Lesson Plan

Branch: Computer Engineering
Semester: 4 – Div A & B **Year: 2022-2023**

Course Title: Operating System	**SEE: 3 Hours – Theory & Oral Examination**
Total Contact Hours: 36 Hours	**Duration of SEE: 3 Hrs**
SEE Marks: 80 (Theory) + 20 (IA)	
Lesson Plan Author: Prachi Patil	**Date: 21-1-23**
Checked By: Dr. Sujata Deshmukh	**Date: 27-1-23**

Prerequisites: Any programming language
Syllabus:

Module	Detailed Content		Hours
1	**Operating system Overview**		4
	1.1	Introduction, Objectives, Functions and Evolution of Operating System	
	1.2	Operating system structures: Layered, Monolithic and Microkernel	
	1.3	Linux Kernel, Shell and System Calls	
2	**Process and Process Scheduling**		9
	2.1	Concept of a Process, Process States, Process Description, Process Control Block.	
	2.2	Uniprocessor Scheduling-Types: Preemptive and Non-preemptive scheduling algorithms (FCFS, SJF, SRTN, Priority, RR)	
	2.3	Threads: Definition and Types, Concept of Multithreading	
3	**Process Synchronization and Deadlocks**		9
	3.1	Concurrency: Principles of Concurrency, Inter-Process Communication, Process Synchronization.	
	3.2	Mutual Exclusion: Requirements, Hardware Support (TSL), Operating System Support (Semaphores), Producer and Consumer problem.	
	3.3	Principles of Deadlock: Conditions and Resource, Allocation Graphs, Deadlock Prevention, Deadlock Avoidance: Banker"s Algorithm, Deadlock Detection and Recovery, Dining Philosophers Problem.	
4	**Memory Management**		9
	4.1	Memory Management Requirements, Memory Partitioning: Fixed, Partitioning, Dynamic Partitioning, Memory Allocation Strategies: Best-Fit, First Fit, Worst Fit, Paging and Segmentation, TLB	
	4.2	Virtual Memory: Demand Paging, Page Replacement Strategies: FIFO, Optimal, LRU, Thrashing	
5		**File Management**	4
	5.1	Overview, File Organization and Access, File Directories, File Sharing	
6		**I/O management**	4
	6.1	I/O devices, Organization of the I/O Function, Disk Organization, I/O Management and Disk Scheduling: FCFS, SSTF, SCAN, CSCAN, LOOK, C-LOOK.	

Course Outcomes (CO):
On successful completion of course learner will be able to:
CSC404.1 Describe the objectives, functions and structure of OS
CSC404.2 Analyze the concept of process management and evaluate performance of process Scheduling algorithms.
CSC404.3 Apply the concepts of synchronization and deadlocks
CSC404.4 Evaluate performance of Memory allocation and replacement policies

CSC404.5 Describe the concepts of file management.
CSC404.6 Apply concepts of I/O management and analyze techniques of disk scheduling.

CO-PO Mapping: (BL – Blooms Taxonomy, C – Competency, PI – Performance Indicator)

CO	BL	C	PI	PO	Mapping
CSC404.1 Describe the objectives, functions and structure of OS	1	1.3	1.3.1	1	2
		1.4	1.4.1		
CSC404.2 Analyze the concept of process management and evaluate performance of process Scheduling algorithms.	4	1.4	1.4.1	1,2, 9, 10, 12	1
		2.2. 2.3 2.4	2.2.4, 2.3.2, 2.4.1,		1
		9.2, 9.3	9.2.1, 9.2.2, 9.2.3, 9.2.4		3
		10.1, 10.2	10.1.1, 10.2.1, 10.2.2,		3
		12.2, 12.3	12.2.1, 12.2.2, 12.3.1, 12.3.2		3
CSC404.3 Apply the concepts of synchronization and deadlocks	3	1.4	1.4.1	1	1
		2.2	2.2.3	2	2
		9.2, 9.3	9.2.1, 9.2.2, 9.2.3, 9.2.4	9	3
		10.1, 10.2	10.1.1, 10.2.1, 10.2.2,	10	3
		12.2, 12.3	12.2.1, 12.2.2, 12.3.1, 12.3.2	12	3
CSC404.4 Evaluate performance of Memory allocation and replacement policies	3	1.4	1.4.1	1	1
		2.2 2.3 2.4	2.2.3, 2.2.4, 2.3.2, 2.4.1,	2	2
		9.2, 9.3	9.2.1, 9.2.2, 9.2.3, 9.2.4	9	3
		10.1,	10.1.1,	10	3

