Code	**: 10ME52**	**IA Marks**	**25**
Hours/Week	**: 04**	**Exam Hours**	**03**
Total Hours	**: 52**	**Exam Marks**	**100**

PART – A

UNIT- 1

Introduction: Definitions: normal, shear, biaxial and tri axial stresses, Stress tensor, Principal Stresses. Engineering Materials and their mechanical properties, Stress-Strain diagrams, Stress Analysis, Design considerations: Codes and Standards.

05 Hours

UNIT- 2

Design For Static & Impact Strength:

Static Strength: Static loads and factor of safety, Theories of failure: Maximum normal stress theory, Maximum shear stress theory, Maximum strain theory, Strain energy theory, Distortion energy theory. Failure of brittle and ductile materials, Stress concentration, Determination of Stress concentration factor.

Impact Strength: Introduction, Impact stresses due to axial, bending and torsional loads, effect of inertia.

07 Hours

UNIT - 3

Design For Fatigue Strength: Introduction- S-N Diagram, Low cycle fatigue, High cycle fatigue, Endurance limit, Modifying factors: size effect, surface effect, Stress concentration effects, Fluctuating stresses, Goodman and Soderberg relationship, stresses due to combined loading, cumulative fatigue damage.

08 Hours

UNIT - 4

Threaded Fasteners: Stresses in threaded fasteners, Effect of initial tension, Design of threaded fasteners under static, dynamic and impact loads, Design of eccentrically loaded bolted joints.

06 Hours

PART – B

UNIT - 5

Design Of Shafts: Torsion of shafts, design for strength and rigidity with steady loading, ASME codes for power transmission shafting, shafts under fluctuating loads and combined loads.

07 Hours

UNIT - 6

Cotter And Knuckle Joints, Keys And Couplings: Design of Cotter and Knuckle joints, Keys: Types of keys, Design of keys, Couplings: Rigid and flexible couplings, Flange coupling, Bush and Pin type coupling and Oldham's coupling.

07 Hours

UNIT - 7

Riveted and Welded Joints – Types, rivet materials, failures of riveted joints, Joint Efficiency, Boiler Joints, Lozanze Joints, Riveted Brackets. Welded Joints – Types, Strength of butt and fillet welds, eccentrically loaded welded joints.

07 Hours

UNIT - 8

Power Screws: Mechanics of power screw, Stresses in power screws, efficiency and self-locking, Design of Power Screw, Design of Screw Jack: (Complete Design).

05 Hours

TEXT BOOKS:

1. **Mechanical Engineering Design,** Joseph E Shigley and Charles R. Mischke. McGraw Hill International edition, 6th Edition 2009.
2. **Design of Machine Elements,** V.B. Bhandari, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2nd Edition 2007.

DESIGN DATA HANDBOOK:

1. **Design Data Hand Book,** K. Lingaiah, McGraw Hill, 2nd Ed.
2. **Data Hand Book,** K. Mahadevan and Balaveera Reddy, CBS Publication
3. **Design Data Hand Book,** H.G. Patil, I. K. International Publisher, 2010.

REFERENCE BOOKS:

1. **Machine Design,** Robert L. Norton, Pearson Education Asia, 2001.
2. **Design of Machine Elements,** M. F. Spotts, T. E. Shoup, L. E. Hornberger, S. R. Jayram and C. V. Venkatesh, Pearson Education, 2006.
3. **Machine Design,** Hall, Holowenko, Laughlin (Schaum's Outlines series) Adapted by S.K. Somani, Tata McGraw Hill Publishing Company Ltd., New Delhi, Special Indian Edition, 2008.
4. **Fundamentals of Machine Component Design,** Robert C. Juvinall and Kurt M Marshek, Wiley India Pvt. Ltd., New Delhi, 3rd Edition, 2007.

ENERGY ENGINEERING

Subject Code	**: 10ME53**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Steam Power Plant: Different Types of Fuels used for steam generation, Equipment for burning coal in lump form, strokers, different types, Oil burners, Advantages and Disadvantages of using pulverized fuel, Equipment for preparation and burning of pulverized coal, unit system and bin system. Pulverized fuel furnaces, cyclone furnace, Coal and ash handling, Generation of steam using forced circulation, high and supercritical pressures.

07 Hours

UNIT - 2

A Brief Account Of Benson, Velox Schmidt Steam Generators. Chimneys: Natural, forced, induced and balanced draft, Calculations and numericals involving height of chimney to produce a given draft. Cooling towers and Ponds. Accessories for the Steam generators such as Superheaters, De-superheater, control of superheaters, Economizers, Air pre-heaters and re-heaters.

07 Hours

UNIT - 3

Diesel Engine Power Plant: Applications of Diesel Engines in Power field. Method of starting Diesel engines. Auxiliaries like cooling and lubrication system, filters, centrifuges, Oil heaters, intake and exhaust system, Layout of diesel power plant.

06 Hours

UNIT - 4

Hydro-Electric Plants: Hydrographs, flow duration and mass curves, unit hydrograph and numericals. Storage and pondage, pumped storage plants,

low, medium and high head plants, Penstock, water hammer, surge tanks, gates and valves. General layout of hydel power plants.

06 Hours

PART – B

UNIT - 5

Nuclear Power Plant: Principles of release of nuclear energy; Fusion and fission reactions. Nuclear fuels used in the reactors. Multiplication and thermal utilization factors. Elements of the nuclear reactor; moderator, control rod, fuel rods, coolants. Brief description of reactors of the following types-Pressurized water reactor, Boiling water reactor, Sodium graphite reactor, Fast Breeder reactor, Homogeneous graphite reactor and gas cooled reactor, Radiation hazards, Shieldings, Radio active waste disposal.

06 Hours

UNIT - 6

Solar Energy: Solar Extra terrestrial radiation and radiation at the earth surface, radiation-measuring instruments, working principles of solar flat plate collectors, solar pond and photovoltaic conversion (Numerical Examples).

Wind Energy: Properties of wind, availability of wind energy in India, wind velocity and power from wind; major problems associated with wind power, wind machines; Types of wind machines and their characteristics, horizontal and vertical axis wind mills, coefficient of performance of a wind mill rotor (Numerical Examples).

08 Hours

UNIT - 7

Tidal Power: Tides and waves as energy suppliers and their mechanics; fundamental characteristics of tidal power, harnessing tidal energy, limitations.

Ocean Thermal Energy Conversion: Principle of working, Rankine cycle, problems associated with OTEC.

Geothermal Energy Conversion: Principle of working, types of geothermal station with schematic diagram, problems associated with geothermal conversion, scope of geothermal energy.

06 Hours

UNIT - 8

Energy From Bio Mass: Photosynthesis, photosynthetic oxygen production, energy plantation.

Bio Chemical Route: Biogas production from organic wastes by anaerobic fermentation, classification of bio gas plants, factors affecting bio gas generation.

Thermo Chemical Route: Thermo chemical conversion on bio mass, types of gasifiers.

06 Hours

TEXT BOOKS:

1. **Power Plant Engineering**, P. K. Nag Tata McGraw Hill 2^{nd} edn 2001.
2. **Power Plant Engineering,** Domakundawar, Dhanpath Rai sons. 2003

REFERENCE BOOKS:

1. **Power Plant Engineering,** R. K. Rajput, Laxmi publication, New Delhi.
2. **Principles of Energy conversion**, A. W. Culp Jr., McGraw Hill. 1996
3. **Non conventional Energy sources**, G D Rai Khanna Publishers.
4. **Non conventional resources,** B H Khan TMH - 2007

1.

MANUFACTURING PROCESS – III

(METAL FORMING PROCESS)

Subject Code	**: 10ME55**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Introduction And Concepts: Classification of metal working processes, characteristics of wrought products, advantages and limitations of metal working processes.Concepts of true stress, true strain, triaxial & biaxial

stresses. Determination of flow stress. Principal stresses, Tresca & Von-Mises yield criteria, concepts of plane stress & plane strain.

06 Hours

UNIT - 2

Effects Of Parameters: Temperature, strain rate, friction and lubrication, hydrostatic pressure in metalworking, Deformation zone geometry, workability of materials, Residual stresses in wrought products.

06 Hours

UNIT - 3

Forging: Classification of forging processes. Forging machines & equipment. Expressions for forging pressures & load in open die forging and closed die forging by slab analysis, concepts of friction hill and factors affecting it. Die-design parameters. Material flow lines in forging. Forging defects, Residual stresses in forging. Simple problems.

07 Hours

UNIT - 4

Rolling: Classification of Rolling processes. Types of rolling mills, expression for RoIling load. Roll separating force. Frictional losses in bearing, power required in rolling, Effects of front & back tensions, friction, friction hill. Maximum possible reduction. Defects in rolled products. Rolling variables, simple problems.

06 Hours

PART - B

UNIT - 5

Drawing: Drawing equipment & dies, expression for drawing load by slab analysis, power requirement. Redundant work and its estimation, optimal cone angle & dead zone formation, drawing variables, Tube drawing, classification of tube drawing, simple problems.

07 Hours

UNIT - 6

Extrusion: Types of extrusion processes, extrusion equipment & dies, deformation, lubrication & defects in extrusion. Extrusion dies, Extrusion of seamless tubes. Extrusion variables, simple problem

06 Hours

UNIT - 7

Sheet & Metal Forming: Forming methods, dies & punches, progressive die, compound die, combination die. Rubber forming. Open back inclinable press (OBI press), piercing, blanking, bending, deep drawing, LDR in drawing, Forming limit criterion, defects of drawn products, stretch forming. Roll bending & contouring, Simple problems

06 Hours

UNIT - 8

High Energy Rate Forming Methods: Principles, advantages and applications, explosive forming, electro hydraulic forming, Electromagnetic forming.

Powder Metallurgy: Basic steps in Powder metallurgy brief description of methods of production of metal powders, conditioning and blending powders, compaction and sintering application of powder metallurgy components, advantages and limitations.

07 Hours

TEXT BOOKS:

1. **Mechanical metallurgy (SI units),** G.E. Dieter, Mc Graw Hill pub.2001
2. **Manufacturing Process – III,** Dr. K.Radhakrishna, Sapna Book House, 2009.

REFERENCE BOOKS:

1. **Materials and Processes in Manufacturing,** E.paul, Degramo, J.T. Black, Ronald, A.K. Prentice -hall of India 2002
2. **Principles of Industrial metal working process,** G.W. Rowe, CBSpub. 2002
3. **Manufacturing Science,** Amitabha Ghosh & A.K. Malik - East - Westpress 2001
4. **Technology of Metal Forming Process**, Surendra kumar, PHI – 2008

FLUID MECHANICS AND MACHINES LABORATORY

Subject Code	**: 10MEL57**	**IA Marks**	**: 25**
Hours/Week	**: 03**	**Exam Hours**	**: 03**
Total Hours	**: 42**	**Exam Marks**	**: 50**

PART - A

1. Determination of coefficient of friction of flow in a pipe.

2. Determination of minor losses in flow through pipes.

3. Determination of force developed by impact of jets on vanes.

4. Calibration of flow measuring devices

a. Orifice Plate meter
b. Nozzle
c. Venturimeter
d. V-notch

18 Hours

PART - B

5. Performance testing of Turbines
   a. Pelton wheel
   b. Francis Turbine
   c. Kaplan Turbines

6. Performance testing of Pumps
   a. Single stage / Multi stage centrifugal pumps
   b. Reciprocating pump

7. Performance test of a two stage Reciprocating Air Compressor

8. Performance test on an Air Blower

24 Hours

Scheme for Examination:

One Question from Part A	-	15 Marks (05 Writeup + 10)
One Question from Part B	-	25 Marks (05 Writeup + 20)
Viva-Voce	-	10 Marks

	Total	**50 Marks**

ENERGY CONVERSION ENGINEERING LABORATORY

Subject Code	**: 10MEL58**	**IA Marks**	**: 25**
Hours/Week	**: 03**	**Exam Hours**	**: 03**
Total Hours	**: 42**	**Exam Marks**	**: 50**

PART - A

1. Determination of Flash point and Fire point of lubricating oil using Abel Pensky and Marten's (closed) / Cleavland's (Open Cup) Apparatus.

