S R M INSTITUTE OF SCIENCE AND TECHNOLOGY

(Deemed to be University u/s 3 of UGC Act 1956)

COLLEGE OF ENGINEERING AND TECHNOLOGY

SCHOOL OF COMPUTING

HANDBOOK

Course Code & Title	**:**	**18CSC205J – OPERATING SYSTEMS**
Programme	**:**	**B.Tech. (Computer Science and Engineering)**
Year & Semester	**:**	**II Year IV Semester**
Academic Year	**:**	**2022 – 23 Even Semester**

TABLE OF CONTENT

SRM
INSTITUTE OF SCIENCE & TECHNOLOGY
Deemed to be **University** *u/s 3 of UGC Act, 1956*

UNIVERSITY VISION

To emerge as a world-class University in creating and disseminating knowledge and providing students a unique learning experience in science, technology, medicine, management and other areas of scholarship that will best serve the world and betterment of mankind.

UNIVERSITY MISSION

TO MOVE UP through international alliances and collaborative initiatives to achieve global excellence.

TO ACCOMPLISH A PROCESS to advance knowledge in a rigorous academic and research environment.

TO ATTRACT AND BUILD PEOPLE in a rewarding and inspiring environment by fostering freedom, empowerment, creativity and innovation.

SCHOOL OF COMPUTING VISION

To become a world class School in importing high quality education and in providing students a unique learning and research experience in the field of Computer Science and Engineering and its related fields.

SCHOOL OF COMPUTING MISSION

- To impart knowledge in cutting edge technologies on par with industrial standards
- To collaborate with renowned academic institutions in research and development
- To instil societal and ethical responsibilities in all professional activities

CTECH DEPARTMENT VISION

To become a world class Department in importing high quality knowledge and in providing students a unique learning and research experience in the field of Computer Science and Engineering.

CTECH DEPARTMENT MISSION

- To impart knowledge in cutting edge technologies at par with industry
- To collaborate with renowned institutions in research and development
- To instil societal and ethical responsibilities in all professional activities

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

- Graduates will be able to perform in technical/managerial roles ranging from design, development, problem solving to production support in software industries and R&D sectors.
- Graduates will be able to successfully pursue higher education in reputed institutions.
- Graduates will have the ability to adapt, contribute and innovate new technologies and systems in the key domains of Computer Science and Engineering.
- Graduates will be ethically and socially responsible solution providers and entrepreneurs in Computer Science and other engineering disciplines.

PROGRAMME OUTCOMES (PO)

PO 1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialisation for the solution of complex engineering problems.

PO 2: Problem analysis: Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO 3: Design/Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations.

PO 4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO 5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO 7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and the need for sustainable development.

PO 8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10: Communication: Communicate effectively on complex engineering activities with the engineering community and with the society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

PO 11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 12: Life-long learning: Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

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ABOUT THE COURSE

Operating Systems is an Under Graduate level course to understand, apply and analyse the operating system functions of process management, memory management, disk management, and file system management. This course explore the services offered by the operating systems practically. It provides a clear description of the concepts that underlie operating systems. This course impart knowledge on process synchronization, process scheduling, disk scheduling, virtual memory management and disk scheduling concepts. The purpose of this course is educate the students, as clearly as possible, the nature and characteristics of modern-day operating systems.

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SYLLABUS

Course Code	18CSC205J	Course Name	OPERATING SYSTEMS	Course Category	C	Professional Core	L	T	P	C
							3	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Science and Engineering	Data Book / Codes/Standards	Nil		

Course Objectives:	The purpose of learning this course is to:
1	Introduce the key role of an Operating system
2	Insist the Process Management functions of an Operating system
3	Emphasize the importance of Memory Management concepts of an Operating system
4	Realize the significance of Device Management part of an Operating system
5	Comprehend the need of File Management functions of an Operating system
6	Explore the services offered by the Operating system practically