		10.2	10.2.1, 10.2.2,		
		12.2, 12.3	12.2.1, 12.2.2, 12.3.1, 12.3.2	12	3
CSC404.5 Describe the concepts of file management.	4	1.4	1.4.1	1	1
		2.2 2.3 2.4	2.2.3, 2.2.4, 2.3.2, 2.4.1,	2	2
		9.2, 9.3	9.2.1, 9.2.2, 9.2.3, 9.2.4	9	3
		10.1, 10.2	10.1.1, 10.2.1, 10.2.2,	10	3
		12.2, 12.3	12.2.1, 12.2.2, 12.3.1, 12.3.2	12	3
CSC404.6 Apply concepts of I/O management and analyze techniques of disk scheduling.	3	1.4	1.4.1	1	1
		2.2 2.3 2.4	2.2.3, 2.2.4, 2.3.2, 2.4.1,	2	2
		9.2, 9.3	9.2.1, 9.2.2, 9.2.3, 9.2.4	9	3
		10.1, 10.2	10.1.1, 10.2.1, 10.2.2,	10	3
		12.2, 12.3	12.2.1, 12.2.2, 12.3.1, 12.3.2	12	3

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
CSC404. 1	2	-	-	-	-	-	-	-	-	-	-	-

CSC404.2	1	1	-	-	-	-	-	-	3	3	-	3
CSC404.3	1	2	-	-	-	-	-	-	3	3	-	3
CSC404.4	1	2	-	-	-	-	-	-	3	3	-	3
CSC404.5	1	2	-	-	-	-	-	-	3	3	-	3
CSC404.6	1	2	-	-	-	-	-	-	3	3	-	3

CO-PSO Mapping:

CO	PSO1	PSO2
CSC404.1	-	-
CSC404.2	-	-
CSC404.3	-	-
CSC404.4	-	-
CSC404.5	-	-
CSC404.6	-	-

CO Measurement Weightages for Tools:

Direct Tool					**Indirect tool**
Tools	**Test1**	**Test2**	**Assignment/Quiz/Gate Questions**	**SEE**	**Course Exit Survey**
CSC404.1	20%		20%	60%	100%
CSC404.2	20%				
CSC404.3	20%				
CSC404.4		20%			
CSC404.5		20%			
CSC404.6		20%			

Attainment:

CO CSC404.1:

Direct Method = 0.2*test +0.2* Assignment + 0.6* SEE_Theory
Final Attainment: 0.8* Direct Attainment +0.2* Indirect Attainment

CO CSC404.2:

Direct Method = 0.2*test +0.2* Assignment + 0.6* SEE_Theory
Final Attainment: 0.8* Direct Attainment +0.2* Indirect Attainment

CO CSC404.3:

Direct Method = 0.2*test +0.2* Assignment + 0.6* SEE_Theory
Final Attainment: 0.8* Direct Attainment +0.2* Indirect Attainment

CO CSC404.4:

Direct Method = 0.2*test +0.2* Assignment + 0.6* SEE_Theory
Final Attainment: 0.8* Direct Attainment +0.2* Indirect Attainment

CO CSC404.5:
Direct Method = 0.2*test +0.2* Assignment + 0.6* SEE_Theory
Final Attainment: 0.8* Direct Attainment +0.2* Indirect Attainment

CO CSC404.6:
Direct Method = 0.2*test +0.2* Assignment + 0.6* SEE_Theory
Final Attainment: 0.8* Direct Attainment +0.2* Indirect Attainment