2. Determination of Calorific value of solid, liquid and gaseous fuels.

3. Determination of Viscosity of a lubricating oil using Redwoods, Saybolt and Torsion Viscometers.

4. Valve Timing/port opening diagram of an I.C. engine (4 stroke/2 stroke).

5. Use of planimeter

21 Hours

PART - B

1. Performance Tests on I.C. Engines, Calculations of IP, BP, Thermal efficiencies, Volumetric efficiency, Mechanical efficiency, SFC, FP, A:F Ratio heat balance sheet for

   (a) Four stroke Diesel Engine

   (b) Four stroke Petrol Engine

   (c) Multi Cylinder Diesel/Petrol Engine, (Morse test)

   (d) Two stroke Petrol Engine

   (e) Variable Compression Ratio I.C. Engine.

21 Hours

<u>Scheme for Examination:</u>

One Question from Part A	-	15 Marks (05 Writeup+10)
One Question from Part B	-	25 Marks (05 Writeup+20)
Viva-Voce	-	10 Marks

Total		**50 Marks**

COMPUTER INTEGRATED MANUFACTURING

Subject Code	**: 10ME61**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART-A

UNIT - 1

Computer Integrated Manufacturing Systems: Introduction, Automation definition, Types of automation, CIM, processing in manufacturing, Production concepts, Mathematical Models-Manufacturing lead time, production rate, components of operation time, capacity, Utilization and availability, Work-in-process, WIP ratio, TIP ratio, Problems using mathematical model equations.

8 Hours

UNIT - 2

High Volume Production System: Introduction Automated flow line-symbols, objectives, Work part transport-continuous, Intermittent, synchronous, Pallet fixtures, Transfer Mechanism-Linear-Walking beam,. roller chain drive, Rotary-rack and pinion, Rachet & Pawl, Geneva wheel, Buffer storage, control functions-sequence, safety, Quality, Automation for machining operation.

6 Hours

UNIT - 3

Analysis Of Automated Flow Line & Line Balancing: General terminology and analysis, Analysis of Tranfer Line without storage upper bound approach, lower bound approach and problems, Analysis of Transfer lines with storage buffer, Effect of storage, buffer capacity with simple problem, Partial automation-with numerical problems, flow lines with more than two stages, Manual Assembly lines, line balancing problem.

6 Hours

UNIT - 4

Minimum Rational Work Element: Work station process time, Cycle time, precedence constraints. Precedence diagram, Balance delay methods of line balancing-largest Candidate rule, Kilbridge and Westers method, Ranked positional weight method, Numerical problems covering all above methods and computerized line balancing.

6 Hours

PART-B

UNIT - 5

Automated Assembly Systems: Design for automated assembly systems, types of automated assembly system, Parts feeding devices-elements of parts delivery system-hopper, part feeder, Selectors, feed back, escapement and placement analysis of Multistation Assembly Machine analysis of single station assembly. **Automated Guided Vehicle System:** Introduction, Vehicle guidance and routing, System management, Quantitative analysis of AGV's with numerical problems and application.

8 Hours

UNIT - 6

Computerized Manufacturing Planning System: Introduction, Computer Aided Process Planning, Retrieval types of process planning, Generative type of process planning, Material requirement planning, Fundamental concepts of MRP inputs to MRP, Capacity planning.

6 Hours

UNIT - 7

Cnc Machining Centers: Introduction to CNC, elements of CNC, CNC machining centers, part programming, fundamental steps involved in development of part programming for milling and turning.

6 Hours

UNIT - 8

Robotics: Introduction to Robot configuration, Robot motion, programming of Robots end effectors, Robot sensors and Robot applications.

6 Hours

TEXT BOOKS:

2. **Automation, Production system & Computer Integrated manufacturing,** M. P. Groover Person India, 2007 2nd edition.
3. **Principles of Computer Integrated Manufacturing**, S. Kant Vajpayee, Prentice Hall India.

REFERENCE BOOKS:

1. **Computer Integrated Manufacturing**, J. A. Rehg & Henry. W. Kraebber.
2. **CADlCAM** by Zeid, Tata McGraw Hill.

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DESIGN OF MACHINE ELEMENTS – II

Subject Code	**: 10ME62**	**IA Marks**	**25**
Hours/Week	**: 04**	**Exam Hours**	**03**
Total Hours	**: 52**	**Exam Marks**	**100**

PART – A

UNIT - 1

Curved Beams: Stresses in curved beams of standard cross sections used in crane hook, punching presses & clamps, closed rings and links

Cylinders & Cylinder Heads: Review of Lame's Equations; compound cylinders, stresses due to different types of fits, cylinder heads, flats.

08 Hours

UNIT - 2

Belts Ropes and Chains: Flat belts: Length & cross section, Selection of V-belts, ropes and chains for different applications.

05 Hours

UNIT - 3

Springs: Types of springs - stresses in Helical coil springs of circular and non-circular cross sections. Tension and compression springs, springs under fluctuating loads, Leaf Springs: Stresses in leaf springs.

Equalized stresses, Energy stored in springs, Torsion, Belleville and Rubber springs.

08 Hours

UNIT - 4

Spur & Helical Gears: Spur Gears: Definitions, stresses in gear tooth: Lewis equation and form factor, Design for strength, Dynamic load and wear load. Helical Gears: Definitions, formative number of teeth, Design based on strength, dynamic and wear loads.

07 Hours

PART – B

UNIT - 5

Bevel and Worm Gears: Bevel Gears: Definitions, formative number of teeth, Design based on strength, dynamic and wear loads. Worm Gears: Definitions, Design based on strength, dynamic, wear loads and efficiency of worm gear drives.

07 Hours

UNIT - 6

Clutches & Brakes: Design of Clutches: Single plate, multi plate and cone clutches. Design of Brakes: Block and Band brakes: Self locking of brakes: Heat generation in Brakes.

05 Hours

UNIT - 7

Lubrication and Bearings: Lubricants and their properties, Mechanisms of Lubrication bearing modulus, coefficient of friction, minimum oil film thickness, Heat Generated, Heat dissipated, Bearing Materials, Examples of journal bearing and thrust bearing design.

07 Hours

UNIT - 8

IC Engine Parts: Design of piston, connecting rod and crank shaft.

05 Hours

DESIGN DATA HANDBOOK:

1. **Design Data Hand Book** , K. Lingaiah, McGraw Hill, 2nd Ed.
2. **Data Hand Book,** K. Mahadevan and Balaveera Reddy, CBS Publication
3. **Design Data Hand Book,** H.G. Patil, I. K. International Publisher, 2010.

TEXT BOOKS:

1. **Mechanical Engineering Design,** Joseph E Shigley and Charles R. Mischke. McGraw Hill International edition, 6th Edition 2003.
2. **Design of Machine Elements,** V. B Bhandari, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2nd Edition 2007

REFERNCE BOOKS:

1. **Machine Design,** Robert L. Norton, Pearson Education Asia, 2001.
2. **Design of Machine Elements,** M. F. Spotts, T. E. Shoup, L. E. Hornberger, S. R. Jayram and C. V. Venkatesh, Pearson Education, 2006.
3. **Machine Design,** Hall, Holowenko, Laughlin (Schaum's Outlines series) Adapted by S.K. Somani, Tata McGraw Hill Publishing Company Ltd., New Delhi, Special Indian Edition, 2008.
4. **Machine Design,** A CAD Approach: Andrew D DIMAROGONAS, John Wiley Sons, Inc, 2001.

HEAT AND MASS TRANSFER

Subject Code	**: 10ME63**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Introductory Concepts And Definitions: Modes of heat transfer: Basic laws governing conduction, convection, and radiation heat transfer; Thermal conductivity; convective heat transfer coefficient; radiation heat transfer;

combined heat transfer mechanism. Boundary conditions of 1st, 2nd and 3rd kind

Conduction: Derivation of general three dimensional conduction equation in Cartesian coordinate, special cases, discussion on 3-D conduction in cylindrical and spherical coordinate systems (No derivation). One dimensional conduction equations in rectangular, cylindrical and spherical coordinates for plane and composite walls. Overall heat transfer coefficient. Thermal contact resistance.

07 Hours

UNIT - 2

Variable Thermal Conductivity: Derivation for heat flow and temperature distribution in plane wall. Critical thickness of insulation without heat generation, Thermal resistance concept & its importance. Heat transfer in extended surfaces of uniform cross-section without heat generation, Long fin, short fin with insulated tip and without insulated tip and fin connected between two heat sources. Fin efficiency and effectiveness. Numerical problems.

06 Hours

UNIT - 3

One-Dimensional Transient Conduction: Conduction in solids with negligible internal temperature gradient (Lumped system analysis), Use of Transient temperature charts (Heisler's charts) for transient conduction in slab, long cylinder and sphere; use of transient temperature charts for transient conduction in semi-infinite solids. Numerical Problems.

06 Hours

UNIT - 4

Concepts And Basic Relations In Boundary Layers: Flow over a body velocity boundary layer; critical Reynolds number; general expressions for drag coefficient and drag force; thermal boundary layer; general expression for local heat transfer coefficient; Average heat transfer coefficient; Nusselt number. Flow inside a duct- velocity boundary layer, hydrodynamic entrance length and hydro dynamically developed flow; flow through tubes (internal flow discussion only). Numericals based on empirical relation given in data handbook.

Free Or Natural Convection: Application of dimensional analysis for free convection- physical significance of Grashoff number; use of correlations of free convection in vertical, horizontal and inclined flat plates, vertical and horizontal cylinders and spheres, Numerical problems.

07 Hours

PART – B

UNIT - 5

Forced Convections: Applications of dimensional analysis for forced convection. Physical significance of Reynolds, Prandtl, Nusselt and Stanton numbers. Use of various correlations for hydro dynamically and thermally developed flows inside a duct, use of correlations for flow over a flat plate, over a cylinder and sphere. Numerical problems.

06 Hours

UNIT - 6

Heat Exchangers: Classification of heat exchangers; overall heat transfer coefficient, fouling and fouling factor; LMTD, Effectiveness-NTU methods of analysis of heat exchangers. Numerical problems.

06 Hours

UNIT - 7

Condensation And Boiling: Types of condensation (discussion only) Nusselt's theory for laminar condensation on a vertical flat surface; use of correlations for condensation on vertical flat surfaces, horizontal tube and horizontal tube banks; Reynolds number for condensate flow; regimes of pool boiling, pool boiling correlations. Numerical problems. Mass transfer definition and terms used in mass transfer analysis, Ficks First law of diffusion (no numericals).

07 Hours

UNIT - 8

Radiation Heat Transfer: Thermal radiation; definitions of various terms used in radiation heat transfer; Stefan-Boltzman law, Kirchoff's law, Planck's law and Wein's displacement law. Radiation heat exchange between two parallel infinite black surfaces, between two parallel infinite gray surfaces; effect of radiation shield; intensity of radiation and solid angle;

Lambert's law; radiation heat exchange between two finite surfaces-configuration factor or view factor. Numerical problems.

07 Hours

TEXT BOOKS:

1. **Heat & Mass transfer,** Tirumaleshwar, Pearson education 2006
2. **Heat transfer-A basic approach,** Ozisik, Tata McGraw Hill 2002

REFERENCE BOOKS:

1. **Heat transfer, a practical approach,** Yunus A- Cengel Tata Mc Graw Hill
2. **Principles of heat transfer,** Kreith Thomas Learning 2001
3. **Fundamentals of heat and mass transfer,** Frenk P. Incropera and David P. Dewitt, John Wiley and son's.
4. **Heat transfer,** P.K. Nag, Tata McGraw Hill 2002.

FINITE ELEMENT METHODS

Subject Code	**: 10ME64**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART-A

UNIT-1

Introduction: Equilibrium equations in elasticity subjected to body force, traction forces, and stress-strain relations for plane stress and plane strains. General description of Finite Element Method, Application and limitations. Types of elements based on geometry. Node numbering, Half band width.

07 Hours

UNIT-2

Basic Procedure: Euler - Lagrange equation for bar, beam (cantilever / simply supported fixed) Principle of virtual work, principle of minimum potential energy, Raleigh's Ritz method. Direct approach for stiffness matrix formulation of bar element. Galerkin's method.