Course Outcomes (CO):	At the end of this course, learners will be able to:	Learning: Level of Thinking (Bloom)	Expected Proficiency %	Expected Attainment %
CO1 :	Express the fundamental concepts in Operating Systems.	2	60	70
CO2 :	Implement synchronization and scheduling in Operating System	3	70	75
CO3 :	Apply fragmentation, paging and segmentation in memory management.	3	70	75
CO4 :	Incorporate page fault handling, demand paging and page buffering techniques in Operating System.	4	60	70
CO5 :	Demonstrate the storage management techniques through various File Management techniques	3	60	70

Program Learning Outcomes (PLO)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO - 3
CO1	3		3										2		
CO2	2	1	3											2	
CO3	3	2	2										2		
CO4	3	2	2											2	
CO5	3		2	2									2		

Duration (hour)		15	15	15	15	15
S-1	SLO-1	Operating System Objectives and Functions	PROCESS SYNCHRONIZATION : Peterson's solution, Synchronization Hardware	MEMORY MANAGEMENT: Memory Management: Logical Vs Physical address space, Swapping	VIRTUAL MEMORY– Background	STORAGE MANAGEMENT : Mass storage structure – Overview of Mass storage structure – Magnetic Disks
	SLO-2	Gaining the role of Operating systems	Understanding the two-process solution and the benefits of the synchronization hardware	Understanding the basics of Memory management	Understanding the need of demand paging	Understanding the Basics in storage management
S-2	SLO-1	The evolution of operating system, Major achievements	Process synchronization: Semaphores, usage, implementation	Contiguous Memory allocation – Fixed and Dynamic partition	VIRTUAL MEMORY – Basic concepts – page fault handling	Disk Scheduling
	SLO-2	Understanding the evolution of Operating systems from early batch processing systems to modern complex systems	Gaining the knowledge of the usage of the semaphores for the Mutual exclusion mechanisms	Getting to know about Partition memory management and issues: Internal fragmentation and external fragmentation problems	Understanding , how an OS handles the page faults	Understanding the various scheduling with respect to the disk
S-3	SLO-1	OS Design considerations for Multiprocessor and Multicore	Classical Problems of synchronization – Readers writers problem, Bounded Buffer problem	Strategies for selecting free holes in Dynamic partition	Performance of Demand paging	FILE SYSTEM INTERFACE: File concept, File access methods
	SLO-2	Understanding the key design issues of Multiprocessor Operating systems and Multicore Operating systems	Good understanding of synchronization mechanisms	Understanding the allocation strategies with examples	Understanding the relationship of effective access time and the page fault rate	Understanding the file basics
S 4-5	SLO-1	LAB 1 : Understanding the booting process of Linux	LAB4 : System admin commands – Basics	LAB7: Shell Programs – Basic level	LAB10 : Overlay concept	LAB13:Process synchronization
S-6	SLO-1	PROCESS CONCEPT– Processes, PCB	Classical Problems of synchronization – Dining Philosophers problem (Monitor)	Paged memory management	Copy-on write	File sharing and Protection
	SLO-2	Understanding the Process concept and Maintanance of PCB by OS	Understanding the synchronization of limited resources among multiple processes	Understanding the Paging technique,PMT hardware mechanism	Understanding the need for Copy-on write	Emphasis the need for the file sharing and its protection
S-7	SLO-1	Threads – Overview and its Benefits	CPU SCHEDULING : FCFS,SJF,Priority	Structure of Page Map Table	Page replacement Mechanisms: FIFO, Optimal, LRU and LRU approximation Techniques	FILE SYSTEM IMPLEMENTATION : File system structure
	SLO-2	Understanding the importance of threads	Understanding the scheduling techniques	Understanding the components of PMT	Understanding the Pros and cons of the page replacement techniques	To get the basic file system structure
S-8	SLO-1	Process Scheduling : Scheduling Queues, Schedulers, Context switch	CPU Scheduling: Round robin, Multilevel queue Scheduling, Multilevel feedback Scheduling	Example : Intel 32 bit and 64 –bit Architectures	Counting based page replacement and Page Buffering Algorithms	Directory Implementation
	SLO-2	Understanding basics of Process scheduling	Understanding the scheduling techniques	Understanding the Paging in the Intel architectures	To know on additional Techniques available for page replacement strategies	Understanding the various levels of directory structure
S 9-10	SLO-1	LAB2 : Understanding the Linux file system	LAB5: System admin commands – Simple task automations	LAB 8:Process Creation	LAB11: IPC using Pipes	LAB14 : Study of OS161
	SLO-2					
S-11	SLO-1	Operations on Process – Process creation, Process termination	Real Time scheduling: Rate Monotonic Scheduling and Deadline Scheduling	Example : ARM Architectures	Allocation of Frames - Global Vs Local Allocation	FILE SYSTEM IMPLEMENTATION :Allocation methods
	SLO-2	Understanding the system calls – fork(),wait(),exit()	Understanding the real time scheduling	Understanding the Paging with respect to ARM	Understanding the root cause of the Thrashing	Understanding the pros and Cons of various disk allocation methods
S-12	SLO-1	Inter Process communication : Shared Memory, Message Passing ,Pipe()	DEADLOCKS: Necessary conditions, Resource allocation graph, Deadlock prevention methods	Segmented memory management	Thrashing, Causes of Thrashing	FILE SYSTEM IMPLEMENTATION :Free space Management
	SLO-2	Understanding the need for IPC	Understanding the deadlock scenario	Understanding the users view of memory with respect to the primary memory	Understanding the Thrashing	Understanding the methods available for maintaining the free spaces in the disk
S-13	SLO-1	PROCESS SYNCHRONIZATION: Background, Critical section Problem	Deadlocks :Deadlock Avoidance, Detection and Recovery	Paged segmentation Technique	Working set Model	Swap space Management
	SLO-2	Understanding the race conditions and the need for the Process synchronization	Understanding the deadlock avoidance, detection and recovery mechanisms	Understanding the combined scheme for efficient management	Understanding the working set model for controlling the Working set Model	Understanding the Low-level task of the OS
S 14-15	SLO-1	LAB3: Understanding the various Phases of Compilation of a 'C' Program	LAB6 : Linux commands	LAB9: Overlay concept	LAB12: IPC using shared memory and Message queues	LAB15 : Understanding the OS161 filesystem and working with test programs
	SLO-2					

