SRI KRISHNA INSTITUTE OF TECHNOLOGY

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#29, Chimney Hills, Hesaraghatta Main Road, Chikkabanavara Post, Bangalore- 560090

Department of Artificial Intelligence & Machine Learning

Academic Year: 2021-2022	Semester: 4th
Course Name: Operating Systems	Course Code: 18CS43
Total Contact hours: 40	Credits: 03
SEE Marks: 60; CIE: 40	Total Marks: 100
Course Plan Author: Dr Geetha C Megharaj	Date: 23-05-2022

Course Prerequisites: Basics of operating system, File System, Memory, Network, Devices etc.

Course Objectives:

1. Introduce concepts and terminology used in OS.
2. Explain threading and multithreaded systems.
3. Illustrate process synchronization and concept of Deadlock.
4. Introduce Memory and Virtual memory management, File system and storage techniques.

Course Outcomes:

1. Demonstrate need for OS and different types of OS
2. Apply suitable techniques for management of different resources
3. Use processor, memory, storage and file system commands
4. Realize the different concepts of OS in platform of usage through case studies

CO Number	Course Outcome At the end of the course, student should be able to . . .	Blooms' Level
CO1	Demonstrate need for OS and different types of OS	L1,L2,L3
CO2	Apply suitable techniques for management of different resources	L1,L2,L3
CO3	Use processor, memory, storage and file system commands	L1,L2,L3
CO4	Realize the different concepts of OS in platform of usage through case studies	L1,L2,L3

Program Outcomes and Program Specific Outcomes

PO, PSO	*1.Engineering Knowledge;* *2.Problem Analysis;* *3.Design / Development of Solutions;* *4.Conduct Investigations of Complex Problems;* *5.Modern Tool Usage;* *6.The Engineer and Society;* *7.Environment and Sustainability;* *8.Ethics;* *9.Individual and Teamwork;* *10.Communication;* *11.Project Management and Finance;* *12.Life-long Learning;* *PSO1.: Graduates will have the ability to adapt, contribute and innovate ideas in the field of Artificial Intelligence and Machine Learning* *PSO2: To provide a concrete foundation and enrich their abilities to qualify for Employment, Higher studies and Research in various domains of Artificial Intelligence and Machine Learning such as Data Science, Computer Vision, Natural Language Processing with Ethical Values.* *PSO3: Graduates will acquire the practical proficiency with niche technologies and open-source platforms and to become Entrepreneur in the domain Artificial Intelligence and Machine Learning*

CO – PO Mapping

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1		1									1			
CO2	2	2	2	2	1				2					2	1
CO3	2	2	2		2									2	2
CO4	1	2	2	2	2				2			2		1	1

Course Content (Syllabus)

OPERATING SYSTEMS **(Effective from the academic year 2018 -2019)** **SEMESTER – IV**			
Course Code	**18CS43**	**CIE Marks**	40
Number of Contact Hours/Week	3:0:0	**SEE Marks**	60
Total Number of Contact Hours	40	**Exam Hours**	03

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. **Process Management** Process concept; Process scheduling; Operations on processes; Inter process communication

Text book 1: Chapter 1, 2.1, 2.3, 2.4, 2.5, 2.6, 2.8, 2.9, 2.10, 3.1, 3.2, 3.3, 3.4
RBT: L1, L2, L3

Module-2

Multi-threaded Programming: Overview; Multithreading models; Thread Libraries; Threading issues. Process Scheduling: Basic concepts; Scheduling Criteria; Scheduling Algorithms; Multiple-processor scheduling; Thread scheduling. **Process Synchronization:** Synchronization: The critical section problem; Peterson‟s solution; Synchronization hardware; Semaphores; Classical problems of synchronization; Monitors.

Text book 1: Chapter 4.1, 4.2, 4.3, 4.4, 5.1, 5.2, 5.3, 5.4, 5.5, 6.2, 6.3, 6.4, 6.5, 6.6, 6.7
RBT: L1, L2, L3

Module-3

Deadlocks : Deadlocks; System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock. **Memory Management:** Memory management strategies: Background; Swapping; Contiguous memory allocation; Paging; Structure of page table; Segmentation.

Text book 1: Chapter 7, 8.1 to 8.6 **RBT: L1, L2, L3**

Module-4

Virtual Memory Management: Background; Demand paging; Copy-on-write; Page replacement; Allocation of frames; Thrashing. **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.

Text book 1: Chapter 91. To 9.6, 10.1 to 10.5 **RBT: L1, L2, L3**

Module-5

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, Implementation of access matrix, Access control, Revocation of access rights, Capability- Based systems. **Case Study: The Linux Operating System:** Linux history; Design principles; Kernel modules; Process management; Scheduling; Memory Management; File systems, Input and output; Inter-process communication.