07 Hours

UNIT-3

Interpolation Models: Interpolation polynomials- Linear, quadratic and cubic. Simplex complex and multiplex elements. 2D PASCAL's triangle. CST elements-Shape functions and Nodal load vector, Strain displacement matrix and Jacobian for triangular and rectangular element.

07 Hours

UNIT-4

Solution of 1-D Bars: Solutions of bars and stepped bars for displacements, reactions and stresses by using penalty approach and elimination approach. Guass-elimination technique.

06 Hours

PART-B

UNIT-5

Higher Order Elements: Langrange's interpolation, Higher order one dimensional elements-Quadratic and cubic element and their shape functions. Shape function of 2-D quadrilateral element-linear, quadric element Iso-parametric, Sub parametric and Super parametric elements. numerical integration : 1, 2 and 3 gauge point for 1D and 2D cases.

06 Hours

UNIT-6

Trusses: Stiffness matrix of Truss element. Numerical problems.

06 Hours

UNIT-7

Beams: Hermite shape functions for beam element, Derivation of stiffness matrix. Numerical problems of beams carrying concentrated, UDL and linearly varying loads.

06 Hours

UNIT-8

Heat Transfer: Steady state heat transfer, 1D heat conduction governing equations. Functional approach for heat conduction. Galerkin's approach for heat conduction. 1D heat transfer in thin fins.

07 Hours

TEXT BOOKS:

1. **Finite Elements in Engineering**, T.R.Chandrupatla, A.D Belegunde, 3rd Ed PHI.
2. **Finite Element Method in Engineering**, S.S. Rao, 4th Edition, Elsevier, 2006.

REFERENCE BOOKS:

1. **"Finite Element Methods for Engineers"** U.S. Dixit, Cengage Learning, 2009
2. **Concepts and applications of Finite Element Analysis**, R.D. Cook D.S Maltus, M.E Plesha, R.J.Witt, Wiley 4th Ed, 2009
3. **Finite Element Methods**, Daryl. L. Logon, Thomson Learning 3rd edition, 2001.
4. **Finite Element Method**, J.N.Reddy, McGraw -Hill International Edition.

MECHATRONICS & MICROPROCESSOR

Subject Code	**: 10ME65**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART - A

UNIT - 1

Introduction to Mechatronic Systems: Measurement and control systems Their elements and functions, Microprocessor based controllers.

06 Hours

UNIT - 2

Review of Transducers and Sensors: Definition and classification of transducers. Definition and classification of sensors. Principle of working and applications of light sensors, proximity sensors and Hall effect sensors.

07 Hours

UNIT - 3

Electrical Actuation Systems: Electrical systems, Mechanical switches, solid-state switches, solenoids, DC & AC motors, Stepper motors and their merits and demerits.

06 Hours

UNIT - 4

Signal Conditioning: Introduction to signal conditioning. The operational amplifier, Protection, Filtering, Wheatstone bridge, Digital signals Multiplexers, Data acquisition, Introduction to Digital system. Processing Pulse-modulation.

07 Hours

PART – B

UNIT - 5

Introduction to Microprocessors: Evolution of Microprocessor, Organization of Microprocessors (Preliminary concepts), basic concepts of programming of microprocessors.

Review of concepts - Boolean algebra, Logic Gates and Gate Networks, Binary & Decimal number systems, memory representation of positive and negative integers, maximum and minimum integers. Conversion of real, numbers, floating point notation, representation of floating point numbers, accuracy and range in floating point representation, overflow and underflow, addition of floating point numbers, character representation.

07 Hours

UNIT - 6

Logic Function: Data word representation. Basic elements of control systems 8085A processor architecture terminology such as CPU, memory and address, ALU, assembler data registers, Fetch cycle, write cycle, state, bus, interrupts. Micro Controllers. Difference between microprocessor and micro controllers. Requirements for control and their implementation in microcontrollers. Classification of micro controllers.

07 Hours

UNIT - 7

Organization & Programming of Microprocessors: Introduction to organization of INTEL 8085-Data and Address buses, Instruction set of 8085, programming the 8085, assembly language programming.

06 Hours

UNIT - 8

Central Processing Unit of Microprocessors: Introduction, timing and control unit basic concepts, Instruction and data flow, system timing, examples of INTEL 8085 and INTEL 4004 register organization.

06 Hours

TEXT BOOKS:

1. **Mechatronics,** W.Bolton, Longman, 2Ed, Pearson Publications, 2007.
2. **Microprocessor Architecture, Programming And Applications With 8085/8085A,** R.S. Ganokar, Wiley Eastern.

REFERENCE BOOKS:

1. **Mechatronics and Microprocessors,** K.P.Ramchandran, G.K.Vijayraghavan, M.S.Balasundran, Wiley, 1st Ed, 2009
2. **Mechatronics - Principles, Concepts and applications** – Nitaigour and Premchand Mahilik **-** Tata McGraw Hill**-** 2003.
3. **Mechatronics Principles & applications**, Godfrey C. Onwubolu, Elsevier..
4. **Introduction Mechatronics & Measurement systems**, David.G. Aliciatore & Michael. B. Bihistaned, Tata McGraw Hill, 2000.

HEAT & MASS TRANSFER LABORATORY

Subject Code	**: 10MEL67**	**IA Marks**	**: 25**
Hours/Week	**: 03**	**Exam Hours**	**: 03**
Total Hours	**: 42**	**Exam Marks**	**: 50**

PART - A

1. Determination of Thermal Conductivity of a Metal Rod.
2. Determination of Overall Heat Transfer Coefficient of a Composite wall.
3. Determination of Effectiveness on a Metallic fin.
4. Determination of Heat Transfer Coefficient in a free Convection on a vertical tube.

5. Determination of Heat Transfer Coefficient in a Forced Convention Flow through a Pipe.
6. Determination of Emissivity of a Surface.

21 Hours

PART – B

1. Determination of Steffan Boltzman Constant.
2. Determination of LMDT and Effectiveness in a Parallel Flow and Counter Flow Heat Exchangers
3. Experiments on Boiling of Liquid and Condensation of Vapour
4. Performance Test on a Vapour Compression Refrigeration.
5. Performance Test on a Vapour Compression Air - Conditioner
6. Experiment on Transient Conduction Heat Transfer

21 Hours

<u>Scheme for Examination:</u>

One Question from Part A	-	20 Marks (05 Write up +15)
One Question from Part B	-	20 Marks (05 Write up +15)
Viva-Voce	-	10 Marks

Total		**50 Marks**

COMPUTER AIDED MODELING AND ANALYSIS LABORATORY

Subject Code	**: 10MEL68**	**IA Marks**	**: 25**
Hours/Week	**: 03**	**Exam Hours**	**: 03**
Total Hours	**: 42**	**Exam Marks**	**: 50**

PART - A

Study of a FEA package and modeling stress analysis of

a. Bars of constant cross section area, tapered cross section area and stepped bar

6 Hours

b. Trusses – (Minimum 2 exercises)

3 Hours

c. Beams – Simply supported, cantilever, beams with UDL, beams with varying load etc (Minimum 6 exercises)

12 Hours

PART - B

a) Stress analysis of a rectangular plate with a circular hole

3 Hours

b) Thermal Analysis – 1D & 2D problem with conduction and convection boundary conditions(Minimum 4 exercises)

9 Hours

c) Dynamic Analysis
   1) Fixed – fixed beam for natural frequency determination
   2) Bar subjected to forcing function
   3) Fixed – fixed beam subjected to forcing function

9 Hours

REFERENCE BOOKS:

1. **A first course in the Finite element method,** Daryl L Logan, Thomason, Third Edition
2. **Fundaments of FEM,** Hutton – McGraw Hill, 2004
3. **Finite Element Analysis,** George R. Buchanan, Schaum Series

Scheme for Examination:

One Question from Part A	-	20 Marks (05 Write up +15)
One Question from Part B	-	20 Marks (05 Write up +15)
Viva-Voce	-	10 Marks

Total		**50 Marks**

HYDRAULICS AND PNEUMATICS

Subject Code	**: 10ME73**	**IA Marks**	**25**
Hours/Week	**: 04**	**Exam Hours**	**03**
Total Hours	**: 52**	**Exam Marks**	**100**

PART – A

UNIT -1

Introduction to Hydraulic Power: Definition of hydraulic system, advantages, limitations, applications, Pascal's law, structure of hydraulic control system, problems on Pascal's law.

The source of Hydraulic Power: Pumps Classification of pumps, Pumping theory of positive displacement pumps, construction and working of Gear pumps, Vane pumps, Piston pumps, fixed and variable displacement pumps, Pump performance characteristics, pump Selection factors, problems on pumps.

07 Hours

UNIT -2

Hydraulic Actuators and Motors: Classification cylinder and hydraulic motors, Linear Hydraulic Actuators [cylinders], single and double acting cylinder, Mechanics of Hydraulic Cylinder Loading, mounting arrangements, cushioning, special types of cylinders, problems on cylinders, construction and working of rotary actuators such as gear, vane, piston motors, Hydraulic Motor Theoretical Torque, Power and Flow Rate, Hydraulic Motor

Performance, problems, symbolic representation of hydraulic actuators (cylinders and motors).

06 Hours

UNIT - 3

Control Components in Hydraulic Systems: Classification of control valves, Directional Control Valves- Symbolic representation, constructional features of poppet, sliding spool, rotary type valves solenoid and pilot operated DCV, shuttle valve, check valves, Pressure control valves - types, direct operated types and pilot operated types. Flow Control Valves - compensated and non-compensated FCV, needle valve, temperature compensated, pressure compensated, pressure and temperature compensated FCV, symbolic representation.

07 Hours

UNIT - 4

Hydraulic Circuit Design And Analysis: Control of Single and Double - Acting Hydraulic Cylinder, Regenerative circuit, Pump Unloading Circuit, Double Pump Hydraulic System, Counter balance Valve Application, Hydraulic Cylinder Sequencing Circuits, Automatic cylinder reciprocating system, Locked Cylinder using Pilot check Valve, Cylinder synchronizing circuit using different methods, factors affecting synchronization, Hydraulic circuit for force multiplication, Speed Control of Hydraulic Cylinder, Speed Control of Hydraulic Motors, Safety circuit, Accumulators, types, construction and applications with circuits.

06 Hours

PART – B

UNIT - 5

Maintenance of Hydraulic System: Hydraulic Oils - Desirable properties, general type of Fluids, Sealing Devices, Reservoir System, Filters and Strainers, wear of Moving Parts due to solid -particle Contamination, temperature control (heat exchangers), Pressure switches, trouble shooting.

06 Hours

UNIT - 6

Introduction to Pneumatic Control: Definition of pneumatic system, advantages, limitations, applications, Choice of working medium. Characteristic of compressed air. Structure of Pneumatic control System, fluid conditioners and FRL unit.

Pneumatic Actuators: Linear cylinder - Types, Conventional type of cylinder- working, End position cushioning, seals, mounting arrangements- Applications. Rod - Less cylinders types, working, advantages, Rotary cylinders- types construction and application, symbols.

07 Hours

UNIT-7

Pneumatic Control Valves: DCV such as poppet, spool, suspended seat type slide valve, pressure control valves, flow control valves, types and construction, use of memory valve, Quick exhaust valve, time delay valve, shuttle valve, twin pressure valve, symbols. Simple Pneumatic Control: Direct and indirect actuation pneumatic cylinders, speed control of cylinders - supply air throttling and Exhaust air throttling and Exhaust air throttling.

Signal Processing Elements: Use of Logic gates - OR and AND gates in pneumatic applications. Practical Examples involving the use of logic gates, Pressure dependant controls- types - construction - practical applications, Time dependent controls principle. Construction, practical applications.

07 Hours

UNIT-8

Multi- Cylinder Application: Coordinated and sequential motion control, Motion and control diagrams. Signal elimination methods, Cascading method- principle, Practical application examples (up to two cylinders) using cascading method (using reversing valves).

Electro- Pneumatic Control: Principles - signal input and out put, pilot assisted solenoid control of directional control valves, Use of relay and contactors. Control circuitry for simple signal cylinder application.

