COURSE TITLE	**OPERATING SYSTEMS & SECURITY**
COURSE CODE	**01CC0401**
COURSE CREDITS	**4**

Objective:

1 The objective of this course is to help students understand the fundamental concepts and core functionalities of operating systems, including process management, memory management, file systems, and I/O systems. It aims to provide in-depth knowledge of security mechanisms and protection strategies employed by modern operating systems. Students will also learn to analyze various security threats and implement suitable mitigation techniques. Additionally, the course focuses on developing practical skills in configuring, managing, and securing operating systems to ensure robust and reliable system performance in real-world environments.

Course Outcomes: After completion of this course, student will be able to:

1 Explain the role of OS and its architecture with system calls and programs.

2 Apply process scheduling and synchronization techniques to manage concurrency.

3 Evaluate memory management and file system operations in modern OS.

4 Analyze threats and demonstrate authentication, access control, and intrusion prevention mechanisms.

5 Apply patching, system hardening, and auditing techniques for OS protection.

Pre-requisite of course: Basic understanding of computer architecture and organization, Familiarity with programming concepts and data structures, Knowledge of computer networks is advantageous.

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	2	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	**Introduction to Operating Systems** Overview and functions,, Types of operating systems, System calls and system programs	6
2	**Process Management** Process concepts, Scheduling algorithms, Threads and concurrency, Process synchronization, Deadlocks	10
3	**Memory and Storage Management** Memory allocation techniques, Virtual memory, File system interface and implementation,, I/O systems	10

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Contents : Unit	Topics	Contact Hours
4	**Operating System Security** Security goals and threats,, Access control mechanisms, Authentication and authorization, Malware and intrusion detection	10
5	**System Protection and Administration** Security policies, System hardening, Patch management, Backup and recovery,, Case studies on OS security	9
Total Hours		**45**

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	**Practical – 1** Introduction to Linux/UNIX commands and shell scripting	2
2	**Practical – 2** Implementing process creation and management using fork(), exec()	2
3	**Practical – 3** Simulation of CPU scheduling algorithms (FCFS, SJF, Round Robin, Priority)	2
4	**Practical – 4** Implementing inter-process communication using pipes and message queues	2
5	**Practical – 5** Demonstrating process synchronization using semaphores and mutexes	2
6	**Practical – 6** Simulating deadlock detection and avoidance algorithms	2
7	**Practical – 7** Implementing memory allocation techniques (First Fit, Best Fit, Worst Fit)	2
8	**Practical – 8** Working with file system operations (create, read, write, delete)	2
9	**Practical – 9** Configuring user authentication and access control in Linux	2
10	**Practical – 10** Setting up and securing SSH connections	2
11	**Practical – 11** Implementing firewall rules using iptables or UFW	2
12	**Practical – 12** Detecting and mitigating malware using antivirus tools	2
13	**Practical – 13** Performing system auditing and log analysis	2
14	**Practical – 14** Applying patches and updates to the operating system	2
Total Hours		**28**

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Textbook :

1 Operating System Concepts (9th ed.), Silberschatz, A., Galvin, P. B., & Gagne, G., Wiley, 2018

References:

1 Modern Operating Systems (4th ed.)., Modern Operating Systems (4th ed.)., Tanenbaum, A. S., & Bos, H., Pearson, 2014

2 Practical UNIX and Internet Security (3rd ed.)., Practical UNIX and Internet Security (3rd ed.)., Garfinkel, S., Spafford, G., & Schwartz, A., O'Reilly Media., 2003

3 Computer Security: Art and Science. Addison, Computer Security: Art and Science. Addison, Bishop, M. , Wesley, 2003

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery					
Remember / Knowledge	**Understand**	**Apply**	**Analyze**	**Evaluate**	**Higher order Thinking / Creative**
10.00	10.00	40.00	20.00	20.00	0.00

Instructional Method:

1 The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

2 The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.

3 Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

4 Students will use supplementary resources such as online videos, NPTEL videos, ecourses, Virtual Laboratory.

Supplementary Resources:

1 NPTEL Course: Operating System Fundamentals

2 MIT OpenCourseWare: Operating System Engineering

3 Coursera: Operating Systems and You: Becoming a Power User

4 edX: Introduction to Linux

5 SecurityTube: Linux Security ModulesMIT OpenCourseWare+2

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