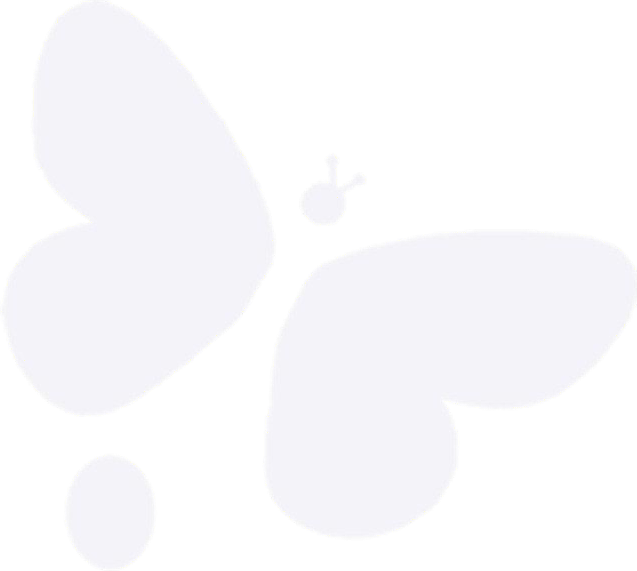
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| **Course Code** | **OPERATING SYSTEMS** | **L** | **T** | **P** | **C** |
| **AM3402** | **3** | **0** | **2** | **4** |

# COURSE OBJECTIVES

The main objectives of this course are to

1. To understand the basics and functions of operating systems.
2. To understand processes and threads
3. To analyze scheduling algorithms and process synchronization.
4. To understand the concept of deadlocks.
5. To analyze various memory management schemes.
6. To be familiar with I/O management and file systems.
7. To be familiar with the basics of virtual machines and Mobile OS like iOS and Android.

# COURSE DESCRIPTION

Operating Systems is a foundational course that explores the principles, components, and functionalities of modern operating systems. The course covers topics such as process management, memory management, file systems, device management, and security. Students will learn about the design and implementation of operating system components, as well as their role in providing an interface between hardware and software applications. The course also discusses key concepts such as concurrency, scheduling, virtualization, and system performance. Hands-on labs and projects provide practical experience in operating system concepts and system-level programming.

# PREREQUISITES

Computer Architecture, Programming Fundamentals, Operating System Concepts, Data Structures and Algorithms, Computer Networks, Software Engineering Principles.

# UNIT I INTRODUCTION 9

Computer System - Elements and organization; Operating System Overview - Objectives and Functions - Evolution of Operating System; Operating System Structures – Operating System Services - User Operating System Interface - System Calls – System Programs - Design and Implementation - Structuring methods.

# UNIT II PROCESS MANAGEMENT 9

Processes - Process Concept - Process Scheduling - Operations on Processes - Inter-process Communication; CPU Scheduling - Scheduling criteria - Scheduling algorithms: Threads – Multi thread Models – Multi core programming- Threading issues; Process Synchronization - The Critical-Section problem - Synchronization hardware – Semaphores – Mutex - Classical problems of synchronization - Monitors; Deadlock - Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.

# UNIT III MEMORY MANAGEMENT 9

Main Memory - Swapping - Contiguous Memory Allocation – Paging - Structure of the Page Table

- Segmentation, Segmentation with paging; Virtual Memory - Demand Paging – Copy on Write - Page Replacement - Allocation of Frames –Thrashing.

# UNIT IV STORAGE MANAGEMENT 9

Mass Storage system – Disk Structure - Disk Scheduling and Management; File-System Interface - File concept - Access methods - Directory Structure - Directory organization - File system mounting - File Sharing and Protection; File System Implementation - File System Structure - Directory implementation - Allocation Methods - Free Space Management; I/O Systems – I/O Hardware, Application I/O interface, Kernel I/O subsystem.

# UNIT V VIRTUAL MACHINES AND MOBILE OS 9

Virtual Machines – History, Benefits and Features, Building Blocks, Types of Virtual Machines and their Implementations, Virtualization and Operating-System Components; Mobile OS - iOS and Android.

