K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BENGALURU - 560109

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

CO-PO Mapping

Course: Analysis & Design of Algorithms				
Type: Core Course			Course Code: BCS401	
No of Hours				
Theory (Lecture Class)	Tutorials	Practical/Field Work/Allied Activities	Total/Week	Total hours of Pedagogy
3	0	2	3	40
Marks				
CIE	SEE	Total	Credits	
50	50	100	3	

Aim/Objectives of the Course

CLO 1 To learn the methods for analyzing algorithms and evaluating their performance.

CLO 2 To demonstrate the efficiency of algorithms using asymptotic notations.

CLO 3 To solve problems using various algorithm design methods, including brute force, greedy, divide and conquer, decrease and conquer, transform and conquer, dynamic programming, backtracking, and branch and bound.

CLO 4 To learn the concepts of P and NP complexity classes.

Course Learning Outcomes

After completing the course, the students will be able to

CO1	**Apply** asymptotic notational method to analyze the performance of the algorithms in terms of time complexity.	**Applying (K3)**
CO2	**Demonstrate** divide & conquer, Transform and Conquer and decrease & conquer approaches to solve computational problems.	**Understand(K2)**
CO3	**Make use of** Space and Time Tradeoffs and Greedy method design approaches to solve the given real world or complex computational problems.	**Applying (K3)**
CO4	Apply dynamic programming to solve graph problems and **Analyse** various classes (P, NP and NP Complete) of problems.	**Analyse (K3)**
CO5	**Illustrate** backtracking, branch & bound and approximation methods.	**Understand(K2)**

Syllabus Content	
Module 1: INTRODUCTION: What is an Algorithm? Fundamentals of Algorithmic Problem Solving **FUNDAMENTALS OF THE ANALYSIS OF ALGORITHM EFFICIENCY:** Analysis Framework, Asymptotic Notations and Basic Efficiency Classes, Mathematical Analysis of Non recursive Algorithms, Mathematical Analysis of Recursive Algorithms. **BRUTE FORCE APPROACHES:** Selection Sort and Bubble Sort, Sequential Search and Brute Force String Matching.	**CO1** 8 hrs PO1-1 PO2-3 PO3-3 PO4-3 PO6-1 PO12-1 PSO1-3
Module 2: **BRUTE FORCE APPROACHES (contd..):** Exhaustive Search (Travelling Salesman probem and Knapsack Problem). **DECREASE-AND-CONQUER:** Insertion Sort, Topological Sorting. **DIVIDE AND CONQUER:** Merge Sort, Quick Sort, Binary Tree Traversals, Multiplication of Large Integers and Strassen's Matrix Multiplication.	**CO2** 8 hrs. PO1-1 PO2-3 PO3-3 PO4-3 PO5-3 PO6-1 PO12-1 PSO1-3
Module 3 **TRANSFORM-AND-CONQUER:** Balanced Search Trees, Heaps and Heapsort. **SPACE-TIME TRADEOFFS:** Sorting by Counting: Comparison counting sort, Input Enhancement in String Matching: Horspool's Algorithm.	**CO3** 8 hrs PO1-1 PO2-3 PO3-3 PO4-3 PO5-3 PO6-1 PO12-1 PSO1-3
Module 4 **DYNAMIC PROGRAMMING:** Three basic examples, The Knapsack Problem and Memory Functions, Warshall's and Floyd's Algorithms. **THE GREEDY METHOD:** Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm, Huffman Trees and Codes.	**CO4** 8 hrs PO1-1 PO2-3 PO3-3 PO4-3 PO5-3 PO6-1 PO12-1 PSO1-3

Module 5 **LIMITATIONS OF ALGORITHMIC POWER:** Decision Trees, P, NP, and NP-Complete Problems. **COPING WITH LIMITATIONS OF ALGORITHMIC POWER**: Backtracking (n-Queens problem, Subset-sum problem), Branch-and-Bound (Knapsack problem), Approximation algorithms for NP-Hard problems (Knapsack problem).	**CO5** 8hrs PO1-1 PO2-3 PO3-3 PO4-3 PO5-3 PO6-1 PO12-1 PSO1-3

Textbooks

1. Introduction to the Design and Analysis of Algorithms, By Anany Levitin, 3rd Edition (Indian), 2017, Pearson.

Reference books

1. Computer Algorithms/C++, Ellis Horowitz, SatrajSahni and Rajasekaran, 2nd Edition, 2014, Universities Press.
2. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, 3rd Edition, PHI.

Design and Analysis of Algorithms, S. Sridhar, Oxford (Higher Education)

Useful Websites

- Design and Analysis of Algorithms: https://nptel.ac.in/courses/106/101/106101060/

Useful Journals

- https://journals.sagepub.com/home/act
- https://journals.stmjournals.com/ijada/

Teaching and Learning Methods

1. Lecture class: 40 hrs

Assessment

Type of test/examination: Written examination

Continuous Internal Evaluation(CIE)

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two

assignments at the end of the semester if two assignments are planned.

- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.
- Rubrics for each

The sum of three tests, two assignments, and quiz or activity will be out of 100 marks and will be scaled down to 50 marks

Total CIE: 50 Marks

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

Marks scored shall be proportionally reduced to 50 marks

CO to PO Mapping

PO1: Science and engineering Knowledge **PO2:** Problem Analysis **PO3:** Design & Development **PO4:**Investigations of Complex Problems **PO5:** Modern Tool Usage **PO6:** Engineer & Society	**PO7:**Environment and Society **PO8:**Ethics **PO9:**Individual & Team Work **PO10:** Communication **PO11:**Project Mngmt & Finance **PO12:**Life long Learning

PSO1: Ability to design and develop Artificial Intelligence technology into innovative products for solving real world problems.

PSO2: An ability to design and develop Data Science methods for analyzing massive datasets to extract insights by applying AI as a tool.

CO	PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
1AI 54	K-level														
O1	K3	1	3	3	3	-	1	-	-	-	-	-	1	3	-
O2	K3	1	3	3	3	3	1	-	-	-	-	-	1	3	-
O3	K3	1	3	3	3	3	1	-	-	-	-	-	1	3	-
O4	K2	1	3	3	3	3	1	-	-	-	-	-	1	3	-
O5	K2	1	3	3	3	3	1	-	-	-	-	-	1	2	-

Course-incharge IQAC HOD Principal

HOD
Dept. of Artificial Intelligence & Data Scienc
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K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BENGALURU - 560109

DEPARTMENT OF APPLIED SCIENCE

CO-PO Mapping

Course: Discrete Mathematical Structures			
Type: Core		Course Code: BCS405A	
No of Hours			
Theory (Lecture Class)	Practical/Field Work/Allied Activities	Total/Week	Total teaching hours
4(2:2)	0	4	40
Marks			
Internal Assessment	Examination	Total	Credits
40	60	100	3

Aim/Objectives of the Course: This course will enable students to:

- To help students to understand discrete and continuous mathematical structures.
- To impart basics of relations and functions.
- To facilitate students in applying principles of Recurrence Relations to find the generating functions and solve the Recurrence relations.
- To have the knowledge of groups and their properties to understand the importance of algebraic properties relative to various number systems

Course Learning Outcomes
After completing the course, the students will be able to

CO1	**Apply** concepts of logical reasoning and mathematical proof techniques in proving theorems and statements.	**Applying (K3)**
CO2	**Utilize** the basic concepts of relations, functions and partially ordered sets for computer representations..	**Applying (K3)**
CO3	**Apply** the terms involved in solving problems on mathematical induction and principles of counting	**Applying (K3)**
CO4	**Solve** problems using recurrence relations and principles of inclusion – exclusion.	**Applying (K3)**
CO5	**Illustrate** the fundamental principles of Algebraic structures with the problems related to computer science & engineering.	**Applying (K3)**

Syllabus Content

Module 2: Relations and Functions Cartesian Products and Relations, Functions – Plain and One-to-One, Onto Functions. The Pigeon-hole Principle, Function Composition and Inverse Functions. Properties of Relations, Computer Recognition – Zero-One Matrices and Directed Graphs, Partial Orders – Hasse Diagrams, Equivalence Relations and Partitions. (RBT Levels: L1, L2 and L3). **LO:** At the end of this session the student will be able to 1. Identify Cartesian products and relations. 2. Understand functions.	CO4 8 hrs PO1-3 PO2-3 PO4-3 PO6-1 PO9-1 PO12 -1 PSO1-2 PSO2-1