Course Level Gap (if any): NO

Content beyond Syllabus: NO

Lecture Plan: SE Comps Div A

Lecture No	Planned Topics and Links	Planned Date	Actual Date	Mode of Delivery
1.	Topic: Intro to OS, Computer ArchitectureVideo	9-1		Online Sources
2.	Introduction, Objectives, Functions and Evolution of Operating System	11-1		Online Sources
3.	Operating system structures: Layered, Monolithic and Microkernel	13-1		Online Sources
4.	Linux Kernel, Shell and System Calls	16-1		Online Sources , Quiz1
5.	Priviledged Instructions, 32-64 bit processor,System calls, Process and Process in memory			Self Study, Video Links
6.	Process and Process Control Block (PCB)Process state transition	18-1		Online Sources
7.	Process State transition (5 state and 7 State)	20-1		Online Sources
8.	Scheduler and types, Threads and types , Multithreading	23-1		Online Sources
9.	Process Scheduling, need, objectives, terminologies wrt comparing scheduling algorithms	25-1		Online Sources
10	FCFS and SJF Algorithms	30-1		Online Sources ,Role play, chalk and Board
11	SRTF and RR Algorithm	1-2		Online Sources , Role play, chalk and Board
12	Priority Scheduling and multi queue scheduling algorithm	2-2		Online Sources , Role play, chalk and Board

13	Multi level feedback queue scheduling algorithm	6-2		Online Sources ,Quiz 2,
14	Intro to process sync, race condition, critical section problem, petersons solution	8-2		Online Sources
15	Lock variable, TSL, turn variable, interested variable mechanism	9-2		Online Sources
16	Synchronization without busy waiting, sleep and wake up call solution	13-2		Online Sources
17	Process Synchronization using semaphore, types of semaphore	15-2		Online Sources
18	Producer consumer problem and solution, OS thread models	16-2		Online Sources
19	Deadlock and conditions for deadlock, strategies-for-handling-deadlock ,deadlock-prevention	20-2		Online Sources
20	Deadlock avaoidance strategy	22-2		Online Sources, chalk and Board
21	Deadlock detection and recovery strategies.	23-2		Online Sources , Quiz 3
22	Dinning philosophers problem.			Self Study, video links
23	Memory management requirements, memory partitioning techniques	6-3		Online Sources
24	Memory allocation strategies.	8-3		Online Sources, chalk and Board
25	Paging – Logical to physical address translation	13-3		Online Sources
26	Page allocation techniques, page hit and miss, page thrashing	15-3		Online Sources
27	Page allocation techniques	16-3		Online Sources, chalk and Board
28	Translation lookaside buffer, Virtual memory , Demand Paging			Self Study, video links
29	Segmentation- address translation from logical to physical address	20-3		Online Sources , Quiz4
30	File organization- attributes-of-the-file, operations-on-the-file ,os-file-access-methods			Online Sources . Self Study, Video links
31	OS Directory structure, Directory implementation	23-3		Online Sources
32	File Allocation techniques	27-3		Online Sources
33	Disk scheduling algorithms: FCFS and SSTF	29-3		Online Sources, chalk and Board
34	Scan and C-Scan algorithms	3-4		Online Sources, chalk and Board
35	Look and C-Look Algorithms	5-4		Online Sources, chalk and Board

36	Comparison of different disk scheduling algorithms.			Self Study, Video Links
37	Device Management is OS	6-4		Quiz5
38	Disk controller in OS			Self Study, Video links

Lecture Plan: SE Comps B

Lecture No	Planned Topics and Links	Planned Date	Actual Date	Mode of Delivery
1.	Topic: Intro to OS, Computer ArchitectureVideo	9-1		Online Sources
2.	Introduction, Objectives, Functions and Evolution of Operating System	11-1		Online Sources
3.	Operating system structures: Layered, Monolithic and Microkernel	12-1		Online Sources
4.	Linux Kernel, Shell and System Calls	16-1		Online Sources
5.	Priviledged Instructions, 32-64 bit processor,System calls, Process and Process in memory			Self Study, Video Links
6.	Process and Process Control Block (PCB)Process state transition	18-1		Online Sources
7.	Process State transition (5 state and 7 State)	19-1		Online Sources
8.	Scheduler and types, Threads and types , Multithreading	23-1		Online Sources
9.	Process Scheduling, need, objectives, terminologies wrt comparing scheduling algorithms	25-1		Online Sources
10	FCFS and SJF Algorithms	30-1		Online Sources, Chalk and Board
11	SRTF and RR Algorithm	31-1		Online Sources, Chalk and Board
12	Priority Scheduling and multi queue scheduling algorithm	2-2		Online Sources, Chalk and Board
13	Multi level feedback queue scheduling algorithm	6-2		Online Sources
14	Intro to process sync, race condition, critical section problem, petersons solution	7-2		Online Sources
15	Lock variable, TSL, turn variable, interested variable mechanism	9-2		Online Sources
16	Synchronization without busy waiting, sleep and wake up call solution	13-2		Online Sources
17	Process Synchronization using semaphore, types of semaphore	14-2		Online Sources