Compressed Air: Production of compressed air- Compressors Preparation of compressed air-Driers, Filters, Regulators, Lubricators, Distribution of compressed air Piping layout.

06 Hours

TEXT BOOKS:

1. **“Fluid Power with Applications”,** Anthony Esposito**,** Sixth edition, Pearson Education, Inc, 2000.
2. **'Pneumatics and Hydraulics',** Andrew Parr, Jaico Publishing Co

REFERENCE BOOKS:

1. **'Oil Hydraulic systems', Principles and Maintenance** S. R. Majurr, Tata McGraw Hill Publishing Company Ltd. - 2001
2. **'Industrial Hydraulics', Pippenger, Hicks"** McGraw Hill, New York
3. **'Hydraulic & Pneumatic Power for Production'**, Harry L. Stewart
4. **'Pneumatic Systems',** S. R. Majumdar, Tata McGraw Hill Publish 1995
5. **Power Hydraulics'** Michael J Pinches & John G Ashby, Prentice Hall

OPERATION RESEARCH

Subject Code	**: 10ME74**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART- A

UNIT -1

Introduction: Evolution of OR, definition of OR, scope of OR, application areas of OR, steps (phases) in OR study, characteristics and limitations of OR, models used in OR, linear programming (LP) problem-formulation and solution by graphical method.

04 Hours

UNIT -2

Solution Of Linear Programming Problems: The simplex method-canonical and standard form of an LP problem, slack, surplus and artificial variables, big M method and concept of duality, dual simplex method.

08 Hours

UNIT -3

Transportation Problem: Formulation of transportation problem, types, initial basic feasible solution using different methods, optimal solution by MODI method, degeneracy in transportation problems, application of transportation problem concept for maximization cases. Assignment Problem-formulation, types, application to maximization cases and travelling salesman problem.

08 Hours

UNIT -4

Integer Programming: Pure and mixed integer programming problems, solution of Integer programming problems-Gomory's all integer cutting plane method and mixed integer method, branch and bound method, Zero-One programming.

06 Hours

PART- B

UNIT -5

Pert-CPM Techniques: Introduction, network construction **-** rules, Fulkerson's rule for numbering the events, AON and AOA diagrams; Critical path method to find the expected completion time of a project, floats; PERT for finding expected duration of an activity and project, determining the probability of completing a project, predicting the completion time of project; crashing of simple projects.

08 Hours

UNIT -6

Queuing Theory: Queuing systems and their characteristics, Pure-birth and Pure-death models (only equations), empirical queuing models – M/M/1 and M/M/C models and their steady state performance analysis.

06 Hours

UNIT -7

Game Theory: Formulation of games, types, solution of games with saddle point, graphical method of solving mixed strategy games, dominance rule for solving mixed strategy games.

06 Hours

UNIT -8

Sequencing: Basic assumptions, sequencing 'n' jobs on single machine using priority rules, sequencing using Johnson's rule-'n' jobs on 2 machines, 'n' jobs on 3 machines, 'n' jobs on 'm' machines. Sequencing 2 jobs on 'm' machines using graphical method.

06 Hours

TEXT BOOKS:

1. **Operations Research,** P K Gupta and D S Hira, Chand Publications, New Delhi - 2007
2. **Operations Research,** Taha H A, Pearson Education

REFERNCE BOOKS:

1. **Operations Research,** A P Verma, S K Kataria &Sons, 2008
2. **Operations Research,** Paneerselvan, PHI
3. **Operations Research,** A M Natarajan, P Balasubramani, Pearson Education, 2005
4. **Introduction to Operations Research,** Hillier and Liberman,8^{th} Ed., McGraw Hill
5. **Operations Research** S.D. Sharma, Ledarnath Ramanath & Co, 2002

NON-CONVENTIONAL ENERGY SOURCES

Subject Code	**: 10ME754**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART A

UNIT – 1

Introduction : Energy source, India's production and reserves of commercial energy sources, need for non-conventional energy sources, energy alternatives, solar, thermal, photovoltaic. Water power, wind bio-mass, ocean temperature difference, tidal and waves, geothermal, tarsands and oil shale, nuclear (Brief descriptions); advantages and disadvantages, comparison (Qualitative and Quantitative).

6 Hours

UNIT – 2

Solar Radiation : Extra-Terrestrial radiation, spectral distribution of extra terrestrial radiation, solar constant, solar radiation at the earth's surface, beam, diffuse and global radiation, solar radiation data.

Measurement of Solar Radiation : Pyrometer, shading ring pyrheliometer, sunshine recorder, schematic diagrams and principle of working.

Solar Radiation Geometry : Flux on a plane surface, latitude, declination angle, surface azimuth angle, hour angle, zenith angle, solar altitude angle expression for the angle between the incident beam and the normal to a plane surface (No derivation) local apparent time. Apparent motion of sum, day length, numerical examples.

9 Hours

UNIT – 3

Radiation Flux on a Tilted Surface : Beam, diffuse and reflected radiation, expression for flux on a tilted surface (no derivations) numerical examples.

Solar Thermal Conversion : Collection and storage, thermal collection devices, liquid flat plate collectors, solar air heaters concentrating collectors (cylindrical, parabolic, paraboloid) (Quantitative analysis); sensible heat storage, latent heat storage, application of solar energy water heating. Space heating and cooling, active and passive systems, power generation, refrigeration. Distillation (Qualitative analysis) solar pond, principle of working, operational problems.

9 Hours

UNIT – 4

Performance Analysis of Liquid Flat Plate Collectors : General description, collector geometry, selective surface (qualitative discussion) basic energy-balance equation, stagnation temperature, transmissivity of the cover system, transmissivity – absorptivity product, numerical examples. The overall loss coefficient, correlation for the top loss coefficient, bottom and side loss coefficient, problems (all correlations to be provided). Temperature distribution between the collector tubes, collector heat removal factor, collector efficiency factor and collector flow factor, mean plate temperature, instantaneous efficiency (all expressions to be provided). Effect of various parameters on the collector performance; collector orientation, selective surface, fluid inlet temperature, number covers, dust.

4 Hours

PART B

UNIT – 5

Photovoltaic Conversion : Description, principle of working and characteristics, applications.

Wind Energy : Properties of wind, availability of wind energy in India, wind velocity and power from wind; major problems associated with wind power, wind machines; Types of wind machines and their characteristics, horizontal and vertical axis wind mills, elementary design principles; coefficient of performance of a wind mill rotor, aerodynamic considerations of wind mill design, numerical examples.

8 Hours

UNIT – 6

Tidal Power : Tides and waves as energy suppliers and their mechanics; fundamental characteristics of tidal power, harnessing tidal energy, limitations.

Ocean Thermal Energy Conversion : Principle of working, Rankine cycle, OTEC power stations in the world, problems associated with OTEC.

Geothermal Energy Conversion : Principle of working, types of geothermal station with schematic diagram, geothermal plants in the world, problems associated with geothermal conversion, scope of geothermal energy.

7 Hours

UNIT – 7

Energy from Bio Mass : Photosynthesis, photosynthetic oxygen production, energy plantation, bio gas production from organic wastes by anaerobic fermentation, description of bio-gas plants, transportation of bio-gas, problems involved with bio-gas production, application of bio-gas, application of bio-gas in engines, advantages.

4 Hours

UNIT – 8

Hydrogen Energy : Properties of Hydrogen with respected to its utilization as a renewable form of energy, sources of hydrogen, production of hydrogen, electrolysis of water, thermal decomposition of water, thermo chemical production bio-chemical production.

Storage & Transportation Methods : Gaseous, cryogenic and metal hydrides, application of hydrogen, domestic and industrial safe burning of hydrogen.

5 Hours

TEXT BOOKS:

1. Non-Conventional Energy Sources by *G.D Rai K*, Khanna Publishers, 2003.
2. Solar energy, by *Subhas P Sukhatme* – Tata McGraw Hill, 2^{nd} Edition, 1996.

REFERENCE BOOKS:

1. Renewable Energy Sources and Conversion Technology by *N.K.Bansal, Manfred Kleeman & Mechael Meliss*, Tata McGraw Hill, 2001.
2. Renewable Energy Resources, *John W.Twidell Anthony D. Weir El*, BG 2001.
3. Solar Power Engineering, *P.K.Nag*, Tata McGraw Hill, 2003.

CONTROL ENGINEERING

Subject Code	**: 10ME82**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Introduction: Concept of automatic controls, Open loop and closed loop systems, Concepts of feedback, requirements of an ideal control system, Types of controllers- Proportional, Integral Proportional Integral, Proportional Integral Differential controllers.

06 Hours

UNIT- 2

Mathematical Models: Transfer function models, models of mechanical systems, models of electrical circuits, DC and AC motors in control systems, models of thermal systems, models of hydraulic systems, pneumatic system, Analogous systems: Force voltage, Force current.

06 Hours

UNIT - 3

Block Diagrams and Signal Flow Graphs: Transfer Functions definition, function, block representation of systems elements, reduction of block diagrams, Signal flow graphs: Mason’s gain formula.

07 **Hours**

UNIT- 4

Transient and Steady State Response Analysis: Introduction, first order and second order system response to step, ramp and impulse inputs, concepts of time constant and its importance in speed of response. System stability: Routh's-Hurwitz Criterion.

06 Hours

PART - B

UNIT - 5

Frequency Response Analysis: Polar plots, Nyquist stability criterion, Stability analysis, Relative stability concepts, Gain margin and phase margin, M&N circles.

06 Hours

UNIT - 6

Frequency Response Analysis Using Bode Plots: Bode attenuation diagrams, Stability analysis using Bode plots, Simplified Bode Diagrams.

07 Hours

UNIT - 7

Root Locus Plots: Definition of root loci, General rules for constructing root loci, Analysis using root locus plots.

06 Hours

UNIT 8

System Compensation and State Variable Characteristics of Linear Systems: Series and feedback compensation, Introduction to state concepts, state equation of linear continuous data system. Matrix representation of state equations, controllability and observability, Kalman and Gilberts test.

07 Hours

TEXT BOOKS :

1. **Modern Control Engineering,** Katsuhiko Ogatta, Pearson Education,2004.
2. **Control Systems Principles and Design,** M.Gopal, 3rd Ed., TMH,2000.

REFERENCE BOOKS :

1. **Modern Control Systems**, Richard.C.Dorf and Robert.H.Bishop, Addison Wesley,1999
2. **System dynamics & control**, Eronini-Umez, Thomson Asia pte Ltd. singapore, 2002.
3. **Feedback Control System**, Schaum's series. 2001.

ELECTIVE-IV (GROUP - D)

TRIBOLOGY

Subject Code	**: 10ME831**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Introduction To Tribology: Properties of oils and equation of flow: Viscosity, Newton's Law of viscosity, Hagen-Poiseuille Law, Flow between parallel stationary planes, viscosity measuring apparatus. Lubrication principles, classification of lubricants.

06 Hours

UNIT - 2

Hydrodynamic Lubrication: Friction forces and power loss in lightly loaded bearing, Petroff's law, Tower's experiments, mechanism of pressure development in an oil film, Reynold's investigation and Reynold's equation in 2D.

06 Hours

UNIT - 3

Idealized Journal Bearing: Introduction to idealized journal bearing, load carrying capacity, condition for equilibrium, Sommerfeld's numbers and significance of it; Partial bearings, end leakages in journal bearing, numerical problems.

07 Hours

UNIT - 4

Slider / Pad Bearing With A Fixed And Pivoted Shoe: Pressure distribution, Load carrying capacity, coefficient of friction, frictional resistance in a pivoted shoe bearing, numerical examples.

07 Hours

PART – B

UNIT - 5

Oil Flow And Thermal Equilibrium Of Journal Bearing: Oil flow through bearings, self-contained journal bearings, bearings lubricated under pressure, thermal equilibrium of journal bearings.

06 Hours

UNIT - 6

Hydrostatic Lubrication: Introduction to hydrostatic lubrication, hydrostatic step bearings, load carrying capacity and oil flow through the hydrostatic step bearing.

06 Hours

UNIT - 7

Bearing Materials: Commonly used bearings materials, properties of typical bearing materials. Advantages and disadvantages of bearing materials.