3. Solve hasse diagrams.	
Module 2: Properties of the Integers Mathematical Induction, The Well Ordering Principle – Mathematical Induction, Recursive Definitions. **Fundamental Principles of Counting:** The Rules of Sum and Product, Permutations, Combinations – The Binomial Theorem, Combinations wit **(RBT Levels: L1, L2 and L3)** **LO:** At the end of this session the student will be able to 1. Understand the well ordering principle. 2. Solve division algorithm and greatest common divisor. 3. Determine the rules of sum and product. 4. Derive binomial theorem	**CO3** 8 hrs PO1-3 PO2-3 PO4-3 PO6-1 PO9-1 PO12 -1 PSO1-2 PSO2-1
Module 4: The Principle of Inclusion and Exclusion: The Principle of Inclusion and Exclusion, Generalizations of the Principle, Derangements – Nothing is in its Right Place, Rook Polynomials. **Recurrence Relations:** First Order Linear Recurrence Relation, The Second Order Linear Homogeneous Recurrence Relation with Constant Coefficients. **(RBT Levels: L1, L2 and L3)** **LO:** At the end of this session the student will be able to 1. Apply the principles of inclusion and exclusion. 2. Identify and solve recurrence relations.	**CO5** 8 hrs. PO1-3 PO2-3 PO4-3 PO6-1 PO9-1 PO12 -1 PSO1-2 PSO2-1
Module-5: Introduction to Groups Theory Definitions and Examples of Particular Groups Klein 4-group, Additive group of Integers modulo n, Multiplicative group of Integers modulo-p and permutation groups, Properties of groups, Subgroups, cyclic groups, Cosets, Lagrange's Theorem (RBT Levels: L1, L2 and L3) **LO:** At the end of this session the student will be able to 1.Find the additive group of Integers modulo n, multiplicative group of Integers modulo-p 2. Find the Cosets. 3. Derive the lagranges theorem.	**CO2** 8 hrs PO1-3 PO2-3 PO4-3 PO6-1 PO9-1 PO12 -1 PSO1-2 PSO2-1
Text Books: 1. Ralph P. Grimaldi, B V Ramana: "Discrete Mathematical Structures an Applied Introduction", 5 th Edition, Pearson Education, 2004. 2. Ralph P. Grimaldi: "Discrete and Combinatorial Mathematics", 5th Edition, Pearson Education.	

2004..

Reference Books:

1. Basavaraj S Anami and Venakanna S Madalli: "Discrete Mathematics – A Conceptbased approach", Universities Press, 2016
2. Kenneth H. Rosen: "Discrete Mathematics and its Applications", 6th Edition, McGraw Hill, 2007. 3. Jayant Ganguly: "A Treatise on Discrete Mathematical Structures", SanguinePearson, 2010.
4. D.S. Malik and M.K. Sen: "Discrete Mathematical Structures Theory and Applications, Latest Edition, Thomson, 2004.
5. Thomas Koshy: "Discrete Mathematics with Applications", Elsevier, 2005, Reprint 2008

Useful Websites

- https://youtu.be/xIUFkMKSB3Y (Propositional Logic)
- https://youtu.be/oU60TuGHxe0 (MI)
- https://youtu.be/Dsi7x-A89Mw (Permutation and Combination)
- https://youtu.be/_BIKq9Xo_5A (Relations)
- https://youtu.be/A__s7cm17KI (Principle of Inclusion Exclusion)

Useful Journals

- Discrete mathematics-Journal-Elsevier
- SIAM Journal on discrete mathematics
- Discrete mathematics & applications-De Gruyter
- Journal of graph theory

Activity-Based Learning (Suggested Activities in Class)/Practical-Based Learning

- Quizzes
- Assignments
- Seminar

Teaching and Learning Methods

1. Lecture class: 40 hrs

Assessment

Type of test/examination: Written examination
Continuous Internal Evaluation (CIE): 50 marks (Average best of two tests will be considered for 25+assignment 25)
Semester End Exam (SEE): 50 marks (students have to answer all main questions)
Test duration: 1 hr :30 min
Examination duration: 3 hrs

CO to PO Mapping

PO1: Science and engineering Knowledge	**PO7:** Environment and Society
PO2: Problem Analysis	**PO8:** Ethics
PO3: Design & Development	**PO9:** Individual & Team Work
PO4: Investigations of Complex Problems	**PO10:** Communication
PO5: Modern Tool Usage	**PO11:** Project Management & Finance
PO6: Engineer & Society	**PO12:** Life- long Learning

PSO1: Understand fundamental and advanced concepts in the core areas of Computer Science and Engineering to analyse, design and implement the solutions for the real-world problems.

PSO2: Utilize modern technological innovations efficiently in various applications to work towards the betterment of society and solve engineering problems.

CO-PO and PSO MAPPING:

CO	PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
BCS405A	K-level														
CO1	K3	3	3	-	3	-	1	-	-	1	-	-	1	2	1
CO2	K3	3	3	-	3	-	1	-	-	1	-	-	1	2	1
CO3	K3	3	3	-	3	-	1	-	-	1	-	-	1	2	1
CO4	K3	3	3	-	3	-	1	-	-	1	-	-	1	2	1
CO5	K3	3	3	-	3	-	1	-	-	1	-	-	1	2	1

Vinutha. S.V
Course In charge

07/05/2024
Head of The Department
Dr. C. VASUDEV
Professor & HOD
Department of Applied Science
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Principal
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K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BENGALURU - 560109

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SESSION : 2023-24 [EVEN SEM]

CO-PO Mapping

Course: Microcontroller				
Type: Integrated Professional Core Course			Course Code: BCS402	
No of Hours				
Theory (Lecture Class)	Tutorials	Practical/Field Work/Allied Activities	Total/Week	Total hours of Pedagogy
3	0	2	5	40 T + 20 P
Marks				
CIE	SEE		Total	Credits
50	50		100	4

Aim/Objectives of the Course

1. Understand the fundamentals of ARM-based systems and basic architecture of CISC and RISC.
2. Familiarize with ARM programming modules along with registers, CPSR and Flags.
3. Develop ALP using various instructions to program the ARM controller.
4. Understand the Exceptions and Interrupt handling mechanism in Microcontrollers.
5. Discuss the ARM Firmware packages and Cache memory polices.

Course Learning Outcomes

After completing the course, the students will be able to

CO1	**Explain** the ARM Architectural features and Instructions.	**Applying (K3)**
CO2	**Develop** programs using ARM instruction set for an ARM Microcontroller	**Applying (K3)**
CO3	**Explain** C-Compiler Optimizations and portability issues in ARM Microcontroller	**Applying (K3)**
CO4	**Apply** the concepts of Exceptions and Interrupt handling mechanisms in developing applications.	**Applying (K3)**
CO5	**Demonstrate** the role of Cache management and Firmware in Microcontrollers.	**Applying (K3)**

Syllabus Content

Module 1:ARM Embedded Systems: The RISC design philosophy, The ARM Design Philosophy, Embedded System Hardware, Embedded System Software. **ARM Processor Fundamentals:** Registers, Current Program Status Register, Pipeline, Exceptions, Interrupts, and the Vector Table, Core Extensions **LO:** At the end of this session the student will be able to 1. Understand the design philosophy of ARM processor. 2. Understand the fundamentals of ARM processor	**CO1** 8hrs PO1-3 PO2-2 PO3-2 PO5-3 PO6-2 PO12-2