Learning Resources	1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating systems, 9th ed., John Wiley & Sons, 2013 2. William Stallings, Operating Systems-Internals and Design Principles, 7th ed., Prentice Hall, 2012	3. Andrew S.Tanenbaum, Herbert Bos, Modern Operating systems, 4th ed., Pearson, 2015 4. Bryant O'Hallaron, Computer systems- A Programmer's Perspective,Pearson, 2015

Learning Assessment	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)			
		Theory (5%)	Practice (5%)	Theory (7.5%)	Practice (7.5%)	Theory (7.5%)	Practice (7.5%)	Theory (5%)	Practice (5%)	Theory (25%)	Practice (25%)
Level 1	Remember	20%		15%		15%				15%	
Level 2	Understand	20%		25%		25%		25%		20%	
Level 3	Apply	45%	30%	40%	35%	40%	40%	20%	20%	45%	30%
Level 4	Analyze	15%	40%	20%	35%	20%	30%	20%	50%	20%	35%

Level 5	Evaluate		30%		30%		30%	25%	30%		35%
Level 6	Create										
	Total	100 %	100 %	100 %	100 %	100 %	100 %	100%	100%	100%	100%

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers			
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts	
1.Mr. Balamurugan, Infosys, balams@gmail.com	*1. Dr.Latha Parthiban, Pondicherry University, lathaparthiban@yahoo.com*	***1. Dr .G. Maragatham, SRMIST***	***3. Ms. Aruna S, SRMIST***
		2. Dr. M. Eliazer, SRMIST	

COURSE OBJECTIVES AND COURSE OUTCOMES

Course Objectives

The purpose of Learning this course is to :

- Introduce the key role of an Operating system
- Insist the Process Management functions of an Operating system
- Emphasize the importance of Memory Management concepts of an Operating system
- Realize the significance of Device Management part of an Operating system
- Comprehend the need of File Management functions of an Operating system
- Explore the services offered by the Operating system practically