# NUMBER OF THEORY PERIODS: 45

**PRACTICAL EXERCISES**

Installation of windows operating system

1. Illustrate UNIX commands and Shell Programming
2. Process Management using System Calls : Fork, Exit, Getpid, Wait, Close
3. Write C programs to implement the various CPU Scheduling Algorithms
4. Illustrate the inter process communication strategy
5. Implement mutual exclusion by Semaphore
6. Write C programs to avoid Deadlock using Banker's Algorithm
7. Write a C program to Implement Deadlock Detection Algorithm
8. Write C program to implement Threading
9. Implement the paging Technique using C program
10. Write C programs to implement the following Memory Allocation Methods
    1. First Fit b. Worst Fit c. Best Fit
11. Write C programs to implement the various Page Replacement Algorithms
12. Write C programs to Implement the various File Organization Techniques
13. Implement the following File Allocation Strategies using C programs

a. Sequential b. Indexed c. Linked

1. Write C programs for the implementation of various disk scheduling algorithms

# NUMBER OF PRACTICAL PERIODS: 30 TOTAL NUMBER OF PERIODS: 75

**COURSE FORMAT**

Lectures and discussions, Hands-on coding exercises and projects, Guest lectures by industry Experts, Group discussions and presentations, Online resources and tutorials

# ASSESSMENTS & GRADING

Quizzes / Assignments, Project, 3 Internal Assessments, Final Examination

# COURSE OUTCOMES

Upon completion of this course, the students will be able to

**CO1** Analyzevarious scheduling algorithms and process synchronization.

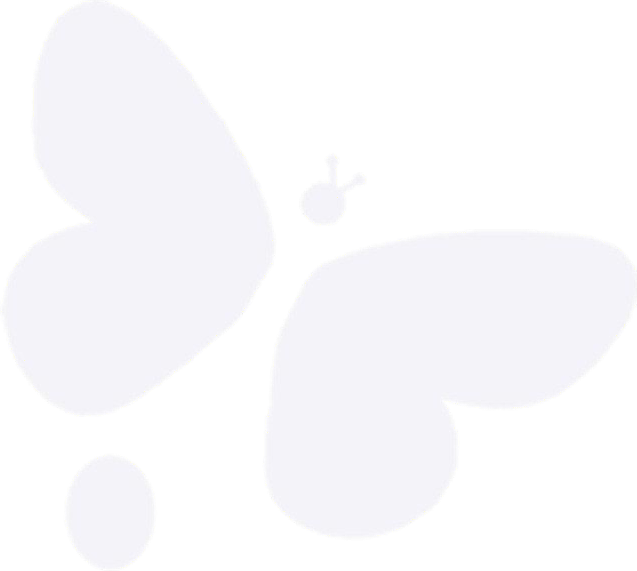
**CO2** Explain deadlock prevention and avoidance algorithms.

**CO3** Compare and contrast various memory management schemes.

**CO4** Explain the functionality of file systems, I/O systems, and Virtualization

**CO5** Compare iOS and Android Operating Systems.

# TEXT BOOKS

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, 10th Edition, John Wiley and Sons Inc., 2018.
2. Andrew S Tanenbaum, "Modern Operating Systems", Pearson, 5th Edition, 2022 New Delhi.

# REFERENCES

1. Ramaz Elmasri, A. Gil Carrick, David Levine, “Operating Systems – A Spiral Approach”, Tata McGraw Hill Edition, 2010.
2. William Stallings, "Operating Systems: Internals and Design Principles", 7 th Edition, Prentice Hall, 2018.
3. Achyut S.Godbole, Atul Kahate, “Operating Systems”, McGraw Hill Education, 2016.

# YOU TUBE RESOURCES

**Operating System - TutorialsPoint**:TutorialsPoint's Operating System playlist offers a series of videos covering fundamental concepts of operating systems, including processes, memory management, file systems, and more.

**Neso Academy:** Neso Academy provides comprehensive tutorials on computer science topics, including operating systems. Their playlist covers various OS concepts such as process scheduling, memory management, file systems, and synchronization.

**Computerphile:**Computerphile offers informative videos on computer science topics, including operating systems. You can find videos on the history of operating systems, process scheduling algorithms, file systems, and more.

**Dr. Soper's Videos - UNC Charlotte**:Dr. Brian Soper from UNC Charlotte provides lectures on operating systems concepts. His videos cover topics such as process management, memory management, file systems, and virtualization.

**The Net Ninja**:The Net Ninja's playlist on operating systems covers essential OS concepts such as processes, threads, scheduling algorithms, memory management, and file systems.