	PSO1-3 PSO2-2
Module 2: Introduction to the ARM Instruction Set: Data Processing Instructions, Branch Instructions, Software Interrupt Instructions, Program Status Register Instructions, Coprocessor Instructions, Loading Constants. **LO:**At the end of this session the student will be able to 1. Understand the different instructions and registers of ARM processor. 2. Demonstrate the programming using ARM instructions.	**CO2** 8 hrs. PO1-3 PO2-2 PO3-3 PO5-3 PO6-2 PO12-2 PSO1-3 PSO2-2
Module 3: C Compilers and Optimization: Basic C Data Types, C Looping Structures, Register Allocation, Function Calls, Pointer Aliasing, Portability Issues. **LO:** At the end of this session the student will be able to 1. Explain the operation of assembly code and their programs. 2. Understand the execution of Assembly language programs.	**CO3** 8hrs PO1-3 PO2-3 PO3-2 PO5-3 PO6-2 PO12-2 PSO1-3 PSO2-2
Module 4:Exception and Interrupt Handling: Exception handling, ARM processor exceptions and modes, vector table, exception priorities, link register offsets, interrupts, assigning interrupts, interrupt latency, IRQ and FIQ exceptions, basic interrupt stack design and implementation. **Firmware:** Firmware and bootloader, ARM firmware suite, Red Hat redboot, Example: sandstone, sandstone directory layout, sandstone code structure. **LO:** At the end of this session the student will be able to 1. Understand the concept exception handling. 2. Explain about ARM processor exceptions and modes. 3. Understand the working of firmware.	**CO4** 8 hrs PO1-3 PO2-3 PO3-3 PO5-3 PO6-2 PO12-2 PSO1-3 PSO2-2
Module 5:CACHES: The Memory Hierarchy and Cache Memory, Caches and Memory Management Units: CACHE Architecture: Basic Architecture of a Cache Memory, Basic Operation of a Cache Controller, The Relationship between Cache and Main Memory, Set Associativity, Write Buffers, Measuring Cache Efficiency, CACHE POLICY: Write Policy—Writeback or Writethrough, Cache Line Replacement Policies, Allocation Policy on a Cache Miss. Coprocessor 15 and caches	**CO5** 8 hrs PO1-3 PO2-3

- The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.

CIE for the practical component of the IPCC

1. **15 marks** for the conduction of the experiment and preparation of laboratory record, and **10 marks** for the test to be conducted after the completion of all the laboratory sessions.
2. On completion of every experiment/program in the laboratory, the students shall be evaluated including viva-voce and marks shall be awarded on the same day.
3. The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to **15 marks**.
4. The laboratory test **(duration 02/03 hours)** after completion of all the experiments shall be conducted for 50 marks and scaled down to **10 marks.**
5. Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **25 marks**.
6. The student has to secure 40% of 25 marks to qualify in the CIE of the practical component of the IPCC.

SEE for IPCC

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored by the student shall be proportionally scaled down to 50 Marks.

The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper may include questions from the practical component Semester End Exam (SEE): 100 marks (students have to answer all main questions) which will be reduced to 50 Marks.

CO to PO Mapping

PO1: Science and engineering Knowledge	**PO7:** Environment and Society
PO2: Problem Analysis	**PO8:** Ethics
PO3: Design & Development	**PO9:** Individual & Team Work
PO4: Investigations of Complex Problems	**PO10:** Communication
PO5: Modern Tool Usage	**PO11:** Project Mgmt. & Finance
PO6: Engineer & Society	**PO12:** Lifelong Learning

PSO1: Understand fundamental and advanced concepts in the core areas of Computer Science and Engineering to analyze, design and implement the solutions for the real world problems.

PSO2: Utilize modern technological innovations efficiently in various applications to work towards the betterment of society and solve engineering problems

LO: At the end of this session the student will be able to 1. Understands the basics of Memory Hierarchy and Cache Memory. 2. Understands theCACHE Architecture. 3. Understand CACHE policy. 4. Understand The Relationship between Cache and Main Memory.	PO3-2 PO5-3 PO6-2 PO12-2 PSO1-3 PSO2-2

Text Books

1. Andrew N Sloss, Dominic Symes and Chris Wright, ARM system developers guide, Elsevier, Morgan Kaufman publishers, 2008.

Reference Books

1. Raghunandan.G.H, Microcontroller (ARM) and Embedded System, Cengage learning Publication, 2019.
2. Insider's Guide to the ARM7 based microcontrollers, Hitex Ltd.,1st edition, 2005

Additional Reading

David E. Culler, Jaswinder Pal Singh, Anoop Gupta: Parallel Computer Architecture, A Hardware / Software Approach, Morgan Kaufman, 1999

Useful Websites

https://nptel.ac.in/courses/117/104/117104072/
https://nptel.ac.in/courses/117/106/117106112/
https://www.coursera.org

Useful Journals

- American Journal of Embedded System and Applications.
- Journal of Microprocessors and Microsystems: Embedded Hardware Design (MICPRO)

Teaching and Learning Methods

1. Lecture class: 40 hrs
2. Practical: 20 hrs

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

CIE for the theory component of the IPCC (maximum marks 50)

- IPCC means practical portion integrated with the theory of the course.
- CIE marks for the theory component are **25 marks** and that for the practical component is **25 marks**.
- 25 marks for the theory component are split into **15 marks** for two Internal Assessment Tests (Two Tests, each of 15 Marks with 01-hour duration, are to be conducted) and **10 marks** for other assessment methods mentioned in 22OB4.2. The first test at the end of 40-50% coverage of the syllabus and the second test after covering 85-90% of the syllabus.
- Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for **25 marks**).

CO	PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
BCS402	K-level														
CO1	K3	3	2	2	--	3	2	--	--	--	--	--	2	3	2
CO2	K3	3	2	3	--	3	2	--	--	--	--	--	2	3	2
CO3	K3	3	3	2	--	3	2	--	--	--	--	--	2	3	2
CO4	K3	3	3	3	--	3	2	--	--	--	--	--	2	3	2
CO5	K3	3	3	2	--	3	2	--	--	--	--	--	2	3	2

Course In charge

HOD-CSE

HOD
Department of Computer Science Engineering
K.S School of Engineering & Management
Bangalore-560109

IQAC Coordinator

Principal

Dr. K. RAMA NARASIMHA
Principal/Director
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K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BENGALURU - 560109
DEPARTMENT OF CIVIL ENGINEERING
2023-24 EVEN SEMESTER

CO-PO Mapping

Course: Analysis of Structures				
Type: Core			Course Code: BCV401	
No of Hours				
Theory (Lecture Class)	Tutorials	Practical/Field Work/Allied Activities	Total/Week	Total hours of Pedagogy
3	0	0	3	40
Marks				
CIE	SEE		Total	Credits
50	50		100	3

Aim/Objectives of the Course

1. To understand the different forms of structural systems.
2. To determine the strain energy and slope and deflection of beams, trusses and frames.
3. To analyze arches and cable structures.
4. To analyze different types of beams and frames using slope deflection method.
5. To aanalyze different types of beams and frames using moment distribution method.

Course Learning Outcomes
After completing the course, the students will be able to

CO1	**Identify** the different forms of structural systems and **analyze** the trusses.	**Applying (K3)**
CO2	**Analyze** and **determine** the stress resultants inarches and cables.	**Applying (K3)**
CO3	**Analyze** the indeterminate structures and **sketch** BMD and SFD using slope deflection method.	**Analyzing (K4)**
CO4	**Analyze** the indeterminate structures and **draw** BMD and SFD using moment distribution method.	**Analyzing (K4)**
CO5	**Evaluate** the slope and deflection in beams, frames and trusses by using moment area method and energy principles.	**Applying (K3)**

Syllabus Content

Module 1: Introduction and Analysis of Plane Trusses: Structural forms, Conditions of equilibrium, Compatibility conditions, Degree of freedom, Linear and nonlinear analysis, Static and kinematic indeterminacies of structural systems, Types of trusses, Assumptions in analysis, Analysis of determinate trusses by method of joints and method of sections.	CO1 8 hrs