07 Hours

UNIT - 8

Behavior Of Tribological Components: Selection, friction, Wear of ceramic materials, wear measurements, effects of speed, temperature and pressure. Tribological measures, Material selection, improved design, surface engineering

07 Hours

TEXT BOOKS:

1. **Fundamentals of Tribology** , Basu S K., Sengupta A N., Ahuja B. B., , PHI 2006
2. **Introduction to Tribology Bearings,** Mujumdar B. C., S. Chand company pvt. Ltd 2008.

REFERENEC BOOKS:

1. **Theory and Practice of Lubrication for Engineers,** Fuller, D., New York company 1998
2. **Principles and Applications of Tribology,** Moore, Pergamaon press 1998
3. **Tribology in Industries,** Srivastava S., S Chand and Company limited, Delhi 2002
4. **Lubrication of bearings – Theoretical Principles and Design,** Redzimovskay E I., Oxford press company 2000

AUTOMOTIVE ENGINEERING

Subject Code	**: 10ME844**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Engine Components And Cooling & Lubrication Systems: Spark Ignition (SI) & Compression Ignition (CI) engines, cylinder – arrangements and their relatives merits, Liners, Piston, connecting rod, crankshaft, valves, valve actuating mechanisms, valve and port timing diagrams, Types of combustion chambers for S.I.Engine and C.I.Engines, Compression ratio, methods of a Swirl generation, choice of materials for different engine components, engine positioning, cooling requirements, methods of cooling, thermostat valves, different lubrication arrangements.

07 Hours

UNIT - 2

Fuels, Fuel Supply Systems For Si And Ci Engines: Conventional fuels, alternative fuels, normal and abnormal combustion, cetane and octane numbers, Fuel mixture requirements for SI engines, types of carburetors, C.D.& C.C. carburetors, multi point and single point fuel injection systems, fuel transfer pumps, Fuel filters, fuel injection pumps and injectors.

07 Hours

UNIT - 3

Superchargers And Turbochargers: Naturally aspirated engines, Forced Induction, Types pf superchargers, Turbocharger construction and operation, Intercooler, Turbocharger lag.

06 Hours

UNIT - 4

Ignition Systems: Battery Ignition systems, magneto Ignition system, Transistor assist contacts. Electronic Ignition, Automatic Ignition advance systems.

06 Hours

PART – B

UNIT - 5

Power Trains: General arrangement of clutch, Principle of friction clutches, Torque transmitted, Constructional details, Fluid flywheel, Single plate, multi-plate and centrifugal clutches.

Gear box: Necessity for gear ratios in transmission, synchromesh gear boxes, 3, 4 and 5 speed gear boxes. Free wheeling mechanism, planetary gears systems, over drives, fluid coupling and torque converters, Epicyclic gear box, principle of automatic transmission, calculation of gear ratios, Numerical calculations for torque transmission by clutches.

08 Hours

UNIT - 6

Drive To Wheels: Propeller shaft and universal joints, Hotchkiss and torque tube drives, differential, rear axle, different arrangements of fixing the wheels to rear axle, steering geometry, camber, king pin inclination, included angle, castor, toe in & toe out, condition for exact steering, steering gears, power steering, general arrangements of links and stub axle, over steer, under steer and neutral steer, numerical problems, types of chassis frames.

06 Hours

UNIT - 7

Suspension, Springs And Brakes: Requirements, Torsion bar suspension systems, leaf spring, coil spring, independent suspension for front wheel and rear wheel. Air suspension system.

Types of brakes, mechanical compressed air, vacuum and hydraulic braking systems, construction and working of master and wheel cylinder, brake shoe arrangements, Disk brakes, drum brakes, Antilock –Braking systems, purpose and operation of antilock-braking system, ABS Hydraulic Unit, Rear-wheel antilock & Numerical Problems

06 Hours

UNIT - 8

Automotive Emission Control Systems: Automotive emission controls, Controlling crankcase emissions, Controlling evaporative emissions, Cleaning the exhaust gas, Controlling the air-fuel mixture, Controlling the combustion process, Exhaust gas recirculation, Treating the exhaust gas, Air-injection system, Air-aspirator system, Catalytic converter, Emission standards- Euro I, II, III and IV norms, Bharat Stage II, III norms.

6 Hours

TEXT BOOKS:

1. **Automotive mechanics,** William H Crouse & Donald L Anglin, 10th Edition Tata McGraw Hill Publishing Company Ltd., 2007
2. **Automotive Mechanics,** S. Srinivasan, 2nd Ed., Tata McGraw Hill 2003.

REFERENCE BOOKS:

1. **Automotive mechanics: Principles and Practices**, Joseph Heitner, D Van Nostrand Company, Inc
2. **Fundamentals of Automobile Engineering,** K.K.Ramalingam, Scitech Publications (India) Pvt. Ltd.
3. **Automobile Engineering**, R. B. Gupta, Satya Prakashan, 4th edn. 1984.
4. **Automobile engineering**, Kirpal Singh. Vol I and II 2002.

SEMESTER I

MANAGING ORGANIZATIONS

Sub Code : **12MBA11**	IA Marks : 50
No. of Lecture Hrs /week : 04	Exam Hrs. : 03
Total No. of Lecture Hrs. : 56	Exam Marks : 100
Practical Component : 01 Hr/ Week	

Part A- Principles of Management

Module I : Introduction (6 Hours)

Management: Introduction, definition of management, nature, purpose and functions, levels and types of managers, managerial roles, skills for managers, evolution of management thought, Fayol's fourteen principles of management and recent trends in management.

Module II: Planning and organizing (12 Hours)

Planning: Nature of planning, planning process, objectives, MBO, strategies, level of strategies, policies, methods and programs, planning premises, decision making, process of decision making, types of decisions, techniques in decision making.

Organizing: Organization structure, formal and informal organizations, principles of organizations-chain of command, span of control, delegation, decentralization, empowerment.

Functional, divisional, geographical, customer based and matrix organizations, tram based structures, virtual organizations, boundary less organizations.

Module III: Controlling (4 Hours)

Controlling, importance of controlling, controlling process, types of control, factors influencing control effectiveness.

Recommended Books

1. Essentials of Management-Koontz, 8/e, McGraw Hill
2. Management: Text and Cases-VSP Rao, Excel Books
3. MGMT, An Innovative approach to teaching and learning Principles of Management, Chuck Williams, Cengage Publications, 2010
4. Principles and practices of Management, Kiran Nerkar, Vilas Chopde, Dreamtech Press, 2011
5. Management Theory & practice – Chandan J. S, Vikas Publishing House.
6. Management Theory & Practice Text & Cases – Subba Rao P & Hima Bindu, Himalaya Publication.

Part B- Organizational Behaviour

Module IV: Introduction (4 hours)

Organizational Behaviour: Introduction, definition, historical development, fundamental principles of OB, contributing disciplines, challenges and opportunities.

Module V: Foundations of Individual Behaviour (14 Hours)

Individual behaviour: Foundations of individual behavior.

Ability: Intellectual abilities, Physical ability, the role of disabilities.

Personality: Meaning, formation, determinants, traits of personality, Big five and MBTI, personality attributes influencing OB.

Attitude: Formation, components of attitudes, relation between attitude and behaviour.

Perception: Process of perception, factors influencing perception, link between perception and individual decision making.

Emotions: Affect, mood and emotion and their significance, basic emotions, emotional intelligence, self awareness, self management, social awareness, relationship management.

Module VI: Motivation and Leadership **(8 Hours)**

Motivation: Meaning, theories of motivation-needs theory, two factor theory, Theory X and Y, application of motivational theories.

Leadership: Meaning, styles of leadership, leadership theories, trait theory, behavioural theories, managerial grid, situational theories-Fiedler's model, SLT, transactional and transformation leadership.

Module VII: Group Behaviour **(4 Hours)**

Definition, types, formation of groups, building effective teams.

Conflict: Meaning, nature, types, process of conflict, conflict resolution.

Power and politics: Basis of power, effectiveness of power tactics. The ethics of behaving politically.

Module VIII: Organizational culture **(4 Hours)**

Importance, managing culture. Work stress and its management.

Practical Component

- Studying organizational structures of any 10 companies and classifying them into different types of organizations which are studied in Module 2 and justifying why such structures are chosen by those organizations.
- Preparing the leadership profiles of any 5 business leaders and studying their leadership qualities and behaviours with respects to the trait, behavioural and contingency theories studied.
- Identifying any five job profiles and listing the various types abilities required for those jobs and also the personality traits/attributes required for the jobs identified.

Note: Faculty can either identify the organizations/ leaders/jobs or students can be allowed to choose the same.

RECOMMENDED BOOKS:

1. Organizational behaviour, Stephen P Robbins, Timothy A. Judge, Neharika Vohra, Pearson, 14th Edition, 2012.
2. Introduction to Organisational Behaviour – Michael Butler, Jaico Publishing House,
3. Organization Behaviour – Ashwathappa, Himalaya Publication House
4. ORGB - Nelson, Quick, Khanelwal, 2/e, Cengage Learning, 2012.
5. Organizational behaviour - Anada Das Gupta, Biztantra, 2011.
6. Organizational behaviour: A modern approach - Arun Kumar and Meenakshi, Vikas Publishing House, 2011.
7. Organizational behaviour – Rao V. S. P, Excel Books, 2009.

REFERENCE BOOKS:

1. Organizational Behaviour - Fred Luthans, 12/e, Mc-Graw Hill International, 2011.
2. Management and organizational Behaviour - Laurie J Mullins, Pearson education
3. Fundamentals of organizational behaviour - Slocum/Hillriegel. Cengene Learning
4. Organizational Behaviour - Aquinas P. G, Excel Books.

ACCOUNTING FOR MANAGEMENT

Sub Code : **12MBA14**	IA Marks : 50
No. of Lecture Hrs /week : 04	Exam Hrs. : 03
Total No. of Lecture Hrs. : 56	Exam Marks : 100
Practical Component : 01 Hr/ Week	
Ratio of Theory to problems = 40:60	

Module I: Introduction to Accounting (4 Hours)

Need and Types of Accounting, Users of Accounting, concepts and conventions of Accounting, Accounting Equations.

Module II: Preparation of Books of Accounts (10 Hours)

Journals, Subsidiary books, three column cash book, ledgers and trial balance. (Problems only on three column cash book)

Module III: Preparation of Financial Statements (12 Hours)

Preparation of final accounts of sole traders and companies (excluding partnership) in horizontal format (students are to be introduced to vertical formats also)

Module IV: Analysis of Financial Statements (14 Hours)

Comparative, common size and trend analysis, Ratio Analysis, Preparation of financial statements using ratios, Cash flow Statement.

Module V: Accounting Standards and IFRS (4 Hours)

IFRS and proposed changes in Indian Accounting Standards.