Course Outcomes

At the end of this course, learners will be able to :

CO1 : Express the fundamental concepts in Operating Systems

CO2 : Implement synchronization and scheduling in Operating System

CO3 : Apply fragmentation, paging and segmentation in memory management

CO4 : Incorporate page fault handling, demand paging and page buffering techniques in Operating System

CO5 : Demonstrate the storage management techniques through various File Management techniques

COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3		3										2		
CO2	2	1	3											2	
CO3	3	2	2										2		
CO4	3	2	2											2	
CO5	3		2	2									2		

LESSON PLAN

Hour #	Topic	CO	Ref.	Teaching Method	Assessment Method
1	Operating System Objectives and Functions, Gaining the role of Operating systems	CO1	T2	Brain Storming	Quiz, MCQ
2	The evolution of operating system, Major achievements, Understanding the evolution of Operating systems from early batch processing systems to modern complex systems	CO1	T2	BB	Descriptive Questions
3	OS Design considerations for Multiprocessor and Multicore, Understanding the key design issues of Multiprocessor Operating systems and Multicore Operating systems	CO1	T1	Presentation	Quiz, MCQ, Descriptive Questions
4	PROCESS CONCEPT– Processes, PCB, Understanding the Process concept and Maintenance of PCB by OS	CO1	T1,T2	BB	Quiz, MCQ, Descriptive Questions
5	Threads – Overview and its Benefits, Understanding the importance of threads	CO1	T1	BB	Descriptive Questions
6	Process Scheduling : Scheduling Queues, Schedulers, Context switch, Understanding basics of Process scheduling	CO1	T1,T2	BB	Quiz, MCQ, Descriptive Questions
7	Operations on Process – Process creation, Process termination, Understanding the system calls – fork(),wait(),exit()	CO1	T1,T2	Demo	Quiz, MCQ, Descriptive Questions
8	Inter Process communication : Shared Memory, Message Passing ,Pipe(), Understanding the need for IPC	CO1	T1,T2	Demo	Quiz, MCQ, Descriptive Questions
9	PROCESS SYNCHRONIZATION: Background, Critical section Problem, Understanding the race conditions and the need for the Process synchronization	CO1	T1,T2	BB	Quiz, MCQ, Descriptive Questions
10	Peterson's solution, Synchronization Hardware, Understanding the two-process solution and the benefits of the synchronization hardware	CO2	T1	BB	Quiz, Open Book Test
11	Process synchronization: Semaphores, usage, implementation, Gaining the knowledge of the usage of the semaphores for the Mutual exclusion mechanisms	CO2	T1	BB, Role Play	Quiz, Open Book Test
12	Classical Problems of synchronization – Readers writers problem, Bounded Buffer problem, Good understanding of synchronization mechanisms	CO2	T1	Gaming/ Animation	Quiz, Open Book Test
13	Classical Problems of synchronization – Dining Philosophers problem (Monitor), Understanding the synchronization of limited resources among multiple processes	CO2	T1	Gaming/ Animation	Quiz, Open Book Test, Project
14	CPU SCHEDULING : FCFS, SJF, Priority, Understanding the scheduling techniques	CO2	T1,T2	Role Play	Quiz, Open Book Test