LO: At the end of this session the student will be able to 1. **Define** equilibrium; compatibility conditions; linear and non-linear systems; geometric and material non-linearity. 2. **Explain** statically determinate and indeterminate structures with examples. 3. **Distinguish** between static and kinematic indeterminacies with examples. 4. **Determine** the static and kinematic indeterminacies for the structures shown. 5. **Explain** the salient features of stress-strain diagram for structural steel. 6. **Analyze** the trusses shown using method of joints. **Indicate** the member forces and **tabulate** the results. 7. **Determine** the member forces in the given truss using method of sections.	PO1-3 PO2-3 PO12 -1 PSO1-3 PSO2-2
Module 2: Arches and Cable Structures: Three hinged parabolic arches with supports at the same and different levels. Determination of normal thrust, radial shear and bending moment. Analysis of cables under point loads and UDL. Length of cables for supports at same and at different levels- Stiffening trusses for suspension cables. **LO:** At the end of this session the student will be able to, 1. **Determine** the reaction components at supports for the given arch and **evaluate** the BM, normal thrust and radial shear at the given distance. Also **sketch** the BMD. 2. **Explain** the method of deriving equations for cable profile and tension in the cable when it is supported at the same level and subjected to horizontal UDL. 3. **Analyze** the given cable and **determine** the length of the cable, max. and min. tensions developed in the cable and the size of the cable. 4. **Analyze** the given cable and determine the forces in the tower when, (i) cable passes over smooth pulley (ii) cable passes over saddle.	**CO2** 8 hrs PO1-3 PO2-3 PO12 -1 PSO1-3 PSO2-2
Module 3: Slope Deflection Method: Introduction, sign convention, development of slope deflection equation; Analysis of continuous beams including settlement of supports; Analysis of orthogonal rigid plane frames including sway frames with kinematic indeterminacy up to 3. **LO:** At the end of this session the student will be able to, 1. **Analyze** a propped cantilever subjected to UDL of w kN/m and span L, using slope-deflection method. 2. **Analyze** the given beam by slope-deflection method and **draw** bending moment diagram and shear force diagram. 3. **Analyze** the given frame by slope-deflection method and **draw** bending moment diagram and shear force diagram.	**CO3** 8 hrs. PO1-3 PO2-3 PO12 -1 PSO1-3 PSO2-2
Module 4: Moment Distribution Method: Introduction, Definition of terms, Development of method, Analysis of continuous beams with support yielding, Analysis of orthogonal rigid plane frames including sway frames with kinematic indeterminacy up to 3. **LO:** At the end of this session the student will be able to, 1. **Explain** fixed end moments for different loading conditions with relevant diagrams.	**CO4** 8 hrs PO1-3 PO2-3

2. **Analyze** the given beam by moment-distribution method and **draw** bending moment diagram and shear force diagram. 3. **Analyze** the given frame by slope-deflection method and **draw** bending moment diagram and shear force diagram.	PO12 -1 PSO1-3 PSO2-2
Module 5: Deflection of Beams: Moment area method: Derivation, Mohr's theorems, sign convention; Application of moment area method to determinate prismatic beams, beams of varying cross section; Use of moment diagram by parts. **Strain Energy:** Principle of virtual displacements, Principle of virtual forces, Strain energy and complimentary energy, Strain energy due to axial force, bending, shear and torsion (No numerical). Castigliano's theorems, application of Castigliano's theorems to calculate deflection of beams, trusses and frames (No numerical on unit load method). **LO:** At the end of this session the student will be able to, 1. **State** and **explain** Mohr's theorems. 2. **State** and **explain** Castigliano's first and second theorems. 3. **Derive** expressions for strain energy due to (i) axial force (ii) bending (iii) shear (iv) torsion. 4. **State** the principles of virtual displacements and forces. 5. **Analyze** the given beam by moment-area method.	**CO5** 8 hrs PO1-3 PO2-3 PO12 -1 PSO1-3 PSO2-2

Suggested Learning Resources:

Text Books

1. Reddy, C.S., Basic Structural Analysis, 3 rd. ed., Tata McGraw-Hill Education Pvt. Ltd., New Delhi, 2011.
2. Hibbeler, R.C., Structural Analysis, 9th edition., Pearson publications., New Delhi, 2012.
3. Thandavamoorthy, T.S., Structural Analysis, 6th edition., Oxford University press., New Delhi,2015.
4. L S Negi and R S Jangid, "Structural Analysis", Tata McGraw-Hill Publishing Company Ltd.
5. D S Prakash Rao, "Structural Analysis: A Unified Approach", Universities Press.
6. K.U. Muthu and H. Narendra, "Indeterminate Structural Analysis", IK International Publishing Pvt. Ltd.
7. Gupta S P, G S Pundit and R Gupta, "Theory of Structures", Vol II, Tata McGraw Hill Publications company Ltd.
8. V N Vazirani and M M Ratwani, "Analysis of Structures", Vol. 2, Khanna Publishers.
9. Wang C K, "Intermediate Structural Analysis", McGraw Hill, International Students Edition. S. Rajashekhara and G. Sankarasubramanian, "Computational Structural Mechanics", PHI Learning Pvt. Ltd.
10. S S Bhavikatti, structural analysis, Vikas publishing house Pvt. Ltd., New Delhi.
11. S Ramamrutham and R Narayanan, Theory of Structures, Dhanpat Rai Publishing Company.

Web links and Video Lectures (e-Resources):

1. Structural Analysis I video course by IIT Kharagpur https://nptel.ac.in/courses/105105166.
2. Structural Analysis I video course by IIT Kharagpur https://nptel.ac.in/courses/105105109.

Useful Journals

- Journal of Structural Engineering.
- International Journal of Structural Engineering and Analysis.

Teaching and Learning Methods

1. Lecture class: 40 hrs

Assessment

Type of test/examination: Written examination
Continuous Internal Evaluation (CIE): 50 marks. Average of two internal assessment tests each of 25 marks. Sum of two assignments (each of 25 Marks) shall be scaled down to 25 Marks.
Semester End Exam (SEE): 100 marks (students have to answer all main questions) which will be scaled down to 50 Marks.
Test duration: 1 hrs
Examination duration: 3 hrs.

CO to PO Mapping

PO1: Science and engineering Knowledge **PO2:** Problem Analysis **PO3:** Design & Development **PO4:**Investigations of Complex Problems **PO5:** Modern Tool Usage **PO6:** Engineer & Society	**PO7:**Environment and Sustainability **PO8:**Ethics **PO9:**Individual & Team Work **PO10:** Communication **PO11:**Project Management & Finance **PO12:**Life long Learning

PSO1: The proficiency in mathematics, physical and management sciences helps to excel in the areas of planning, analysis related to Civil Engineering systems.

PSO2: Identify sustainable materials and technologies, code of practices in construction industry and transportation systems.

CO	PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
BCV 401	K-level														
CO1	K3	3	3	-	-	-	-	-	-	-	-	-	1	3	2
CO2	K3	3	3	-	-	-	-	-	-	-	-	-	1	3	2
CO3	K3	3	3	-	-	-	-	-	-	-	-	-	1	3	2
CO4	K4	3	3	-	-	-	-	-	-	-	-	-	1	3	2
CO5	K4	3	3	-	-	-	-	-	-	-	-	-	1	3	2

Course In charge

Head - Dept

Professor & Head
Dept. of Civil Engineering
K.S. Group of Institutions
K.S. School of Engineering & Management
Bangalore-560 062.

IQAC Coordinator

Principal
Dr. K. RAMA NARASIMHA
Principal/Director
K S School of Engineering and Management
Bengaluru - 560 109

K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BENGALURU - 560109

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

SESSION: 2023-2024 (EVEN SEMESTER)

CO-PO MAPPING

Course Title : PRINCIPLES OF COMMUNICATION SYSTEMS			
Type: IPCC		Course Code: BEC402	
No of Hours			
Theory (Lecture Class)	Practical/Field Work/Allied Activities	Total/Week	Total teaching hours
4	2	4+2	40+ 10Lab slots
Marks			
Internal Assessment	Examination	Total	Credits
50	50	100	4

Aim/Objectives of the Course:

1. To understand and analyse concepts of Analog Modulation schemes- AM, SSB, DSBSC and to determine power and bandwidth.
2. To understand and analyse the concept of and FM modulation and demodulation.
3. To understand the concepts of PAM, PPM a, PWM and PCM Modulation techniques.
4. To understand and analyse the concepts of lSI-Nyquist Criterion, Eye pattern. Also discuss the concept of noise, noise level, calculate signal to noise ratio in cascading stages.
5. To understand the concept of probability, random variable correlation autocorrelation and its properties.