18	Producer consumer problem and solution, OS thread models	16-2		Online Sources
19	Deadlock and conditions for deadlock, strategies-for-handling-deadlock ,deadlock-prevention	20-2		Online Sources
20	Deadlock avaoidance strategy	21-2		Online Sources, Chalk and Board
21	Deadlock detection and recovery strategies.	23-2		Online Sources
22	Dinning philosophers problem.			Self Study, video links
23	Memory management requirements, memory partitioning techniques	2-3		Online Sources
24	Memory allocation strategies.	6-3		Online Sources, Chalk and Board
25	Paging – Logical to physical address translation	7-3		Online Sources
26	Page allocation techniques, page hit and miss, page thrashing	13-3		Online Sources
27	Page allocation techniques	14-3		Online Sources, Chalk and Board
28	Translation lookaside buffer, Virtual memory , Demand Paging			Self Study, video links
29	Segmentation- address translation from logical to physical address	16-3		Online Sources
30	File organization- attributes-of-the-file, operations-on-the-file ,os-file-access-methods			Self Study, Video links
31	OS Directory structure, Directory implementation	20-3		Online Sources
32	File Allocation techniques	21-3		Online Sources
33	Disk scheduling algorithms: FCFS and SSTF	23-3		Online Sources, Chalk and Board
34	Scan and C-Scan algorithms	27-3		Online Sources, Chalk and Board
35	Look and C-Look Algorithms	28-3		Online Sources, Chalk and Board
36	Comparison of different disk scheduling algorithms.			Self Study, Video Links
37	Device Management is OS	3-4		Online Sources
38	Disk controller in OS	6-4		Online Sources

Textbooks:	
1	William Stallings, Operating System: Internals and Design Principles, Prentice Hall, 8th Edition, 2014, ISBN-10: 0133805913 • ISBN-13: 9780133805918.
2	Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, Operating System Concepts, John Wiley &Sons, Inc., 9th Edition, 2016, ISBN 978-81-265-5427-0
References:	
1	Achyut Godbole and Atul Kahate, Operating Systems, McGraw Hill Education, 3rd Edition
2	Andrew Tannenbaum, Operating System Design and Implementation, Pearson, 3rd Edition.
3	Maurice J. Bach, "Design of UNIX Operating System", PHI
4	Sumitabha Das, "UNIX: Concepts and Applications",McGraw Hill, 4th Edition

Web References:

1. www.geeksforgeeks.com
2. www.javatpoint.com
3. For Slow Learners: Gate Smashers (Youtube Channel): https://www.youtube.com/watch?v=WJ-UaAaumNA
4. For Fast Learners: Swayam: https://onlinecourses.nptel.ac.in/noc20_cs04/preview
5. Stanford University: http://web.stanford.edu/~ouster/cgi-bin/cs140-spring14/lectures.php

Evaluation Scheme

CIE Scheme

Internal Assessment: 20 (Average of two tests)

Internal Assessment Scheme

Module		Lecture Hours	No. of questions in IA			No. of questions in SEE
			Test 1	Test 2	Test 3*	
1	Process Overview	4	01 (5 marks)	-	--	-
2	Process Management	9	01 (7 Marks)	-	--	-
3	Process Synchronization	9	01 (8 Marks)	-	--	-
4	Memory Management	9		1 (5 Marks)	--	-
5	File Management	4	-	1 (7 Marks)	--	-
6	I/O Management	4	-	1 (8 Marks)	--	-

Note: Four to six questions will be set in the Test paper

Verified by:

Programme Coordinator **Subject Expert :**

Monica Khanore **Dr. Sujata Deshmukh**