DISCIPLINE SPECIFIC ELECTIVES (DSE-2)

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Operating Systems	4	3	-	1	Class XII passed with Physics + Mathematics/Applied Mathematics + Chemistry OR Physics + Mathematics/Applied Mathematics + Computer Science/Informatics Practices	Programming Fundamentals using Python (DSC-1, Sem I)/ Algorithm Design and Analysis(DSE-1B, Sem III)

Learning Objectives

COURSE OVERVIEW: Operating systems course is intended as a general introduction to the techniques used to implement operating systems and related kinds of systems software. The topics covered will be functions and structure of operating systems, process management (creation, synchronization, and communication); processor scheduling; deadlock prevention, avoidance, and recovery; main-memory management; virtual memory management (swapping, paging, segmentation and page-replacement algorithms); control of disks and file-system structure and implementation.

The Learning Objectives of this course are as follows:

- To explain main components of OS and their working
- To familiarize the operations performed by OS as a resource Manager
- To introduce various scheduling policies of OS.
- To teach the different memory management techniques.

Learning outcomes

The Learning Outcomes of this course are as follows:

- Learn multiprogramming, multithreading concepts for a small operating system.
- Create, delete, and synchronize processes for a small operating system.
- Implement simple memory management techniques.
- Implement CPU and disk scheduling algorithms.
- Use services of modern operating system efficiently

- Learn basic file system.

SYLLABUS OF ELDSE-2B **Total Hours- Theory: 45 Hours, Practicals: 30 Hours**

UNIT – I (11 Hours)

Overview: Introduction, Computer-System Organization and Architecture, Multiprocessor and Clustered Systems, OS Operations, Multiprogramming and Multitasking, Resource management- process management, memory management, file-system management, Mass- storage management, I/O System management systems, protection and security. Virtualization, Distributed systems, Real Time Embedded Systems, Free and Open source Operating systems and Operating system services.

UNIT – II (12 Hours)

Process management: Basic concepts, Scheduling Criteria, Scheduling algorithms- FCFS, SJF, Priority, RR and Multilevel Queue. Process synchronization.

Concurrency and Synchronization: The Critical-section problem, Semaphores, Deadlock Characterization, Prevention, Avoidance, Detection and Recovery.

UNIT – III (12 Hours)

Memory management: Basic hardware, Address binding, Physical and Logical address space, Swapping, Memory allocation strategies -Fixed and Variable Partitions, Fragmentation, Paging, Segmentation, Demand Paging and virtual memory, Page Replacement Policies - FIFO, OPR, LRU.

UNIT – IV (10 Hours)

File system: Concept of a file, access methods, directory structure, file system mounting, file sharing, protection, file system structure, file system implementation, Directory implementation, allocation methods, free-space management, efficiency and performance, Disk scheduling algorithms- FCFS, SSTF, SCAN and C-SCAN.

Practical component (if any) – Operating Systems
(Python software)

Learning outcomes

The Learning Outcomes of this course are as follows:

- Implement various process scheduling algorithms
- Implement various priority based scheduling algorithms
- Implement various page replacement algorithms
- Implement various disk scheduling algorithms

LIST OF PRACTICALS (Total Practical Hours – 30 Hours)

1. Write a program to implement FCFS scheduling algorithm.
2. Write a program to implement Round Robin Process scheduling algorithm.

3. Write a program to implement SJF Process scheduling algorithm.
4. Write a program to implement non-preemptive priority-based scheduling algorithm.
5. Write a program to implement preemptive priority-based scheduling algorithm.
6. Write a program to implement SRJF scheduling algorithm.
7. Write a program to implement first-fit, best-fit and worst-fit allocation strategies.
8. Write a program to implement FIFO Page replacement algorithm.
9. Write a program to implement OPR Page replacement algorithm.
10. Write a program to implement LRU Page replacement algorithm.
11. Write a program to implement SCAN Disk Scheduling algorithm.
12. Write a program to implement SSTF Disk Scheduling algorithm.

Note: Students shall sincerely work towards completing all the above listed practicals for this course. In any circumstance, the completed number of practicals shall not be less than eleven.

Essential/recommended readings

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, "Operating Systems Concepts", Tenth Edition, John Wiley & Sons, 2018, ISBN:978-1-118-06333-0.
2. D.M.Dhamdhere, "Operating Systems", 2nd Edition, Tata McGraw Hill, 2011.

Suggestive readings

1. Andrew S Tanenbaum, Herbert Bos "Modern Operating Systems" , Fourth Edition, Pearson Education India, 2016. ISBN 978-9332575776.
2. William Stallings, "Operating Systems Internals and Design Principles", Seventh Edition, Pearson Education, 2018. ISBN 978-9352866717.
3. Garry Nutt, Nabendu Chaki, Sarmistha Neogy, "Operating Systems", Third Edition, Pearson Education.
4. Deitel & Deitel (2008), Operating systems, 3rd edition, Pearson Education, India
5. Achyut S Godbole, Atul Kahate, "Operating Systems", 3rd Edition, Tata McGraw Hill, 2011.

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.