Course Learning Outcomes

After completing the course, the students will be able to

CO1	Explain the concepts of Amplitude modulation, DSBSC Modulation, SSB modulation and different demodulation technique of AM Wave also **determine** power, bandwidth and sketch the spectrum.	**Applying (K3)**
CO2	Explain frequency modulation and demodulation technique by different methods and also **calculate** the frequency deviation, modulation index and sketch the FM wave.	**Applying (K3)**
CO3	Explain the working of PAM, generation and demodulation technique of PPM waves and PCM wave. Also **calculate** the Nyquist rate and bandwidth of signals.	**Applying (K3)**
CO4	Explain the concept of lSI-Nyquist Criterion, Eye pattern. Also discuss the concept of noise, noise level, **calculate** signal to noise ratio in cascading stages.	**Applying (K3)**
CO5	Explain the concept of conditional probability, random process mean, correlation, covariance, and **determine** auto correlation along with Gaussian distribution function.	**Applying (K3)**

Syllabus Content	
Module 1: **Amplitude Modulation Fundamentals:** AM Concepts, Modulation index and Percentage of Modulation, Sidebands and the frequency domain, AM Power, Single Sideband Modulation. **AM Circuits:** Amplitude Modulators: Diode Modulator, Transistor Modulator, collector Modulator. Amplitude Demodulators: Diode Detector, Balanced Modulators: Lattice Modulators. **Frequency Division Multiplexing:** Transmitter-Multiplexer, Receiver-Demultiplexer. LO's: After the completion of this unit, the students will be able to 1. Explain the concept of amplitude modulation and modulation index. 2. Determine the average power of an amplitude modulated wave. 3. Explain the concept of low level modulator and high level modulator of an AM wave. 4. Explain the working of Frequency Division Multiplexing.	**CO1** 08 hrs. PO1-3 PO2-3 PO3-3 PO5-2 PO9-1 PO12 -1 PSO1-3 PSO2-2
Module 2: **Fundamentals of Frequency Modulation:** Basic Principles of Frequency Modulation, Principles of Phase Modulation, Modulation index and sidebands, Noise Suppression Effects of FM, Frequency Modulation versus Amplitude Modulation. **FM Circuits:** Frequency Modulators: Voltage Controlled Oscillators. , Frequency Demodulators: Slope Detectors, Phase Locked Loops. **Communication Receiver:** Super heterodyne receiver, Frequency Conversion: Mixing Principles, JFET Mixer. LO's: After the completion of this unit, the students will be able to 1. Explain the concept of frequency modulation and modulation index. 2. Explain the working of 10-GHz SiGe integrated VCO. 3. Determine of the frequency deviation caused by the noise and the improved output S/N?	**CO2** 08 hrs PO1-3 PO2-3 PO3-3 PO5-2 PO9-1 PO12 -1 PSO1-3 PSO2-2
Module 3: **Digital Representation of Analog Signals:** Introduction, Why Digitize Analog Sources? The Sampling process, Pulse Amplitude Modulation, Time-Division Multiplexing, Pulse Position Modulation: Generation and Detection of PPM wave. The Quantization Process. Pulse Code Modulation: Sampling, Quantization, Encoding, line Codes, Differential encoding, Regeneration, Decoding, filtering, multiplexing. **LO's:** After the completion of this unit, the students will be able to 1. Why digitize analog signals? List out the comparison between Anglo and Digital communication systems. 2. With mathematical equations, explain the concept of sampling process indicating the aliasing.	**CO3** 08 hrs PO1-3 PO2-3 PO3-3 PO5-2 PO9-1 PO12 -1 PSO1-3 PSO2-2

3. Given the data stream 1110010100. Sketch the transmitted sequence of pulses for each of the following line code. (a)Unipolar NRZ, (b) bipolar RZ.	
Module 4: **Baseband Transmission of Digital signals:** Introduction, Intersymbol Interference, Eye Pattern, Nyquist criterion for distortion less Transmission, Baseband M-ary PAM Transmission. **Noise:** Signal to Noise Ratio, External Noise, Internal Noise, Semiconductor Noise, Expressing Noise Levels, Noise in Cascade Stages. **LO's:** After the completion of this unit, the students will be able to 1. Define Intersymbol Interference (ISI). Outline Baseband binary data transmission system with neat block diagram and equations. 2. Illustrate the concept of noise in cascaded stages with a diagram. Write Friis' formula and mention its terms. 3. Explain the following concepts briefly: a. Nyquist criterion for distortionless transmission b. Baseband M-ary PAM transmission.	**CO4** 08 hrs PO1-3 PO2-3 PO3-3 PO5-2 PO9-1 PO12 -1 PSO1-3 PSO2-2
Module 5 **Random Variables and Processes:** Introduction, Probability, Conditional Probability, Random variables. Statistical Averages: Function of a random variable, Moments, Random Processes, Mean, Correlation and Covariance function: Properties of autocorrelation function, Cross–correlation functions, Gaussian Process: Gaussian Distribution Function. **LO's:** After the completion of this unit, the students will be able to 1. Define Probability. Illustrate the relationship between sample space, events and probability. 2. What is the pdf of $Y = \cos x = g(x)$, where x is a random variable uniformly distributed in the interval ($-\pi$, π). Compute the expected value of Y. 3. Define Autocorrelation Function and Cross correlation function explain the properties of ACF 4. What is conditional probability? Prove that P(B/A) = P(A/B).P(B)/P(A)	**CO5** 08 hrs PO1-3 PO2-2 PO3-3 PO5-2 PO9-1 PO12 -1 PSO1-3 PSO2-2

PRACTICAL COMPONENT OF IPCC: Using suitable simulation software, demonstrate the operation of the following circuits: 1. Basic Signals and Signal Graphing: a) unit Step, b) Rectangular, c) standard triangle d) sinusoidal and e) Exponential signal. 2. Illustration of signal representation in time and frequency domains for a rectangular pulse. 3. Amplitude Modulation and demodulation: Generation and display the relevant signals and its spectrums. 4. Frequency Modulation and demodulation: Generation and display the relevant signals and its spectrums. 5. Sampling and reconstruction of low pass signals. Display the signals and its spectrum. 6. Time Division Multiplexing and Demultiplexing. 7. PCM Illustration: Sampling, Quantization and Encoding 8. Generate a)NRZ, RZ and Raised cosine pulse, b) Generate and plot eye diagram 9. Generate the Probability density function of Gaussian distribution function. 10. Display the signal and its spectrum of an audio signal.	**CO 4, 5** 13 hrs. PO1-3 PO2-3 PO3-3 PO5-1 PO9-1 PO12 -1 PSO1-3 PSO2-2

Text Books:

1. Louis E Frenzel, Principles of Electronic Communication Systems, 3rd Edition, Mc Graw Hill Education (India) Private Limited, 2016. ISBN: 978-0-07-066755-6.
2. Simon Haykin & Michael Moher, Communication Systems, 5th Edition, John Wiley, India Pvt. Ltd, 2010, ISBN:978-81-265-2151-7

Reference Books:

1. B P Lathi, Zhi Ding, "Modern Digital and Analog Communication Systems", Oxford University Press., 4th edition, 2010, ISBN: 97801980738002.
2. Herbert Taub, Donald L Schilling, Goutam Saha, "Principles of Communication systems", 4th Edition, Mc Graw Hill Education (India) Private Limited, 2016. ISBN: 978-1-25-902985-1

Useful Websites

1. Principles of Communication Systems **https://nptel.ac.in/courses/108104091**
2. Communication Engineering **https://nptel.ac.in/courses/117102059**

Useful Journals

1. AEÜ - International Journal of Electronics and Communications-Elsevier

Teaching and Learning Methods

1. Lecture class: 40 hours
2. Practical classes: 14 hours

Assessment

Type of test/examination: Written examination

Continuous Internal Evaluation(CIE) : 50 marks (20 marks -Average of three tests + 10 marks Assignments+20 Lab Component(15 marks: Record and Observation, 5marks: Lab test)

Semester End Exam (SEE): 100 marks (students have to answer all main questions) which will be reduced to 50 Marks.

Test duration: 1 :00 hours

Examination duration: 3 hours

CO to PO Mapping

PO1: Science and engineering Knowledge	**PO7:**Environment and Sustainability
PO2: Problem Analysis	**PO8:**Ethics
PO3: Design & Development	**PO9:**Individual & Team Work
PO4: Investigations of Complex Problems	**PO10:** Communication
PO5: Modern Tool Usage	**PO11:**Project Management & Finance
PO6: Engineer & Society	**PO12:**Life Long Learning

PSO1: Be able to acquire knowledge and apply concepts in the field of engineering and interdisciplinary subjects.

PSO2: Be able to identify the existing problems, effectively utilize tools to provide solution, and disseminate the information.