15	CPU Scheduling: Round robin, Multilevel queue Scheduling, Multilevel feedback Scheduling, Understanding the scheduling techniques	CO2		Gaming/ Animation	Quiz, Open Book Test, Assignment
16	Real Time scheduling: Rate Monotonic Scheduling and Deadline Scheduling, Understanding the real time scheduling	CO2	T1	BB, Group Discussion	Quiz, Open Book Test
17	DEADLOCKS: Necessary conditions, Resource allocation graph, Deadlock prevention methods, Understanding the deadlock scenario	CO2	T1,T2	BB, Simulation	Quiz, Open Book Test, Assignment
18	Deadlocks :Deadlock Avoidance, Detection and Recovery, Understanding the deadlock avoidance, detection and recovery mechanisms	CO2	T1,T2	BB, Brain Storming	Quiz, Open Book Test, Project
19	MEMORY MANAGEMENT: Memory Management: Logical Vs Physical address space, Swapping, Understanding the basics of Memory management	CO3	T1,T2	Presentation	Quiz, Open Book Test
20	Contiguous Memory allocation – Fixed and Dynamic partition, Getting to know about Partition memory management and issues: Internal fragmentation and external fragmentation problems	CO3	T1,T2	Presentation	Quiz, Open Book Test
21	Strategies for selecting free holes in Dynamic partition, Understanding the allocation strategies with examples	CO3	T1,T2	BB	Quiz, Open Book Test
22	Paged memory management, Understanding the Paging technique, PMT hardware mechanism	CO3	T1,T2	BB	Quiz, Open Book Test
23	Structure of Page Map Table, Understanding the components of PMT	CO3	T1,T2	Presentation	Quiz, Open Book Test
24	Example : Intel 32 bit and 64 –bit Architectures, Understanding the Paging in the Intel architectures	CO3	T1	Group Discussion	Quiz, Open Book Test, Assignment
25	Example : ARM Architectures, Understanding the Paging with respect to ARM	CO3	T1	Group Discussion	Quiz, Open Book Test, Assignment
26	Segmented memory management, Understanding the users view of memory with respect to the primary memory	CO3	T1	BB	Quiz, Open Book Test
27	Paged segmentation Technique, Understanding the combined scheme for efficient management	CO3	T1	BB	Quiz, Open Book Test
28	VIRTUAL MEMORY– Background, Understanding the need of demand paging	CO4	T1,T2	BB	Quiz, MCQ, Descriptive Questions
29	VIRTUAL MEMORY – Basic concepts – page fault handling, Understanding , how an OS handles the page faults	CO4	T1,T2	BB	Quiz, MCQ, Descriptive Questions
30	Performance of Demand paging, Understanding the relationship of effective access time and the page fault rate	CO4	T1,T2	Presentation	Quiz, MCQ, Descriptive Questions

31	Copy-on write, Understanding the need for Copy-on write	CO4	T1	Presentation	Quiz, MCQ, Descriptive Questions
32	Page replacement Mechanisms: FIFO, Optimal, LRU and LRU approximation Techniques, Understanding the Pros and cons of the page replacement techniques	CO4	T1,T2	Role Play	Quiz, MCQ, Descriptive Questions, Project
33	Counting based page replacement and Page Buffering Algorithms, To know on additional Techniques available for page replacement strategies	CO4	T1	Flipping Classroom	Quiz, MCQ, Descriptive Questions
34	Allocation of Frames - Global Vs Local Allocation, Understanding the root cause of the Thrashing	CO4	T1	BB	Quiz, MCQ, Descriptive Questions
35	Thrashing, Causes of Thrashing, Understanding the Thrashing	CO4	T1	BB	Quiz, MCQ, Descriptive Questions
36	Working set Model, Understanding the working set model for controlling the Working set Model	CO4	T1	Simulation	Quiz, MCQ, Descriptive Questions
37	STORAGE MANAGEMENT : Mass storage structure – Overview of Mass storage structure – Magnetic Disks, Understanding the Basics in storage management	CO5	T1,T2	Presentation	Quiz, MCQ, Descriptive Questions
38	Disk Scheduling, Understanding the various scheduling with respect to the disk	CO5	T1,T2	Role Play/ Animation	Quiz, MCQ, Descriptive Questions
39	FILE SYSTEM INTERFACE: File concept, File access methods, Understanding the file basics	CO5	T1,T2	Presentation	Quiz, MCQ, Descriptive Questions
40	File sharing and Protection, Emphasis the need for the file sharing and its protection	CO5	T1,T2	Presentation	Quiz, MCQ, Descriptive Questions
41	FILE SYSTEM IMPLEMENTATION : File system structure, To get the basic file system structure	CO5	T1,T2	BB	Quiz, MCQ, Descriptive Questions
42	Directory Implementation, Understanding the various levels of directory structure	CO5	T1,T2	BB	Quiz, MCQ, Descriptive Questions
43	FILE SYSTEM IMPLEMENTATION :Allocation methods, Understanding the pros and Cons of various disk allocation methods	CO5	T1,T2	Group Discussion	Quiz, MCQ, Descriptive Questions
44	FILE SYSTEM IMPLEMENTATION :Free space Management, Understanding the methods available for maintaining the free spaces in the disk	CO5	T1,T2	BB	Quiz, MCQ, Descriptive Questions
45	Swap space Management, Understanding the Low-level task of the OS	CO5	T1,T2	BB	Quiz, MCQ, Descriptive Questions