Module VI: Audit Report **(4 Hours)**

Audit Report, Directors' Report and basics of MAOCARO 1998 (Amended 2003)

Module VII: **(2 Hours)**

Corporate Governance, Human Resource Accounting, Forensic Accounting Window Dressing

Module VIII: Income Tax **(6 Hours)**

Heads of Income, Salary, Profit in lieu of salary, Perquisites, deductions u/s 80C, Income Tax Rates – For Individuals only (Only Theory)

Practical Components:

- Collecting Annual reports of the companies and analyzing the financial statements using different techniques and presenting the same in the class.
- Analyzing the companies' cash flow statements and presenting the same in the class.
- Exposing the students to usage of accounting software's (Preferably Tally)
- Filling up of ITR forms

RECOMMENDED BOOKS:

1. Financial Accounting: A Managerial Prespective - Narayanaswamy R, 4/e ,PHI, 2011 (Based on IFRS).
2. Accounting For Managers – Jawaralal, 5/e, Himalaya Publishing House, 2011.
3. Financial Accounting – Dhanesh K. Khatri, – McGraw Hill, 2011
4. A Text book of Accounting For Management – Maheswari S. N, Maheswari Sharad K. Maheswari, 2/e, Vikas Publishing house (P) Ltd.
5. Financial Accounting For Management-Ramachandran N & Ram Kumar Kakani, 3/e TMH Publications, 2011.
6. Financial Accounting - Tulsian P. C, 1/e, Pearson Education.
7. Accounting for managers –Madegowda J, Himalaya Publishing House.
8. Advanced Accountancy- Gupta R. L & Radhaswamy M–Sultan Chand Publications
9. Financial Accounting - Jain and Narang, Kalyani Publishers
10. Direct Taxes – Vinod Singhania and Kapil Singhania, Taxman Publications

REFERENCE BOOKS:

1. Financial Accounting for Management: An Analytical Perspective – Ambrish Gupta, 1/e, Pearson Education.
2. Introduction to Financial Statement Analysis – Ashish K Bhatta charya, Elsevier India
3. Accounting for Managers: Text & Cases - Bhattacharya, 3/e, Vikas Publications, 2004.
4. Financial Accounting for Business Managers - Ashish K. Bhattacharya, 2/e, PHI, 2005.
5. Financial Accounting – Raman B. S, Vol I & Vol II, United Publishers,1/e, 2009.
6. Financial Accounting (IFRS update)– Gary A. Porter & Curtis L. Norton, 6/e, Cengage Learning.
7. Accounting For Business Managers – Sakshi Vasudeva, Himalaya Publishing House.
8. Accounting For Management – Arora M. N., Himalaya Publishing House.
9. Essentials of Financial Accounting – Bhattacharya, 2/e, Prentice Hall India, (Based on IFRS)
10. Comdex (Computer and Financial Accounting with Tally 9.0 Course Kit). - Dream Tech.
11. Comdex – Tally 9, Namrata Agrawal- DreamTech.
12. IFRS: A Practical approach – Jasmine Kaur, McGraw Hill.
13. Income Tax - Gaur & Narang, Kalyani Publishers.
14. Financial Accounting - Paul Kimmet, Jerry Weygant & Donald Kieso - Wiley Publications.

MANAGERIAL COMMUNICATION

Sub Code : **12MBA16**	IA Marks : 50
No. of Lecture Hrs /week : 04	Exam Hrs. : 03
Total No. of Lecture Hrs. : 56	Exam Marks : 100
Practical Component : 01 Hr/ Week	

Module I: Introduction **(6Hours)**

Meaning & Definition, Role, Classification – Purpose of communication – Communication Process – Characteristics of successful communication – Importance of communication in management – Communication structure in organization – Communication in conflict resolution - Communication in crisis. Communication and negotiation. Communication in a cross-cultural setting

Module II: Oral Communication (6Hours)

Meaning – Principles of successful oral communication – Barriers to communication – Conversation control – Reflection and Empathy: two sides of effective oral communication. Modes of Oral Communication.
Listening as a Communication Skill, Non verbal communication.

Module III: Written Communication (6Hours)

Purpose of writing – Clarity in writing – Principles of effective writing – Approaching the writing process systematically: The 3X3 writing process for business communication: Pre writing – Writing – Revising – Specific writing features – Coherence – Electronic writing process.

Module IV: Business Letters and Reports (8Hours)

Introduction to business letters – Types of Business Letters **-** Writing routine and persuasive letters – Positive and Negative messages
Writing Reports: Purpose, Kinds and Objectives of reports – Organization & Preparing reports, Short and Long reports
Writing Proposals: Structure & preparation.
Writing memos

Module V: Case Method of Learning (8Hours)

Understanding the case method of learning – Different types of cases – Difficulties and overcoming the difficulties of the case method – Reading a case properly (previewing, skimming, reading, scanning) – Case analysis approaches (Systems, Behavioural, Decision, Strategy) – Analyzing the case – Dos and don’ts for case preparation – Discussing and Presenting a Case Study

Module VI (6Hours)

Presentation skills: What is a presentation – Elements of presentation – Designing & Delivering Business Presentations – Advanced Visual Support for Managers
Negotiation skills: What is negotiation – Nature and need for negotiation – Factors affecting negotiation – Stages of negotiation process – Negotiation strategies

Module VII **(6Hours)**

Employment communication: Introduction – Composing Application Messages **-** Writing CVs – Group discussions – Interview skills

Impact of Technological Advancement on Business Communication – Technology-enabled Communication **- Communication networks** – Intranet – Internet – e mails – SMS – teleconferencing – videoconferencing

Module VIII: Group Communication **(10Hours)**

Meetings – Planning meetings – objectives – participants – timing – venue of meetings – leading meetings. Meeting Documentation: Notice, Agenda, Resolution & Minutes.

Seminars – workshop – conferences

Media management – The press release – Press conference – Media interviews

Etiquette Advantage in Business Communication

Practical Components:

- Demonstrate the effect of noise as a barrier to communication
- Make students enact and analyze the non-verbal cues
- Give exercises for clarity and conciseness in written communication.
- Group Activity: Form Student groups and ask them to write a persuasive letter and proposal for an innovative product or service. Circulate the work from each group among all other groups and ask them to evaluate the letter and proposal in line with possible responses to a letter (pleased, displeased, neither pleased nor displeased but interested, not interested)
- A suitable case is to be selected and administered in the class sticking to all the guidelines of case administering and analysis. Demonstrate using Communication Equipments like Fax, Telex, Intercoms, etc,
- Demonstrating Video conferencing & teleconferencing in the class.
- Conduct a mock meeting of students in the class identifying an issue of their concern. The students should prepare notice, agenda and minutes of the meeting.

- Business etiquettes to be demonstrated in role play by students
- Each student to give presentation of 5 minutes (this can be spread throughout the semester)and to be evaluated by the faculty

RECOMMENDED BOOKS:

1. Business Communication : Concepts, Cases And Applications – Chaturvedi P. D, & Mukesh Chaturvedi ,2/e, Pearson Education, 2011 (Module 1, 2, 4, 5, & 7).
2. Business Communication: Process And Product – Mary Ellen Guffey, 3/e, Cengage Learning, 2002. (Module 3)
3. Communication – Rayudu C. S, HPH.
4. Business Communication – Lesikar, Flatley, Rentz & Pande, 11/e, TMH, 2010 (Module 1, 2, 4, 5, & 7).
5. Advanced Business Communication – Penrose, Rasberry, Myers, 5/e, Cengage Learning, 2004 (Module 1, 5, 6 & 8).
6. BCOM – Lehman, DuFrene, Sinha, Cengage Learning, 2/e 2012
7. Business Communiacation – Madhukar R. K, 2/e, Vikas Publishing House.

REFERENCE BOOKS:

1. Effective Technical Communication **-** Ashraf Rizvi M, TMH, 2005.
2. Business Communication **-** Sehgal M. K & Khetrapal V, Excel Books.
3. Business Communication – Krizan, Merrier, Jones, 8/e, Cengage Learning, 2012.
4. Basic Business Communiaction – Raj Kumar, Excel Books, 2010.

Website:

http: //www.fundula.com/allcourses

SEMESTER II

BUSINESS, GOVERNMENT AND SOCIETY

Sub Code: **12MBA21**	IA Marks 50
No.of Lecture Hrs/week : 04	Exam Hrs. : 03 Hours
Total No. of Lecture Hrs. : 56	Exam Marks : 100
Practical Component : 01 Hr/ Week	

Module I: The Study of Business, Government and Society (BGS) (4 Hours)

Importance of BGS to Managers – Models of BGS relationships – Market Capitalism Model, Dominance Model, Countervailing Forces Model and Stakeholder Model – Global perspective – Historical Perspective

Module II: The Dynamic Environment (4 Hours)

Historical Forces changing the Business Environment – Key environments of Business – Power dimensions of Business – Theoretical perspective – Sociological perspective

Module III: Corporate Governance (8 Hours)

Introduction, Definition, Market model and control model, OECD on corporate governance, A historical perspective of corporate governance, Issues in corporate governance, relevance of corporate governance, need and importance of corporate governance, benefits of good corporate governance, the concept of corporate, the concept of governance, theoretical basis for corporate governance, obligation to society, obligation to investors, obligation to employees, obligation to customers, managerial obligation, Indian cases

Module IV: Public Policies **(8 Hours)**

The role of public policies in governing business, Government and public policy, classification of public policy, areas of public policy, need for public policy in business, levels of public policy, elements of public policy, the corporation and public policy, framing of public policy, business and politics-levels of involvement, business, government, society and media relationship government regulations in business, justification of regulation, types of regulation, problems of regulation

Module V: Environmental concerns and corporations (6 Hours)

History of environmentalism, environmental preservation-role of stakeholders, international issues, sustainable development, costs and benefits of environmental regulation, industrial pollution, role of corporate in environmental management, waste management and pollution control, key strategies for prevention of pollution, environmental audit, Laws governing environment

Module VI: Business Ethics (6 Hours)

Meaning of ethics, business ethics, relation between ethics and business ethics, evolution of business ethics, nature of business ethics, scope, need and purpose, importance, approaches to business ethics, sources of ethical knowledge for business roots of unethical behavior, ethical decision making, some unethical issues, benefits from managing ethics at workplace, ethical organizations

Module VII: Corporate Social Responsibility (6 Hours)

Types and nature of social responsibilities, CSR principles and strategies, models of CSR, Best practices of CSR, Need of CSR, Arguments for and against CSR, CSR Indian perspective, Indian examples

Module VIII: Business Law (14 Hours)

Law of contract, meaning of contract, agreement, essential elements of a valid contract, classification of contracts, proposal and acceptance, free consent, void agreements

Negotiable instruments act 1881: Nature and Characteristics of Negotiable instruments, Kinds of Negotiable Instruments – Promissory Notes, Bills of Exchange and Cheques. Parties to Negotiable Instruments, Negotiation, Presentment, Discharge and Dishonor of Negotiable Instrument, Law of agency, Bailment & Pledge:

Sale of goods act 1930: Definition of Sale, Sale v/s Agreement to Sell, Goods, price and Time, Condition and Warranties, Express and Implied Condition, "Doctrine of Caveat Emptor", Performance of Contract of sale, Right of Unpaid Seller.

Intellectual property law, law relating to patents, law relating to copyrights, law relating to trade mark

Practical Component:

- Students are expected to study any five CSR initiatives by Indian organizations and submit a report for the same.
- A group assignment on "The relationship between Business, Government and Society in Indian Context and relating the same with respect the models studied in module 1.
- Case studies/Role plays related ethical issues in business with respect to Indian context.

RECOMMENDED BOOKS:

1. Business, Government, and Society: A Managerial Perspective, Text and Cases – John F. Steiner, 12/e, McGraw-Hill, 2011.
2. Business and Government – Francis Cherunilam, HPH.
3. Corporate Governance: principles, policies and practices – Fernando A. C, 2/e, Pearson, 2011.
4. Business Ethics and Corporate Governance **-** Ghosh B. N, Tata McGraw-Hill, 2012.
5. Business Law for Managers, Goel P. K, Biztantra, 2012.
6. Corporate Social Responsibility: A Study of CSR Practices in Indian Industry, Baxi C. V & Rupamanjari Sinha Ray, Vikas Publishing House, 2012.

REFERENCE BOOKS:

1. Business and Society **-** Lawrence and Weber, 12/e, Tata McGraw-Hill, 2010.
2. Business Ethics **-** Bajaj P. S & Raj Agarwal, Biztantra, 2012.
3. Corporate Governance **-** Keshoo Prasad, 2/e, PHI.
4. Corporate Governance, Ethics and social responsibility **-** Balachandran V, & Chandrashekharan V, 2/e, PHI, 2011.
5. Corporate Governance – Machiraju H. R, HPH.
6. Business Ethics and Corporate Governance – Prabakaran S, Excel Books.
7. Corporate Goverance – Badi N. V, Vrinda Publications, 2012.
8. Civic Sense – Prakash Pillappa, Excel Books, 2012.

MACRO BUSINESS ENVIRONMENT

Sub Cod e: **12MBA23**	IA Marks : 50
No. of Lecture Hrs /week : 04	Exam Hrs. : 03
Total No. of Lecture Hrs. : 56	Exam Marks : 100
Practical Component : 01 Hr/ Week	

Module I **(8 Hours)**

Indian Economy and Business environment: Nature and Scope, Structure of the Business Environment – Internal and External environment.
Political and Legal Environment: overview, Philosophies, Political System, Judiciary, Constitution of India.
Economic Environment: overview, Nature of Indian Economy, Features of Indian Economy, Charges in recent times.
Socio – Cultural Environment: Socio Cultural factors affecting the Business.