CO	PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
BEC 402	K-level														
CO1	K3	3	3	3	-	2	-	-	-	1	-	-	1	3	2
CO2	K3	3	3	3	-	2	-	-	-	1	-	-	1	3	2
CO3	K3	3	3	3	-	2	-	-	-	1	-	-	1	3	2
CO4	K3	3	3	3	-	2	-	-	-	1	-	-	1	3	2
CO5	K3	3	2	3	-	2	-	-	-	1	-	-	1	3	2

Course In charge

Head of the Department
Professor & Head
Dept. of Electronics & Communication Engineering
K.S. School of Engineering & Management
Bangalore - 560 109

Principal

Dr. K. RAMA NARASIMHA
Principal/Director
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Bengaluru - 560 109

Justification for CO-PO mapping:

DSDV-BEC402	Justification for PO mapping
CO1	**PO1:** CO1 strongly maps to PO1 because to understand the concepts of Amplitude modulation, DSBSC Modulation, SSB modulation and different demodulation technique which involves basic knowledge of science and engineering. PO2: CO1 strongly maps to PO2 as it involves analysis of Problems of an AM Wave and to determine power, bandwidth. **PO3:** CO1 strongly maps to PO3 as AM involves design and development of modulated waves. **PO5:** CO1 moderately maps to PO5 as some of the modern tools can be used to simulate the Amplitude modulated waves. **PO9:** CO1 weakly maps to PO9 in view of the fact that only few basic concepts required in engineering solutions. **PO12:** CO1 is weakly correlated to PO12 because it is necessary to Recognize the need for, and ability to engage in independent and life-long learning in the broadest context of technological change. **PSO1:** CO1 strongly maps to PSO1 in view by acquiring the knowledge and apply concepts in the field of engineering.. **PSO2:** CO1 moderately maps to PSO2 in view by understanding the problems and disseminate the information.
CO2	**PO1:** CO2 strongly maps to PO1 because to understand the concepts of frequency modulation, and different demodulation technique which involves basic knowledge of science and engineering. **PO2:** CO2 strongly maps to PO2 as it involves analysis of Problems of an FM Wave and to determine frequency deviation and carrier swing. **PO3:** CO2 strongly maps to PO3 as FM involves design and development of modulated waves. **PO5:** CO2 moderately maps to PO5 as some of the modern tools can be used to simulate the frequency modulated waves. **PO9:** CO2 weakly maps to PO9 in view of the fact that only few basic concepts required in engineering solutions. **PO12:** CO2 is weakly correlated to PO12 because it is necessary to Recognize the need for, and ability to engage in independent and life-long learning in the broadest context of technological change. **PSO1:** CO2 strongly maps to PSO1 in view by acquiring the knowledge and apply concepts in the field of engineering. **PSO2:** CO2 moderately maps to PSO2 in view by understanding the problems and disseminate the information.
CO3	**PO1:** CO3 strongly maps to PO1 because to understand the concepts of Pulse Amplitude modulation, PPM, PWM and PCM which involves basic knowledge of science and engineering. **PO2:** CO3 strongly maps to PO2 as it involves analysis of Problems on calculating Nyquist rate and Nyquist interval. **PO3:** CO3 strongly maps to PO3 as PAM, PPM, PWM which involves design and development of modulated waves. **PO5:** CO3 moderately maps to PO5 as some of the modern tools can be used to simulate the Pulse Code modulated waves.

	PO9: CO3 weakly maps to PO9 in view of the fact that only few basic concepts required in engineering solutions. **PO12:** CO3 is weakly correlated to PO12 because it is necessary to Recognize the need for, and ability to engage in independent and life-long learning in the broadest context of technological change. **PSO1:** CO3 strongly maps to PSO1 in view by acquiring the knowledge and apply concepts in the field of engineering. **PSO2:** CO3 moderately maps to PSO2 in view by understanding the problems and disseminate the information.
CO4	**PO1:** CO4 strongly maps to PO1 because to understand the concepts of Intersymbol Interference, expressing Noise Levels, Noise in Cascade Stages. which involves basic knowledge of science and engineering **PO2:** CO4 strongly maps to PO2 as it involves analysis of Problems on calculating Signal to Noise ratio. **PO3:** CO4 strongly maps to PO3 as Eye pattern, Nyquist criterion for distortion less Transmission which involves design and development of transmitted signals. . **PO5:** CO4 moderately maps to PO5 as some of the modern tools can be used to simulate the baseband M-ary PAM waves. **PO9:** CO4 weakly maps to PO9 in view of the fact that only few basic concepts required in engineering solutions. **PO12:** CO4 is weakly correlated to PO12 because it is necessary to Recognize the need for, and ability to engage in independent and life-long learning in the broadest context of technological change. **PSO1:** CO4 strongly maps to PSO1 in view by acquiring the knowledge and apply concepts in the field of engineering. **PSO2:** CO4 moderately maps to PSO2 in view by understanding the problems and disseminate the information..
CO5	**PO1:** CO5 strongly maps to PO1 because to understand the concepts of probability, correlation and auto correlation with its properties which involves basic knowledge of science and engineering **PO2:** CO5 moderately maps to PO2 as it involves analysis of Problems in finding probability, covariance and expected values. **PO3:** CO5 strongly maps to PO3 as random variables involves design and development of Gaussian distributed random variable. **PO5:** CO5 moderately maps to PO5 as some of the modern tools can be used to simulate the Gaussian distributed random variable. **PO9:** CO5 weakly maps to PO9 in view of the fact that only few basic concepts required in engineering solutions. **PO12:** CO5 is weakly correlated to PO12 because it is necessary to Recognize the need for, and ability to engage in independent and life-long learning in the broadest context of technological change. **PSO1:** CO5 strongly maps to PSO1 in view by acquiring the knowledge and apply concepts in the field of engineering. **PSO2:** CO5 moderately maps to PSO2 in view by understanding the problems and disseminate the information.

CO PO mapping for the events conducted after gap identification

Sl. No.	Gap Identification	CO	Relevant PO Mapping
1	Video Lectures	CO1,CO2,CO3,CO4,CO5	PO4, PO6, PO7, PO8, PO10 and PO11: Video lectures helps in Engineer & Society, Environment and Sustainability & Communication.

Course In charge

K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BANGALORE - 560109

DEPARTMENT OF MECHANICAL ENGINEERING

CO-PO Mapping

Course: Machining Science and Metrology			
Type: Core		Course Code: BME402	
No of Hours per week			
Theory (Lecture Class)	Practical/Field Work/Allied Activities	Total/Week	Total teaching hours
03	02	04	50
Marks			
Internal Assessment	Examination	Total	Credits
50	50	100	3

Pre-Requisite: The student should have basic knowledge of machine tools.

Aim/Objective of the Course:

1. To enrich the knowledge pertaining to relative motion and mechanics required for various machine tools.
2. To introduce students to different machine tools to produce components having different shapes and sizes.
3. To develop the knowledge on mechanics of machining process and effect of various parameters on machining.
4. To understand the basic principles of measurements
5. To enrich the knowledge pertaining to gauge, comparator and angular measurement.

Course Learning Outcomes:

After completing the course, the students will be able to,

CO1	**Analyze** various cutting parameters in metal cutting.	**Applying (K3)**
CO2	**Understand** the construction of machines & machine tools and **compute** the machining time of various operations.	**Applying (K3)**
CO3	**Understand** the concept of Temperature in Metal Cutting, forms of wear in metal cutting and Cutting fluids and find the tool life	**Applying (K3)**
CO4	**Understand** the objectives of metrology, methods of measurement, standards of measurement & various measurement parameters. Explain tolerance, limits of size, fits, geometric and position tolerances, gauges and their design **construct** the height using slip gauges to measure the unknown angles	**Applying (K3)**
CO5	**Understand** the working principle of different types of comparators, gauges and **construct** the angle gauges to angular Measurements	**Applying (K3)**

Detailed Syllabus:

Module-1 **Introduction to Metal cutting:** Orthogonal and oblique cutting. Classification of cutting tools: single, and multipoint; tool signature for single point cutting tool. Mechanics of orthogonal cutting; chip formation, shear angle and its significance, Merchant circle diagram. Numerical problems. Cutting tool materials and applications. **Introduction to basic metal cutting machine tools: Lathe-** Parts of lathe machine, accessories of lathe Machine and various operations carried out on lathe. Kinematics of lathe. Turret and Capstan lathe. **Laboratory Experiments:** 1. To study the tool geometry of a single point turning tool (SPTT) in the American Standards Association (ASA) system. 2. Preparation of one model on lathe involving - Plain turning, Facing, Knurling, Drilling, Boring, Internal Thread cuts and Eccentric turning. 3. Preparation of One model on lathe involving - Plain turning, Facing , Taper turning, Step turning, Thread cutting, Facing, Knurling, Drilling, Boring, Internal Thread cutting and Eccentric turning.	CO1 08 hrs PO1 PO2 PO3 PO7 PO12