BB – Black Board Teaching, MCQ-Multiple Choice Questions

Text Books:

T1 : Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating systems, 9th ed., John Wiley & Sons, 2013

T2 : William Stallings, Operating Systems-Internals and Design Principles, 7th ed., Prentice Hall, 2012

T3 : Andrew S. Tanenbaum, Herbert Bos, Modern Operating systems, 4th ed., Pearson, 2015

LIST OF PRACTICAL EXERCISES

Hour #	Name of the Exercise
1	Operating system Installation
2	Booting Process of Linux
3	Basic Linux Commands
4	Advanced Linux Commands
5	Shell Scripts using conditional statements
6	Shell Scripts using Iterative statements
7	Process creation using getpid() and getppid()
8	Process creation using wait(), sleep() and exit()
9	Program in which the child process calculates the sum of odd numbers and the parent process calculate the sum of even numbers up to the number 'n'
10	Program in which the parent process sorts the integers using insertion sort and waits for child process to sort the integers using selection sort
11	FCFS Process Scheduling
12	Round Robin Process Scheduling
13	Program using fifo()
14	Program using pipie()
15	Message Queue - Sending
16	Message Queue - Receiving
17	Shared memory - Attach memory
18	Shared memory - Detach memory
19	Overlay Concepts using execl() and execlp()
20	Overlay Concepts using execv() and execvp()
21	Mutual Exclusion using System V Semaphore
22	Mutual Excluaion using POSIX Semaphore
23	Reader-Writer Problem (Reader Process)
24	Reader-Writer Problem (Writer Process)
25	Dining- Philosopher Problem (Hour 1)
26	Dining- Philosopher Problem (Hour 2)
27	Shell Code analyser
28	GNU Debugger
29	Binary file analyser
30	Study of OS161

LEARNING ASSESSMENT PLAN

Learning Assessment Plan										
Bloom's Level of Thinking	Continuous Learning Assessment **(Internal)**								Final Examination	
	CLAT1 (5%)	**CLAT2 (7.5%)**	**CLAT3 (7.5%)**	**CLAT4 (5%)**	**CLAP1 (5%)**	**CLAP2 (7.5%)**	**CLAP3 (7.5%)**	**CLAP4 (5%)**	**(25%)**	**(25%)**
	Theory				Practical				Theory	Practical
Remember	20%	15%	15%						15%	
Understand	20%	25%	25%	25%					20%	
Apply	45%	40%	40%	20%	30%	35%	40%	20%	45%	30%
Analyze	15%	20%	20%	20%	40%	35%	30%	50%	20%	35%
Evaluate				25%	30%	30%	30%	30%		35%
Create										

COURSE ASSESSMENT PLAN

Course Outcomes (CO)	Weightage	CLA1	CLA2	CLA3	CLA4	End-Sem
CO1 : Express the fundamental concepts in Operating Systems	22%	√			√	√
CO2 : Implement synchronization and scheduling in Operating System	19%		√		√	√
CO3 : Apply fragmentation, paging and segmentation in memory management	22%		√		√	√
CO4 : Incorporate page fault handling, demand paging and page buffering techniques in Operating System	19%			√	√	√
CO5 :Demonstrate the storage management techniques through various File Management techniques	18%			√	√	√
Weightage	**--**	**10%**	**15%**	**15%**	**10%**	**50%**