Module II **(8 Hours)**

Globalisation and Indian Business Environment: Meaning and Implications, Phases, Globalisation Impact on Indian Economy across Sectors. Modes of entry strategies.

India's Foreign Trade Policies – Recent Developments, Global outsourcing, MNCs and FDI in Retail, Infrastructure, Pharma. Insurance, Banking & Finance and Automobile. Impact of WTO ON India's foreign trade.
Technological Environment: Technology and Development, Integrating technology with Business. India and Global Knowledge Market.

Module III **(6 Hours)**

International Business Environment: Review of the global economy, The global recession, Business environment in Developed and Developing Countries.
International trade theories.
GATT and WTO: Agreements and Implications.
International cultural aspects- Values and norms, religion and ethics, language, education, impact of cultural differences on business.

Module IV **(8 Hours)**

Measuring the Economy: Basic economic Concepts, Open and Closed Economies, Primary, Secondary and Tertiary sectors and their contribution to the economy. SWOT Analysis for the Indian economy. Measuring GDP and GDP Growth rate. Components of GDP.
Business Cycle- Features, Phases, Economic Time series – Economic indicators, Correlation, persistence, coherence.
Inflation: Types, Measurement, Kinds of Price Indices.
Employment and unemployment rates: Measurement.
National Income: Estimates, Trends, Measurement, Problems in measuring National Income.

Module V **(8 Hours)**

Industrial Policies and Structure: Planning- Problems in industrial development during the plan period, Classification of industries based on ownership. Industrial policies, Industrial strategy for the future, New industrial policy 1991.
Structure of Indian Industry: Public and Private Sector Enterprises, Objectives of PSUs, Performance and shortcomings. Private Sector– growth, problems and prospects. SSI – Role in Indian Economy. Disinvestments in Indian public sector Units since 1991.
Industry Analysis: Textiles, Electronics, Automobile, FMCG, Telecom, Pharma Sectors.

Module VI **(8 Hours)**

Economic policies: Privatisation-Problems and prospects.
Fiscal Policy: Objectives, Instruments, Union Budget, Reforms -Raja Chelliah Committee Recommendations, Taxes, Role of Government.
Monetary Policy: Money, Measures of money supply, Monetary system in India, Monetary policy- Tools for credit control. Structure of the Banking system, RBI and its functions, Banking structure reforms - Narasimham committee recommendations.

MODULE VII **(6 Hours)**

Infrastructure in the Indian Economy- Infrastructure and economic Development, Energy, Power, Transport system- Railways, Road transport, Water transport and Air Transport.Power.
Communication System in India, Development of IT Sector in India – its contributions to Indian economy.
Importance of Human resources development- Measures of Human development, Human Development index. Major thrust areas in human resource development.

Module VIII **(4 hours)**

Agriculture and Business: Role of Agriculture in Economic Development, Trends in Agricultural Production, Agro based Industries, Dependence of Business on Agriculture, Corporate India Initiatives.

Practical Component

- A Debate on ‘Should the government allow cultivation of BT crops in India’.
- ‘Indian Shining’ a debate on for and against.
- International Cultural environment- The problems faced by MNC’s – A Case study.
- ‘Disinvestment in PSU’s since 1991’- A case study
- Exposure of INR to the Fluctuation of USD and the impact on Indian companies receivables and payables.
- Tracking of business cycle for India using GDP data.
- A case study on Bangalore Metro Rail project.
- Corporate India initiatives for rural developments

RECOMMENDED BOOKS:

1. Economic Environment of Business – Misra S. K & Puri V. K. , 6/e, Himalaya publishing house, 2010.
2. Business Environment :Text and Cases - Justin Paul, 3/e, McGraw Hill, 2011.
3. Macro Economic Theory – Vaish M. C, 14/e, Vikas Publishing House, 2010
4. Business Environment - Fernando, 1/e, Pearson, 2011.
5. Indian Economy – Datt and Sundharam, 64th Edition, S Chand, 2011.
6. International Business: Competing in the Global Marketplace - Charles W. L. Hill & Jain, 6/e, TMH, 2009.

REFERENCE BOOKS:

1. Principles of Macro Economics –Mankiw, 4/e, Cengage Learning, 2011.
2. Macro Economics – Andrew. B. Abel, & Ben S. Bernanke, 7/e, Pearson Education, 2011.
3. Macro Economic Theory – Kennedy,1/e , PHI, 2011.
4. Macro Economics: Theory and Policy – Vanitha Agarwal, 1/e, Pearson, 2010.
5. Macro Economics- Hall & Papell, 6/e, Viva Books, 2010.
6. The Business Environment – Wetherly & Otter, 1/e, Oxford University Press, 2010.
7. Business Environment – Suresh Bedi, Excel Books.

Exam: Only Theory questions.

MARKETING MANAGEMENT

Sub Code: **12MBA24**	IA Marks 50
No.of Lecture Hrs/week : 04	Exam Hrs. : 03 Hours
Total No. of Lecture Hrs. : 56	Exam Marks : 100
Practical Component : 01 Hr/ Week	

Module I **(7 Hours)**

Introduction: Nature and scope of marketing, Evolution, Various marketing orientations, Marketing Vs Selling concepts, Consumer need, Want and demand concepts, Marketing Environment – Assessing the impact of micro and macro environment. Marketing challenges in the globalized economic scenario.

Module II **(7 Hours)**

Understanding Consumer Behaviour: Buying motives, Factors influencing buying behaviour, Buying habits, Stages in consumer buying decision process, Types of consumer buying decisions, Organizational buying Vs House hold buying, Consumer Protection Act, 1986 – An Introduction.

Module III **(8 Hours)**

Market Segmentation, Targeting, Positioning & Branding

Segmentation: Meaning, Factors influencing segmentation, Market Aggregation, Basis for segmentation, Segmentation of Consumer and Industrial markets.

Targeting: Meaning , Basis for identifying target customers, Target Market Strategies,

Positioning: Meaning, Product differentiation strategies, Tasks involved in positioning

Branding: Concept of Branding, Brand Types, Brand equity, Branding Strategies

Module IV **(7 Hours)**

Product Decisions: Concept, product hierarchy, New product development, diffusion process, Product Life cycle, Product mix strategies and merchandise planning and strategies.

Packaging / Labeling: Packaging as a marketing tool, requirement of good packaging, Role of labeling in packaging

Module V **(4 Hours)**

Pricing Decisions: Pricing concepts for establishing value, Pricing strategies-Value based, Cost based, Market based, Competitor based, New product pricing – Price Skimming & Penetration pricing,

Module VI **(5 Hours)**

Distribution Decisions: Meaning, Purpose, Channel alternatives, Factors affecting channel choice, Channel design and Channel management decisions, Channel conflict, Distribution system, Multilevel Marketing (Network Marketing)

Module VII **(9 Hours)**

Integrated Marketing Communications: Concept of communication mix, communication objectives, steps in developing effective communication, Stages in designing message

Advertising: Advertising Objectives, Advertising Budget, Advertising Copy, AIDA model, Advertising Agency Decisions

Sales Promotion: Sales Promotion Mix, Kinds of promotion, Tools and Techniques of sales promotion, Push-pull strategies of promotion.

Personal selling: Concept, Features, Functions, Steps/process involved in Personal Selling,

Publicity / Public Relation: Meaning, Objectives, Types, Functions of Public Relations

Direct Marketing: Meaning, Features, Functions, Basic concepts of e-commerce, e-business, e-marketing, m-Commerce, m-marketing, e-networking.

Module VIII **(5 Hours)**

Marketing Planning: Meaning, Concepts of Marketing plan, Steps involved in planning.

Marketing Organisation: Factors influencing the size of the marketing organization, various types of marketing structures/organisation

Marketing Audit: Meaning, Features of marketing audit, various components of marketing audit.

CASE STUDIES ON INDIAN CONTEXT ONLY (4 Hours)

Practical Components:

- Consider a few products like mobile phone, shoes, clothes etc and analyse their buying motives.
- Analyse the various colleges in a city – how are they segmented? If you were to start a new MBA college, how would you position it? What would your parameters be?
- Analyse the product life cycle of a few common products like jeans, pagers, desktop computers etc etc.
- Go to a supermarket and study the pricing, packaging and advertising strategy of some FMCG companies like Levers, Godrej, ITC, Brittania, Parle, and others in some products like soaps, biscuits, juices etc.
- Take any consumer product like soaps, biscuits etc and study the marketing organization of the company producing it.

RECOMMENDED BOOKS:

1. Marketing Management: A South Asian Perspective - Kotler, Keller, Koshy & Jha, 13/e, Pearson Education, 2012.
2. Marketing : An Introduction - Rosalind Masterson & David Pickton, 2/e, Sage Publications, 2010.
3. Marketing Management - Tapan Panda, 2/e, Excel Publication, 2007.
4. Marketing Management - Ramaswamy V. S. & Namakumar S, 4/e, Macmillan Publishers, 2011.
5. Fundamentals of Marketing Management - Etzel M. J, B J Walker & William J. Stanton, 14/e, TMH, 2010.
6. Marketing Management - Arun Kumar & Meenakshi N, 2/e, Vikas, 2011.
7. Marketing Management – K Karunakaran, 3/e, 2012, Himalaya Publishing House,

REFERENCE BOOKS:

1. Marketing Management-Rajan Saxena, 4/e, Cenage Learning.

2. Marketing- Lamb, Hair,Sharma Mc Danniel, 1/e, Cengage Learning 2012.
3. Marketing: Marketing in the 21st Century - Evans & Berman, 2/e, Cengage Learning, 2005.
4. Marketing : Planning, Implementation, and Control - William M. Pride, Ferrell O. C , Cengage Learning, 2010.
5. Applied Case Studies in Marketing – Shajahan S, Primus Books, 2011.
6. Marketing In India: Text and Cases- Neelamegham S, 4/e, Vikas.

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FINANCIAL MANAGEMENT

Sub Code: **12MBA25**	IA Marks : 50
No. of Lecture Hrs /week : 04	Exam Hrs. : 03
Total No. of Lecture Hrs. : 56	Exam Marks : 100
Practical Component : 01 Hr/ Week	

Module I **(5 Hours)**

Financial management – Introduction to financial management, objectives of financial management – profit maximization and wealth maximization. Changing role of finance managers. Interface of Financial Management with other functional areas. **Indian financial system** – Primary market, Secondary market – stocks & commodities market, Money market, Forex markets. (Theory Only)

Module II **(5 Hours)**

Sources of Financing: Shares, Debentures, Term loans, Lease financing, Hybrid financing, Venture capital investing, Warrants. Angel investing Private equity, Warrants and convertibles (Theory Only)

Module III **(10 Hours)**

Time value of money –Future value of single cash flow & annuity, present value of single cash flow, annuity & perpetuity. Simple interest & Compound interest, Capital recovery & loan amortization.

Module IV **(8 Hours)**

Cost of Capital Cost of capital – basic concepts. Cost of debenture capital, cost of preferential capital, cost of term loans, cost of equity capital (Dividend discounting and CAPM model). Cost of retained earnings. Determination of Weighted average cost of capital (WACC) and Marginal cost of capital.

Module V **(10 Hours)**

Investment decisions -– Investment evaluation techniques – Net present value, Internal rate of return, Modified internal rate of return, Profitability index, Payback period, Discounted pay back period , Accounting rate of return. Estimation of cash flow for new project, replacement projects.

Module VI **(6 Hours)**

Working capital management – factors influencing working capital requirements. Current asset policy and current asset finance policy. Determination of operating cycle and cash cycle. Estimation of working capital requirements of a firm.(Does not include Cash, Inventory & Receivables Management)

Module VII **(8 Hours)**

Capital structure and dividend decisions – Planning the capital structure. (No capital structure theories to be covered) Leverages – Determination of operating leverage, financial leverage and total leverage. Dividend policy – Factors affecting the dividend policy **-** dividend policies**-** stable dividend, stable payout. (No dividend theories to be covered).