LO: After competing this unit the student will be able to 1. Explain the tool geometry 2. Explain the different cutting methods and chip formation 3. Do the different lathe operations	
Module- 2 **Milling Machines:** up milling & down milling, classification of milling machines, constructional features (Column and Knee and vertical milling machine), milling cutter nomenclature, various milling operations, calculation of machining time. **Indexing:** Need of indexing Simple, compound and differential indexing calculations. Simple numerical on indexing. **Shaping, Slotting and Planning Machines Tools:** Driving mechanisms of Shaper, Slotter and Planer. Operations done on Shaper, Planer & Slotter Difference between shaping and planning operations. **Drilling Machines:** Constructional features (Radial & Bench drilling Machines), operations, types of drill & drill bit nomenclature. Calculation of machining time. **Grinding**: Grinding operation, classification of grinding processes: cylindrical, surface &centerless grinding **Laboratory Experiments:** 1. Cutting of Gear Teeth using Milling Machine. 2. One Job, Cutting of V Groove/ dovetail / Rectangular groove using a shaper. 3. Simple operations and One Job on the drilling and grinding machine. **LO: After competing this unit the student will be able to** 1. Explain all the conventional machining process. 2. Do the different milling, shaping operations 3. Do the different drilling, grinding operations	CO2 08 hrs PO1 PO2 PO3 PO4 PO5 PO6 PO12
Module 3: **Thermal aspects, Tool wear, and Machinability** **Temperature in Metal Cutting**: Heat generation in metal cutting; temperature distribution in metal cutting, effect of cutting speed on temperatures, measurement of cutting temperatures Tool life and tool Wear: progressive tool wear; **Forms of wear in metal cutting:** crater wear, flank wear, tool-life criteria, cutting tool materials: basic requirements of tool materials, major classes of tool materials: high-speed steel, cemented carbide, ceramics, CBN and diamond, tool coatings; the work material and its machinability **Cutting fluids:** Action of coolants and application of cutting fluids **Laboratory Experiments:** 1. Demonstration / Experiment on tool wears and tool life on anyone conventional machining process. 2. Analysis of chip formation and chip reduction coefficient in turning of mild steel by HSS tool with different depth of cut, speed, and feed rate. **LO: After competing this unit the student will be able to** 1. Explain the concept temperature distribution, wear in the tool and tool life. 2. Calculate tool life.	CO3 08 hrs PO1 PO2 PO3 PO5 PO7 PO12
Module 4: **Introduction:** Introduction to metrology & measurements, definition, objectives and classification of metrology, standards of length- wave length standard, sub division of standards, numerical problems on length calibration. **Line & End Standards:** Line and end standard, slip gauges, wringing phenomena, numerical problems on slip gauges. **Systems of Limits, Fits & Tolerance:** Definition of tolerance, tolerance specification in assembly, principle of interchangeability and selective assembly, limits of size, Indian standards, concepts of limits of size and tolerances, cost v/s tolerances, compound tolerances, accumulation of tolerances,	CO4 08 hrs PO1 PO2 PO3 PO4 PO5 PO12

definition of fits, types of fits and their designation. **Laboratory Experiments:** 1. Cutting force measurement with dynamometers (Demonstration) for turning, drilling, grinding operations. **LO: After competing this unit the student will be able to** 1. Differentiate different standards 2. Explain the concept of measurement using different standards 3. Explain the concept of Limits fits and gauges	
Module 5: **Gauges:** Classification of gauges, Taylor's principle, design of GO, NO GO gauges, wear allowance on gauges, types of gauges- plain plug gauges, ring gauges, snap gauge, limit gauge, simple problems. **Comparators:** Introduction to comparators, classification, characteristics, systems of displacement amplification in mechanical comparators, Reed type, Sigma comparator, Zeiss ultra-optimeter, Solex air gauge, ultrasonic gauges, LVDT. **Angular Measurements:** Bevel protractor, sine bar, angular gauges, numerical on building of angles. **Laboratory Experiments:** 1. Experiment on anyone advanced machining process 2. Demonstration/Experimentation of simple programming of CNC machine operations. **LO: After competing this unit the student will be able to** 1. Understand the different types of gauges and comparators 2. Understand the programming of CNC lathe and milling.	CO5 08 hrs PO1 PO2 PO3 PO4 PO5 PO12
Practical/Field Work Content 1. Machine shop lab and industrial visit to one of the well-known industries.	
Textbooks: 1. Manufacturing Process II by Kestoor Praveen 2. Manufacturing Process by A C Niranjan 3. Rao P. N., Manufacturing Technology II, Tata McGraw Hill.	
Reference Books: 1. Shaw, M C, (2014), Metal Cutting Principles, Oxford University Press. 2. McGeough, J A, (1988), Advanced Methods of Machining, Springer. 3. Boothroyd, G., and Knight, W. A., Fundamentals of Machining and Machine Tools, CRC Press. 4. Chattopadhyay, A B, (2013), Machining and Machine Tools, Wiley India. 5. Mikell P. Groover, (2019), Fundamentals of Modern Manufacturing: Materials, Processes, and Systems, Wiley Publications. 6. Mechanical Measurements Beckwith Marangoni and Lienhard Pearson Education 6th Ed.,	
Useful Websites: 1. V. K. Jain, Advanced Machining Processes, NPTEL Course Department of Mechanical Engineering, IIT Kanpur, Link: http://nptel.ac.in/courses/112104028/. 2. U. S. Dixit, Mechanics of Machining, NPTEL Course Department of Mechanical Engineering Guwahati, Link: http://nptel.ac.in/courses/112103248/. 3. A. B. Chattopadhyay, Manufacturing Processes II, NPTEL Course of Department of Mechanical Engineering, IIT Kharagpur, https://nptel.ac.in/courses/112/105/112105126/	
Useful Journals: 1. https://www.sciencedirect.com/journal/journal-of-manufacturing-processes 2. https://www.scimagojr.com/journalsearch.php?q=27677&tip=sid&clean=0	
Teaching and Learning Methods: 1. Lecture class : 40 hrs 2. Practical classes : 03 hrs	

Assessment:

Type of test/examination: Written examination

Continuous Internal Evaluation(CIE) : 50 marks (Average of two tests will be considered)

Semester End Exam(SEE) : 100 marks (students have to answer all main questions) which will be reduced to 50 Marks.

Test duration: 1 :30 hrs

Examination duration: 3 hrs

CO to PO Mapping

PO1: Science and engineering Knowledge **PO2:** Problem Analysis **PO3:** Design & Development **PO4:** Investigations of Complex Problems **PO5:** Modern Tool Usage **PO6:** Engineer & Society	**PO7:** Environment and Society **PO8:** Ethics **PO9:** Individual & Team Work **PO10:** Communication **PO11:** Project Mngmt & Finance **PO12:** Life long Learning

PSO1: Ability to apply concept of mechanical engineering to design a system, a component or a process/system to address a real-world challenges.

PSO2: Ability to develop effective communication, team work, entrepreneurial and computational skills

CO	PO	PO1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO8	PO9	PO10	PO1 1	PO12	PS O1	PS O 2
18 ME34	K-level														
CO1	K2	3	3	2	-	-	-	1	-	-	-	-	1	3	1
CO2	K3	3	3	3	2	1	1	-	-	-	-	-	1	3	1
CO3	K2	3	2	2	-	1	-	1	-	-	-	-	1	3	1
CO4	K3	3	3	3	2	1	-	-	-	-	-	-	1	3	1
CO5	K2	3	3	3	2	2	1	-	-	-	-	-	1	3	1

Course In charge **Head of the Department** **Principal**

K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BANGALORE - 560109
DEPARTMENT OF MBA
SESSION:2023-2024, BATCH: 2022-24, IV SEM. (EVEN SEMESTER)
CO-PO Mapping

Course: MERGERS, ACQUISITION AND CORPORATE RESTRUCTURING			
Type: ELECTIVE		**Course Code: 22MBAFM404**	
No of Hours			
Theory (Lecture Class)	Practical/Field Work/Allied Activities	Total/Week	Total teaching hours
2	2	4	40
Marks			
Internal Assessment	Examination	Total	Credits
50	50	100	3

Aim/Objectives of the Course

- To **impart** knowledge on theories and rationale of corporate restructuring.
- To **explain** and critically evaluate M & A with its different classifications, strategies, theories, synergy etc.
- To **evaluate** the financial forms of M & A.
- To **understand** the HR & legal aspects of M & A.
- To **use** appropriate defensive strategies against hostile takeovers.