TARGETS PLANNED

- Expected Pass Percentage is 100%
- Expected CO Attainment is 2.25
- Expected “O” Grade attainment is 15%
- Planned to Conduct Technical Sessions related to operating systems by Industry experts
- Planned to do Case Studies on Windows and Linux operating system
- Planned to motivate the learners to do online courses/certification related to operating systems

CYCLE TEST I
PORTION, SCHEDULE AND QUESTION PATTERN

Theory

Portion : Unit 1

Schedule : 50 Minutes Test

Pattern : 5 MCQ Questions (Each 1 Mark) : 5 Marks
2 Descriptive Questions (Each 10 Marks) : 20 Marks
Maximum Marks : 25 Marks

Practicals

Portion : Exercises 1 to 6

CYCLE TEST II
PORTION, SCHEDULE AND QUESTION PATTERN

Theory

Portion : Unit 2 and 3

Schedule : 100 Minutes Test

Pattern : 5 out of 7 Open Book questions (Each 10 Marks) : 50 Marks

Practicals

Portion : Exercises 7 to 18

CYCLE TEST III
PORTION, SCHEDULE AND QUESTION PATTERN

Theory

Portion : Unit 4 and 5

Schedule : 100 Minutes Test

Pattern : 10 MCQ Questions (Each 1 Mark) : 10 Marks
4 out of 6 Descriptive Questions (Each 10 Marks) : 40 Marks
Maximum Marks : 50 Marks

Practicals

Portion : Exercises 19 to 30

CLAT4 and CLAP4 ASSESSMENT

For CLAT4

1. Unit-wise MCQ Test on Gate level questions using Online tools.
   Best of 4 out of 5 MCQ Test 4 x 1 = 4 Marks

2. Two Assignments using scenario based questions : 2 x 0.5 = 1 Mark

   Total CLAT4 : 5 Marks

For CLAP4

1. Model Practical Test : 3 Marks

2. Any one of the following can be considered for 2 marks
   - Online Certification completed after Jan 2023
   - Online Course completed after Jan 2023
   - Mini Projects using Operating system concepts

   Total CLAP4 : 5 Marks

RUBRICS FOR LAB EXERCISES

Evaluation Parameters	Weightage
Approach	30%
Code	30%
Validate	5%
Dry Run	5%
Scalable	5%
Readable	10%
Output	10%
Total	**100%**

- **Approach** to solution indicates the generalness (handle all types of data) and efficiency of the solution.
- **Source code** should ensure the completeness of solution and follow coding standard
- **Validate :** Inclusion of appropriate validation check for input
- **Dry run** the program with two sample inputs
- **Scalable :** Ability to handle data of varied size
- **Readable :** Appropriate comments for the purpose of documentation
- **Output** as per the expected format

RUBRICS FOR ASSIGNMENTS

Evaluation Parameters	Marks
Proper team formation (Appropriate mix)	10
Clear representation of Individual Contribution	10
Modular Approach (Validation, Integration)	20
Correctness of Algorithm (Handling Edge cases)	20
Sample Test Case (Table comparing time complexity)	10
Documentation	20
Viva	10
Total	**100**

INNOVATIVE TEACHING METHODS

- Role Play
- Group Discussion
- Brain Storming
- Team Quiz
- Gaming
- Animation
- Flipping Class room
- Simulation
- Videos Lectures
- You tube channel for OS course
- Use of Online tool like Kahoot, Mentimeter, etc

LIST OF COURSE COORDINATORS

Audit Professor **:** Dr. M. Lakshmi, Prof. & Head
Department of Data Science and Business Systems

Dr. V. Kavitha, Professor
Department of Data Science and Business Systems

Course Coordinator (School of Computing) **:** Dr. M. Eliazer, Asst. Prof./CTECH

Course Coordinator (CTECH - Theory) **:** Dr. M. Eliazer, Asst. Prof./CTECH

Course Coordinator (CTECH - Lab) **:** Mrs. B. Sowmya, Asst. Prof./CTECH

Course Coordinator (NWC) **:** Mrs. G. Sujatha, Asst. Prof./NWC

Course Coordinator (DSBS) **:** Dr. P. Rajasekar, Asst. Prof./DSBS

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