Module VIII **(4 Hours)**

Emerging Issues in Financial management: Derivatives, Mergers and Acquisitions, Behavioral Finance, Financial Modelling, Financial engineering, risk management. (Theory Only)**.**

Practical Components:

- Identifying the small or medium sized companies and understanding the Investment evaluation techniques used by them.

- Using the annual reports of selected companies, students can study the working capital management employed by them. Students can also compare the working capital management of companies in the same sector.
- Students can choose the companies that have gone for stock split and Bonus issue in the last few years and study the impact of the same on the stock price.

RECOMMENDED BOOKS:

1. Financial Management - Khan M. Y.& Jain P. K, 6/e, TMH, 2011.
2. Financial Management - Pandey I. M, 10/e, Vikas.
3. Financial Management - Prasanna Chandra, 8/e, TMH, 2011.
4. Financial Management, Kapil, Pearson Education, 2011.
5. Financial Management, Srivastav, Oxford University press, 2011.

REFERENCE BOOKS:

1. Fundamentals of Financial Management - Brigham & Houston, 10/e, Cengage Learning.
2. Fundamentals of Financial Management – Vanhorns & Bhandari, Pearson Education.
3. Contemporary Financial Management – Kothari & Dutta, Macmillan India Ltd.
4. Fundamentals of Corporate Finance - Stephen A. Ross, Wester Field, Jordan, 8/e, McGraw Hill, 2010.
5. Fundamentals of Financial Management –Vanhorne & Wachowicz, 13/e, PHI, 2011.
6. Corporate Finance – Damodaran, 2/e, Wiley India (P) Ltd., 2004
7. Financial Management –Shah, Wiley India (P) Ltd.
8. Principles of Managerial Finance - Gitman, 10/e, Pearson Education, 2004
9. Principles of Corporate Finance:Theory & Practice - Brealy and Myers, 10/e, TMH, 2012.
10. Financial Management & Policy- Vanhorne, James C., 12/e, Pearson, 2002
11. Fundamentals of Financial Management – Sharan, 2/e, Pearson, 2005.
12. Financial Management – Paresh P. Shah, 2/e, Biztantra.
13. Financial Management: Comprehensive Text Book with case Studies – Ravi M. Kishore, 7/e, Taxmann.
14. Financial Management – Sudarshan Reddy, H P H

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SALES AND RETAIL MANAGEMENT

Sub Code: **12MBAMM312**	IA Marks 50
No.of Lecture Hrs/week : 04	Exam Hrs. : 03 Hours
Total No. of Lecture Hrs. : 56	Exam Marks : 100
Practical Component : 01 Hr/ Week	

PART – A

SALES MANAGEMENT

Module I **(8 Hours)**

Introduction to sales management: Meaning, Personal Selling, the sales management process Emerging Trends in Sales Management, Qualities and Responsibilities of a sales manager. **Selling skills & selling strategies:** selling and buying styles, selling situations, selling skills, selling process

Module II **(6Hours)**

Sales organization: Meaning, Factors influencing structure, organisational principle and design key account sales, sales process automation, emerging organisational designs **Management of Sales Territory & Sales Quota:**

Sales territory, meaning, size, designing, sales quota, procedure for setting sales quota ,Types of sales quota, Methods of setting sales Quota.

Module III **(6 Hours)**

Recruitment and selection of sales force: Hiring process, sources, selection process. **Training: -** process, types of training and training methods, designing a sales training programme,

Module IV **(6 Hours)**

Sales force motivation: Nature of motivation, Importance, Process and factors in the motivation, **Compensation**: **-** Meaning, Types compensation plans and **evaluation: -** of sales force by performance and appraisal process.

Case Studies on Sales Management **(2 Hours)**

PART – B

RETAIL MANAGEMENT

Module V **(7 Hours)**

Retailing: - Meaning, Nature, Classification, Growing Importance of Retailing, Factors Influencing Retailing, Functions of Retailing, and Retail as a career. Developing and applying Retail Strategy, Strategic Retail Planning Process, Retail Organization, The changing Structure of retailing, Classification of Retail Units, Types of Retail Formats

Module VI **(7 Hours)**

Setting up Retail organization: Size and space allocation, location strategy, factors Affecting the location of Retail, Retail location Research and Techniques, Objectives of Good store Design.
Store Layout and Space planning: Types of Layouts, role of Visual Merchandiser, Visual Merchandising Techniques, Controlling Costs and Reducing Inventories Loss, Exteriors, Interiors.
Store Management: Responsibilities of Store Manager, Store Security, Parking Space Problem at Retail Centers, Store Record and Accounting System, Coding System, Material Handling in Stores, Management of modern retails stores.

Module VII **(6 Hours)**

Emergence of Organized Retiling: Traditional Retailing, Organized Retailing in India, Retailing in rural India, Retail Environment in India, FDI in retailing, Role of IT in retailing, Emerging trends in organized retailing

Module VIII **(6 Hours)**

Retail Pricing: Factors influencing retail pricing, Retail pricing strategies, Retail promotion strategies
Relationship Marketing in Retailing: Management & Evaluation of Relationships in Retailing, Retail **Research in Retailing:** Importance of Research in Retailing, Trends in Retail Research, Areas of Retail Research. Customer Audits, Brand Management in retailing
Case Studies **(2Hours)**

Practical Components:

- Interview a salesperson and write a brief report about what they like and dislike about their jobs, their salary, travelling allowances, sales quotas, why they chose a sales career, and what does it take to succeed in this profession.
- Go to a kirana store and a supermarket and compare the following: a) store arrangement b) No of brands carried c) pricing policies – are discounts given? d) service – personal or impersonal? Etc etc.
- Go to around three kirana stores in your neighbourhood (around 2 kms) and discuss with them the importance of location, pricing, credit policy, etc . What percentages of goods is sold 'loose' in each locality and compare this with the approximate income range of the customers? What are the retailers losses when a customer defaults in payment? Does he make up for it by increasing his prices to other customers?
- Ask your friends if they would buy certain goods like groceries, vegetables, socks, mobile, pens etc from the roadside vendor as against a regular shop. Group the products into low risk and high risk ones. Does this buying behavior also depend on the personality of the individual doing the buying? Or the one doing the selling?
- Student can make a presentation on any product or the services of student choice, covering selling strategies and one day work exposure towards merchandising in any big retail outlets of respective places where institute is operating. Rural colleges can send the students to the city nearby to observe the merchandising planning in retail outlets and to make a small report.

RECOMMENDED BOOKS:

1. Sales & Distribution Management - Tapan K. Panda & Sunil Sahadev, 6/e, Oxford University Press.
2. Managing of Sales Force - Spiro Stanton Rich, 11/e, TMH, 2003.
3. Sales Management: Text and Cases – Ghosh P. K, HPH.
4. Integrated Retail Management - James R. Ogden & Denise T. Ogden, Biztantra, 2003.
5. Retail Management - Levy & Weitz, 8/e, TMH, 2012.
6. Retailing Management - Swapana Pradhan, 4/e, TMH, 2012.
7. Retail Marketing Management - Dravid Gilbert, 2/e, Pearson Education.
8. The Art of Retailing - A. J. Lamba,McGraw Hill.
9. Retail Management: A Strategic Approach - Barry Berman, Joel R. Evans, Pearson.

REFERENCE BOOKS:

1. Sales & Retail Management : An Indian Perspective - S.L. Gupta, 1/e, 2007, Excell books.
2. Salesmanship and Sales Management - Sahu P. K & Raut K. C, 3/e, Vikas Publishing House.
3. Sales Management - Douglas J. Dalrymple, William L Crowe, John Wiley & Co.
4. Sales & Distribution Management: An Indian Perspective – Gupta S. L, Excel Books, 2010.
5. Principles of Retail Management - Rosemary Varley, Mohammed Rafiq, Palgrave Macmillan, 2009..
6. Retail Management -Chetan Bajaj, Oxford University press.
7. Managing Retailing -Sinha, Piyush Kumar & Uniyal & Oxford University Press, 2010.
8. Retail Management – Arif Sheikh, HPH.

Website:

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HUMAN RESOURCE MANAGEMENT

Sub Code: **12MBA26**	IA Marks 50
No.of Lecture Hrs/week : 04	Exam Hrs. : 03 Hours
Total No. of Lecture Hrs. : 56	Exam Marks : 100
Practical Component : 01 Hr/ Week	

Module I **(6 Hours)**

Introduction, meaning and significance of HRM. Historical evolution of HRM. Major functions of HRM. Line functions and staff functions. Principles of HRM. HR Competencies. Institutions of repute which impart HRM education in India. Professional Associations in HRM. Career opportunities in HRM.

Module II **(6 Hours)**

Pre-recruitment functions of HRM- Organizational structure, Job analysis, HR Planning and budget approval. Strategic decision to outsource, engage contract workers or to recruit people on company role.

Module III **(8 Hours)**

Recruitment, selection and appointment: Meaning and significance of recruitment, process of recruitment, sources of recruitment, cost-benefit analysis of recruitment. Meaning and significance of selection, process of selection, selection techniques- tests, interviews and salary negotiation. Meaning and significance of appointment, process of appointment, legal aspects of employment contract, joining formalities and induction.

Module IV **(8 Hours)**

Training and development: Meaning and significance of training and development, Process of training development, needs analysis, training design, training implementation and training evaluation. Methods of training-on the job methods and off the job methods.

Module V **(6 Hours)**

Compensation and benefits: Meaning and significance of compensation and benefits. Basic salary, allowances, incentives, perks, and benefits. Structured pay scales of the government sector and cost to company approach of the private consultant. Statutory aspects of compensation and benefits.

Module VI **(8 Hours)**

Performance management: Meaning and significance of performance management. Process of performance management. Types of performance appraisal system. Performance goal setting, performance coaching and monitoring, performance evaluation and performance feedback. Aligning performance outcome to career and succession planning.

Module VII **(8 Hours)**

Employee Relations: Meaning and significance of employee relations. Employee relation in unionized and non-unionized organizations. Handling employee grievances. Employee discipline and domestic enquiry. Legal aspects of employee relations with reference to trade union Act, industrial employment standing orders Act and Industrial Disputes Act. Statutory aspects of health, welfare and safety of employees.

Module VIII **(6 Hours)**

Career and succession planning: Meaning, significance and process of career planning. Career stages, responsibility for career planning and career anchors. Meaning, significance and process of succession planning. Continuity of leadership and its impact on business.

Practical Component:

- Expose students to simulated recruitment exercises- Job profile, personal profile, advertisements etc.
- Expose students to standard selection tests followed in various sectors.
- Exploring performance appraisal practices in various sectors.
- Exploring training and development practices.
- Exploring employee separation practices.

- Give a job analysis case and ask the students to prepare job description and job specification.
- Conduct a debate on company employees versus contract employees.
- Give a case and ask the students to prepare the recruitment advertisement for a news paper.
- Ask the students to prepare an appointment letter for the post of office manager of a company known to you.
- Give a performance goal setting case and ask the students to perform dyadic role paying.

RECOMMENDED BOOKS:

1. Essentials of Human Resource Management and Industrial Relations – P Subba Rao, HPH.
2. Human Resource Management - Seema Sanghi, Macmillan, 2011.
3. Human Resource Management - Cynthia D. Fisher, 1/e, Cengage Learning..
4. Human Resource Management - Biswajeet Pattanayak, 3/e, PHI.
5. Human Resources Management: A South Asian Perspective, Snell, Bohlander, & Vohra, Cengage Learning, 16th Rep., 2012.
6. Human Resource Management - Lawrence S. Kleeman, Biztantra , 2012.
7. A Text Book of Human Resource Management – Dwivedi R. S, Vikas Publishing House.
8. Human Resource Management – Rao V. S. P, Excel Books, 2010.

REFERENCE BOOKS:

1. Human Resource Management - John M. Ivancevich, 10/e, McGraw Hill.
2. Human Resource Management in practice - Srinivas R. Kandula, PHI, 2009
3. Managing Human Resources - Luis R Gomez-Mejia, David B. Balkin, Robert L. Cardy, 6/e, PHI, 2010.
4. Human Resource Management - David A. Decenzo, Stephen P. Robbins, 10/e, Wiley India Pvt. Ltd., 2011.
5. Personnel Management – Memoria, HPH.

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