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

DEPARTMENT OF COMPUTER SCIENCE AND BUSINESS SYSTEMS

CO-PO Mapping

Course: OPERATING SYSTEMS			
Type: Core		Course Code: BCS303	
No of Hours			
Theory (Lecture Class)	Practical/Field Work/Allied Activities	Total/Week	Total teaching hours
4	2	6	40 T + 20 P
Marks			
Internal Assessment	Examination	Total	Credits
50	50	100	4

Aim/Objectives of the Course

1. Learn about the basics of operating system its concepts.
2. Describe process management and multi-threading systems and process scheduling.
3. Demonstrate the concept of process synchronization and deadlocks.
4. Understand memory management and virtual memory management Concepts.
5. Illustrate the concept of File System Implementation and protection.

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

CO1	**Explain** the operating system structures and operating system services	Understanding(K2)
CO2	**Demonstrate** process management, multi-threaded programming and **Illustrate** process synchronization techniques.	Applying (K3)
CO3	**Describe** he concept of process synchronization and the methods for handling deadlock	Applying (K3)
CO4	**Demonstrate** memory management strategies and **Illustrate** different techniques for virtual memory management	Applying (K3)
CO5	**Demonstrate** File System Implementation, secondary storage structures, and protection.	Applying (K3)

Syllabus Content

Module 1: 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.	CO1 8 hrs. PO1-3 PO2-2 PO3-2 PO4-2 PO6-2

Laboratory Components 1. Develop a c program to implement the Process system calls (fork (), exec(), wait(), create process, terminate process) **LO:** At the end of this session the student will be able to, 1) Define an Operating system? 2) Explain the different operations of operating systems. 3) Explain system calls & Explain the operating system structure. 4) Describe Virtual machines and System boot.	PO12 -2 PSO1-3 PSO2-2
Module 2:Process Management: Process concept; Process scheduling; Operations on processes, Inter process communication.**Multi-threaded Programming**: Overview; Multi-threading models; Thread Libraries; Threading issues. **Process Scheduling:** Basic concepts; Scheduling Criteria; Scheduling Algorithms; Multiple-processor scheduling; Thread Scheduling. **Laboratory Components** 1. Simulate the following CPU scheduling algorithms to find turnaround time and waiting time a) FCFS b) SJF c) Round Robin d) Priority **LO:** At the end of this session the student will be able to, 1. Illustrate the concepts of process management. 2. Describe the Multi-threading models. 3. Explain thread libraries and threading issues. 4. Make use of the scheduling algorithms to solve problems.	**CO2** 8 hrs. PO1-3 PO2-3 PO3-3 PO4-2 PO6-2 PO12 -2 PSO1-3 PSO2-2
Module 3: Process Synchronization: Synchronization: The critical section problem; Peterson's solution; Synchronization hardware; Semaphores; Classical problems of synchronization. **Deadlocks:** System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock. **Laboratory Components** 1. Develop a C program to simulate producer-consumer problem using semaphores. 2. Develop a C program which demonstrates inter process communication between a reader process and a writer process. Use mkfifo, open, read, write and close API s in your program. 3. Develop a C program to simulate Bankers Algorithm for Deadlock Avoidance. **LO:** At the end of this session the student will be able to, 1. Explain the process synchronization. 2. Utilize the concept of semaphores. 3. Outline the concept of Deadlocks & the methods for handling the deadlocks. 4. Discuss the deadlock detection and recovery from deadlock.	**CO3** 8 hrs. PO1-3 PO2-2 PO3-2 PO4-2 PO6-2 PO12 -2 PSO1-3 PSO2-2

Module 4 :Memory Management: Memory management strategies: Background; Swapping; Contiguous memory allocation; Paging; Structure of page table; Segmentation. **Virtual Memory Management**: Background; Demand paging; Copy-on-write;Page replacement; Allocation of frames; Thrashing. **Laboratory Components** 1. Develop a C program to simulate the following contiguous memory allocation Techniques: a) Worst fit b) Best fit c) First fit. 2. Develop a C program to simulate page replacement algorithms: a) FIFO b) LRU **LO:** At the end of this session the student will be able to, 1. Explain the memory management strategies. 2. Solve memory management problems. 3. Discuss Demand paging and copy on write. 4. Outline page replacement and allocation of frames. 5. Solve page replacement problems.	**CO4** 8 hrs. PO1-3 PO2-3 PO3-3 PO4-2 PO6-2 PO12 -2 PSO1-3 PSO2-2
Module 5: 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. **Secondary Storage Structures, Protection:** Mass storage structures; Disk-structure; Disk attachment; Disk scheduling; Disk management; Swap space management. Protection: Goals of protection, Principles of protection, Domain of protection, Access matrix, **Laboratory Components** 1. Simulate following File Organization Techniques a) Single level directory b) Two level directory 2. Develop a C program to simulate the Linked file allocation strategies. 3. Develop a C program to simulate SCAN disk scheduling algorithm. **LO:** At the end of this session the student will be able to, 1. Explain the file concepts and its access modes and directory structure. 2. Explain the File System mounting, sharing and Protection. 3. Explain the secondary storage structure and its protection. 4. Explain the swap page replacement 5. Solve disk scheduling problems.	**CO5** 8 hrs. PO1-3 PO2-2 PO3-2 PO4-2 PO6-2 PO12 -2 PSO1-3 PSO2-2
Text Books 1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Principles 7th	

edition, Wiley-India, 2006.

Reference Books (specify minimum two foreign authors text 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.

Useful Websites

1. https://onlinecourses.nptel.ac.in/noc20_cs04/announcements?force=true
2. https://www.youtube.com/watch?v=WJ-UaAaumNAhttp://35/
3. https://www.tutorialspoint.com/operating_system/index.htm
4. https://www.studytonight.com/operating-system/

Teaching and Learning Methods

1. Lecture class: 28 hrs.
2. Problem Solving: 12 hrs.

Assessment

Type of test/examination: Written examination

Continuous Internal Evaluation(CIE) :

CIE marks for the theory component are **25 marks** and that for the practical component is **25 marks**.

CIE for the theory component of the IPCC

1) Two Tests each of 15 marks (duration 01 hour)

2) 10 Marks for other assessment methods

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)**.

CIE for the practical component of the IPCC

1) **15 marks** for the conduction of the experiment and preparation of laboratory record
2) **10 marks** for the test to be conducted after the completion of all the laboratory sessions.

Total CIE: 50 Marks(25 Theory + 25 Practical)

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

Test duration : 1hr 30 minutes

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 Management & Finance **PO12:**Life long 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.

CO	PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
BCS 303	K-level														
CO1	K2	3	2	2	2	-	2	-	-	-	-	-	2	3	2
CO2	K3	3	3	3	2	-	2	-	-	-	-	-	2	3	2
CO3	K3	3	2	2	2	-	2	-	-	-	-	-	2	3	2
CO4	K3	3	3	3	2	-	2	-	-	-	-	-	2	3	2
CO5	K3	3	2	2	2	-	2	-	-	-	-	-	2	3	2

Course In charge

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