Course Learning Outcomes
After completing the course, the students will be able to:

CO1	To explain the major forms and objectives of corporate restructuring.	**Evaluating (K5)**
CO2	To describe the process of value creation under different forms of M &A	**Creating (K6)**
CO3	To Understand M&A with its different classifications, strategies, theories, synergy etc.	**Understanding (K1)**
CO4	To Conduct financial evaluation of M&A	**Evaluating (K5)**
CO5	To Analyze and demonstrate the accounting aspects of Amalgamation	**Analyzing (K4)**
CO6	To Critically evaluate different types of M&A, takeover and anti-takeover strategies	**Evaluating (K5)**

Syllabus Content

Module-1 (6 hours) Corporate Restructuring Meaning, significance and forms of restructuring–sell-off, spin-off, divestitures, demerger, Equity Carve Out (ECO), Leveraged Buy Outs (LBO), Management Buy Out (MBO), Master	**CO1** 06 hrs PO1,

Limited Partnership (MLP), Limited Liability Partnership (LLP) and joint ventures. (Theory). Introduction to cross-borders mergers and acquisitions. **LO:** At the end of this session the student will be able to 1. **Discuss** the forms of Corporate Restructuring. 2. **Write** about ESOP, LBO and MBO? 3. **Write** short note on spin off and sell off. 4. **Explain** the types of MLP.	PSO1
Module-2 (6 hours) Mergers and Acquisitions (M&A): Introduction of M & A, Meaning-types of mergers–Merger Motives-Theories of Mergers-Mergers and industry life cycle, Reasons for failures of M & A, synergy-types of synergy–value creation in M&A (Theory). **LO:** At the end of this session the student will be able to 1. **Outline** the significance of Mergers. 2. **Compare** M&A? 3. **Write** short note on SWOT Analysis in M&A. 4. **Outline** theories of Mergers? 5. **Explain** motives behind mergers?	CO2 6 hrs. PO1, PO2,PSO2
Module-3 (6 hours) Merger Process: Procedure for effecting M & A-Five-stage model–Due diligence–Types, process and challenges of due diligence-HR aspects of M & A–Tips for successful mergers-Process of merger integration (Theory). **LO:** At the end of this session the student will be able to 1. **Define** term Merger Integration? 2. **Discuss** the five stage Model. 3. **Define** Due Diligence and its types. 4. **Enumerate** short note on the tips for successful mergers.	CO3 6 hrs PO1, PSO1
Module-4 (8 hours) Financial Evaluation of M & A: Merger as a capital budgeting-Business valuation approaches-asset based, market based and income-based approaches-Exchange Ratio (Swap Ratio)-Methods of determining exchange rate. (Theory and Problems). **LO:** At the end of this session the student will be able to 1. **Write** about Capital budgeting in M &A? 2. **Discuss** the Business valuation approaches. 3. **Explain** methods of determining exchange rate?	CO4 8hrs PO1, PO4,PO5,PSO2
Module-5 (8 hours) Accounting aspects of Amalgamation: Types of amalgamations (Amalgamation in the nature of merger and amalgamation in the nature of purchase)-Methods of Accounting-Pooling of interest method and Purchase method)–Calculation of purchase consideration-Journal entries in the books of transferor & transferee company-Ledger accounts in the books of transferor and transferee companies. (Theory and Problems). **LO: At the end of this session the student will be able to**	CO5 8 hrs PO2, PS5,PSO4

1. **Outline** the meaning of Amalgamation and Absorption. 2. **Discuss** the types of Amalgamations. 3. **Explain** the methods of Accounting in Amalgamation.	
Module-6 (6 hours) Acquisitions/Takeovers & Post acquisition integration: Meaning and types of acquisition/takeovers (Friendly and Hostile takeovers)-Anti-takeover strategies-Anti-takeover amendments-Legal and human framework of M & A-Combination and Competition Act-2002, Competition Commission of India (CCI)-The SEBI Substantial Acquisition of Shares and Takeover (Takeover code-2011). Post acquisition integration: Organization and human aspect of post 01.02.2023 acquisition –Stages in the integration process (Theory). **LO:** At the end of this session the student will be able to 1. **Write** about the Anti-takeover strategies. 2. **Explain** the SEBI Takeover Code. 3. **Discuss** the Competition Commission of India.	**CO-6** 6 hrs PO3, PO4,PO5,PSO2, PSO4
Suggested Learning Resources: 1. Mergers Acquisitions & Corporate Restructuring - Strategies & Practices, Rabi Narayan Kar and Minakshi, Taxmann's, 3/e, 2017. 2. Mergers and Acquisitions, Sheeba Kapil and Kanwal N. Kapil, Wiley, 2/e, 2017. 3. Mergers, Acquisitions and Corporate Restructuring: Text and Cases, Chandrashekar, Krishnamurti & Vishwanath S, Sage Publications, 2/e, 2018. 4. Mergers, Acquisitions and Takeovers, H.R.Machiraju, New Age International Publishers, 1/e, 2010.	
Useful Websites • http://www.forbes.com/ • http://www.bloomberg. com/ • www.reuters.com/ • www.cnnmoney.org/ • www.financialtimes.com/	
Useful Journals • Journal of Finance • Journal of Financial Economics • Review of Financial studies • Global Finance Journal • Indian Journal of Finance	
Teaching and Learning Methods 1. **Lecture class: 44 hrs** 2. **Practical classes: 08 hrs** **Question Paper: 50 % Theory 50% problems**	

Assessment

Type of test/examination: Written examination

Continuous Internal Evaluation(CIE) : 50 marks (Average of TWO tests will be considered)

Semester End Exam(SEE) : 100 marks (students have to answer all main questions) which will be reduced to 50 Marks.

Test duration: 1 :30 hrs **Examination duration:** 3 hrs

Assessment Details (both CIE and SEE)

- The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.
- The minimum passing marks for the CIE is 50% of the maximum marks.
- Minimum passing marks in SEE is 40% of the maximum marks of SEE.
- A student shall be deemed to have satisfied the academic requirements (passed) and earned the credits allotted to each course if the student secures not less than 50% in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- There shall be a maximum of 50 CIE Marks. A candidate shall obtain not less than 50% of the maximum marks prescribed for the CIE.

CIE Marks shall be based on:

a) Tests (for 25Marks) and

b) Assignments, presentations, Quiz, Simulation, Experimentation, Mini project, oral examination, field work and class participation etc., (for 25 Marks) conducted in the respective course.

- Course instructors are given autonomy in choosing a few of the above based on the subject relevance and should maintain necessary supporting documents for same.

PO1. Students are given sufficient theoretical knowledge and are enabled to apply them to solve practical problems in business and other organizations/institutions of importance

PO2. Students are provided effective communication skills with a high degree of lateral and critical thinking that enhances learn ability, developed for being continuously employable.

PO3. Students are instilled with leadership qualities, ethically sound, enabled with decision making skills that reflect a high degree of social consciousness

PO4. Students are trained for sustained research orientation to comprehend a growingly complex, economic, legal and ethical environment

PO5. Students are equipped with self-sustaining entrepreneurship qualities that encourages calculated risk taking.

PSO1) Comprehend the contemporary features and characteristics of Business Management Science and its administration

PSO2) Analyze and interpret the dynamic situations for making Business Management strategies and decisions at the national and global level

PSO3) Handle responsibility with the ethical values for all actions undertaken by them.

PSO4) Adapt and focus on achieving the organizational goal and objectives with complete zeal and commitment

CO		PO					PSO			
		PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO 3	PSO 4
22MBA FM404	K-Level	-	-	-	-	-	-	-	-	-
CO1	K5	2	-	-	-	-	2	-	-	-
CO2	K6	1	2	-	-	-	-	2	-	-
CO3	K1	1	-	-	-	-	1	-	-	-
CO4	K5	1	-	-	3	1	-	3	-	-
CO5	K4	-	2	-	-	1	-	-	-	2
CO6	K5	-	-	1	3	1	-	2	-	1

Course In charge

Head of the Department 18/7/24.

IQAC

Principal /Director

Dr. K. RAMA NARASIMHA
Principal/Director
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