Text book 1: Chapter 12.1 to 12.6, 21.1 to 21.9 **RBT: L1, L2, L3**

Schedule of Instruction

Sl.no	Class no	Module	Topic	Reference (Book, Page no.)	Course Outcome	Delivery mode
1	2	**Module1:**	**Introduction to OS, System Structures:** What is Operating System do Computer system organization, Computer system architecture, Operating System Structure.	T1, 3-16	CO1	
2	3		Operating system operations, Process management, Memory Management, Storage Management	T1, 17-25	CO1	
3	4		Protection and security, Distributed system, Special purpose system, Computing environments	T1, 26-33	CO1	
4	5		Operating system services: User-operation system interface, System calls	T1, 39-45	CO1	
5	6		Types of system calls, System programs,	T1, 46-52	CO1	
6	7		Operating system design and implementation; Operating System structure;	T1, 53-61	CO1	
7	8		Virtual machines; Operating system generation, System Boot	T1, 62-67	CO1	
8	9		Process Management Process concept; Process scheduling; Operations on processes; Inter process communication	T1, 79-99	CO1	
9	11	**Module 2:**	Multithreaded programming overview, Multithreading models, Thread libraries, Threading issues,	T1, 123-138	CO2	
10	12		Process scheduling, Basic concepts, Scheduling Criteria,	T1, 149-153	CO2	
11	13		Scheduling Algorithms	T1, 154-164	CO2	
12	14		Multiprocess Scheduling, Thread scheduling	T1, 165-169	CO2	
13	15		Process Synchronization: Synchronization, The critical section problem, Peterson's solution	T1, 187-192	CO2	

14	16		Synchronization hardware,	T1, 193-195	CO2	
15	17		Semaphores, Classical problems of synchronization	T1, 200-204	CO2	
16	18		Monitors	T1, 205-212	CO2	
17	20	**Module 3:**	Deadlocks: System model Deadlock characterization	T1, 237-242	CO2	
18	21		Methods for handling dead locks, Deadlock prevention	T1, 243-246	CO2	
19	22		Detection and avoidance	T1, 247-253	CO2	
20	23		Deadlock Detection, Recovery from deadlock	T1, 254-258	CO2	
21	24		Memory management Strategies, Background, Swapping	T1, 265-273	CO2	
22	25		Contiguous memory allocation	T1, 274-277	CO2	
23	26		Paging	T1, 278-287	CO2	
24	27		Paging	T1, 278-287	CO2	
25	28		Structure of page table	T1, 288-291	CO2	
26	29		Segmentation	T1, 292-294	CO2	
27	31	**Module 4:**	Virtual Memory Management: Background, Demand paging	T1, 303-312	CO2	
28	32		Copy on write, Page replacement	T1, 313-326	CO2	
29	33		Page replacement	T1, 315-326	CO2	
30	34		Page replacement	T1, 315-326	CO2	
31	35		Allocation of frames, Thrashing,	T1, 327-334	CO2	
32	36		File system, Implementation of file system, File concepts, Access methods	T1, 359-368	CO3	
33	37		Directory structure,	T1, 369-378	CO3	
34	38		File system mounting, File sharing, Protection	T1, 379-385	CO3	

36	40	**Module 5:**	Secondary storage structures, Protection, Mass storage structure, Disk structure	T1, 435-437	CO3	
37	41		Disk attachment, Disk scheduling;	T1, 438-444	CO3	
38	42		Disk management; Swap space management	T1, 445-450	CO3	
39	43		Protection: Goals of protection, Principles of protection, Domain of protection	T1, 595-601	CO3	
40	44		Access control, Revocation of access rights, Capability- Based systems	T1, 609-612	CO3	
41	45		The Linux operating system, Linux History, Design Principles,	T1, 713-719	CO4	
42	46		Kernel modules, Process Management	T1, 720-726	CO4	
43	47		Scheduling, Memory Management, File system,	T1, 727-736	CO4	
44	48		File system, Input and output, Inter-process communication	T1, 737-749	CO4	

**L – Lecture, V- Videos or any other mode*

Textbooks	
T1	Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Principles 7th edition, Wiley-India, 2006
Reference books	
R1	Ann McHoes Ida M Fylnn, Understanding Operating System, Cengage Learning, 6th Edition
R2	D.M Dhamdhere, Operating Systems: A Concept Based Approach 3rd Ed, McGraw- Hill, 2013.
R3	P.C.P. Bhatt, An Introduction to Operating Systems: Concepts and Practice 4th Edition, PHI (EEE), 2014.
R4	William Stallings Operating Systems: Internals and Design Principles, 6th Edition, Pearson.

	Web links and Video Lectures (e-Resources):
1	https://sites.google.com/view/4thsemester/
2	C. Surendar. Introduction to OS. Professor of Computer Science, United States.
3	P. J. K . and U. Berkeley. 20 January). Deadlock/CPU Scheduling. Available: C. Franklin and D. Coustan. 20 January). Memory Management. Available:
4	http://computer.howstuffworks.com/operating-system7.htm https://www.youtube.com/watch?v=vBURTt97EkA&list=PLBlnK6fEyqRiVhbXDGLXDk_OQAeuVcp2O
5	https://www.youtube.com/watch?v=bkSWJJZNgf8&list=PLxCzCOWd7aiGz9donHRrE9I3Mwn6XdP8p

Assessment Schedule:						
Sl.No.	**Assessment type**	**Contents**	**CO**	**Duration In Hours**	**Marks**	**Date & Time**
1	**CIE Test 1**	Module1 & Module 2	CO1, CO2	1.5	30	
2	**CIE Test 2**	Module 3 & Module 4	CO2, CO3, CO4	1.5	30	
	CIE Test 3	Module 5 & Module 1	CO3, CO4, CO1	1.5	30	
3	**Assignment 1**	Module1 & Module 2	CO1, CO2		10	
4	**Assignment 2**	Module 3 & Module 4	CO2, CO3, CO4		10	
5	**Seminar *(or any planned activtiy)***	Module 5	CO3, CO4		10	
6	**Semester End Examination**	Modules 1 to 5	CO1 to CO4	3	100	

Seminar: Group of 2 students
Module 5

The Average of total marks of three tests, two assignments, and seminar will be out of 40 marks and final exam will be for 100 marks scaled down to 60 marks.

CIE + SEE = 40 + 60 = 100 marks

Faculty Incharge DAC Chairman