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	**:**	**21CSC202J – OPERATING SYSTEMS**
Programme	**:**	**B.Tech. (Computer Science and Engineering)**
Year & Semester	**:**	**II Year III Semester**
Academic Year	**:**	**2023 – 24 Odd 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

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. The protection and security features in operating system are covered.

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SYLLABUS

Course Code	21CSC202J	Course Name	OPERATING SYSTEMS	Course Category	C	Professional Core	L	T	P	C
							3	0	2	4

Pre-requisite Courses	*COA*	Co-requisite Courses	*Nil*	Progressive Courses	*Nil*
Course Offering Department	Electrical and Electronics Engineering	Data Book / Codes/Standards	*Nil*		

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*	Learning		
		1	2	3
CLR-1:	Outline the structure of OS and basic architectural components involved in OS design			
CLR-2:	Introduce the concept of deadlock and various memory management mechanism			
CLR-3:	Familiarize the scheduling algorithms, file systems, and I/O schemes			
CLR-4:	Identify and tell the various embedded operating systems and computer security concepts			
CLR-5:	Name the various computer security techniques in windows and Linux			

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1:	Use the appropriate concepts of operating system for resource utilization	3	70	75
CLO-2:	Choose the relevant process and thread concepts for solving synchronization problems	5	70	75
CLO-3:	Exemplify different types of scheduling algorithms and deadlock mechanism.	5	70	75
CLO-4:	Experiment the performance of different algorithms used in management of memory, file and I/O and select the appropriate one.	4	70	75
CLO-5:	Demonstrate different device and resource management techniques for memory utilization with security mechanisms	3	70	75

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
CLO-1:	3	3	2	2	-	-	-	-	-	-	-	3	-	-	-
CLO-2:	3	3	3	2	-	-	-	-	-	-	-	3	-	-	-
CLO-3:	3	3	3	2	-	-	-	-	-	-	-	3	-	-	-
CLO-4:	3	3	3	2	-	-	-	-	-	-	-	3	-	-	-
CLO-5:	3	2	3	2	-	-	-	-	-	-	-	3	-	-	-

Unit-1
Introduction, Computer-System Organization, Computer-System Architecture, Operating-System Structure, Operating-System Operations, Process Management, Memory Management, Storage Management, Protection and Security, Kernel Data Structures, Computing Environments, Open-Source Operating Systems, Operating-System Services, User and Operating-System Interface, System Calls, Types of System Calls, System Programs, Operating-System Design and Implementation, Operating-System Structure, Operating-System Debugging, Operating-System Generation, System Boot.

Unit-2
PROCESS MANAGEMENT: Process Concept, Process Scheduling, Operations on Processes, Interprocess Communication, Communication in Client– Server Systems, Threads: Multicore Programming, Multithreading Models, Thread Libraries, Implicit Threading, Threading Issues. Process Synchronization: The Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Mutex Locks, Semaphores, Classic Problems of Synchronization, Monitors

Unit-3
CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Thread Scheduling, Multiple-Processor Scheduling, Real-Time CPU Scheduling. Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock

Unit-4
MEMORY MANAGEMENT: Main Memory, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of the Page Table. Virtual Memory: Introduction, Demand Paging, Copy-on-Write, Page Replacement, Allocation of Frames, Thrashing, Memory-Mapped Files, Allocating Kernel Memory. STORAGE MANAGEMENT: Disk Structure, Disk Attachment, Disk Scheduling, Disk Management, Swap-Space Management, RAID Structure. File-System Interface: File Concept, Access Methods, Directory and Disk Structure, File-System Mounting, File Sharing, Protection. .

Unit-5
PROTECTION AND SECURITY: Goals of Protection, Principles of Protection, Domain of Protection, Access Matrix, Implementation of the Access Matrix, Access Control, Revocation of Access Rights, Capability-Based Systems, Language-Based Protection, The Security Problem, Program Threats, System and Network Threats, Cryptography as a Security Tool, User Authentication, Implementing Security Defenses, Firewalling to Protect Systems and Networks, Computer-Security Classifications.

Lab 1: Operating system Installation, Basic Linux commands
Lab 2: Process Creation using fork() and Usage of getpid(), getppid(), wait() functions
Lab 3: Multithreading
Lab 4: Mutual Exclusion using semaphore and monitor
Lab 5: Reader-Writer problem
Lab 6: Dining Philosopher problem
Lab 7: Bankers Algorithm for Deadlock avoidance
Lab 8: FCFS and SJF Scheduling
Lab 9: Priority and Round robin scheduling
Lab 10: FIFO Page Replacement Algorithm
Lab 11: LRU and LFU Page Replacement Algorithm
Lab 12: Best fit and Worst fit memory management policies
Lab 13: Disk Scheduling algorithm
Lab 14: Sequential and Indexed file Allocation
Lab 15: File organization schemes for single level and two level directory

Learning Resources		
	1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", John Wiley & Sons (Asia) Pvt. Ltd, Tenth Edition, 2018	7. *https://nptel.ac.in/courses/106/105/106105214/*
	2. RamazElmasri, A. Gil Carrick, David Levine, "Operating Systems – A Spiral Approach ", Tata McGraw Hill Edition, 2010	8. *https://nptel.ac.in/courses/106/106/106106144/*
		9. https://nptel.ac.in/courses/106/102/106102132/
		10. https://onlinecourses.nptel.ac.in/noc21_cs44/preview

	3. Dhananjay M. Dhamdhere, "Operating Systems – A Concept Based Approach", Third Edition, Tata McGraw Hill Edition, 2019 4. *Andrew S. Tanenbaum, "Modern Operating Systems", Fourth Edition, Global Edition, Pearson, 2015.* 5. *William Stallings, "Operating Systems: Internals and Design Principles", Pearson Education, Sixth Edition, 2018.* 6. *Charles Crowley, "Operating Systems: A Design-Oriented Approach", Tata McGraw Hill Education, 2017.*	11. *https://nptel.ac.in/courses/106/105/106105172/*

	Bloom's Level of Thinking	Formative CLA – 1 Average of unit test (45%)		Life Long Learning CLA – 2 Practice (15%)		Summative Final Examination (40% Weightage)	
		Theory	Practice	Theory	Practice	Theory	Practice
Level 1	**Remember**	**20%**	**-**	**-**	**0%**	**20%**	-
Level 2	**Understand**	**40%**	**-**	**-**	**40%**	**40%**	-
Level 3	**Apply**	**20%**	**-**	**-**	**40%**	**20%**	-
Level 4	**Analyze**	**20%**	**-**	**-**	**10%**	**10%**	-
Level 5	**Evaluate**	**0%**	**-**	**-**	**10%**	**10%**	-
Level 6	**Create**	**0%**	**-**	**-**	**0%**	**0%**	-
	Total	100 %		100 %		100 %	

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Mr.T.Madhan, Team Leader, Tata Consultancy Services, siruseri Campus, Chennai, madhan.tk@gmail.com	*1. Dr. S. Janakiraman, Associate Professor, Pondicherry University, sj.dbt@pondiuni.edu.in*	1. Dr. N. Prasath, Associate Professor, SRMIST
2. Mrs.K.Saranya, IT Analyst, Tata Consultancy Services, siruseri Campus, Chennai, saranya.k6@gmail.com	*2. Dr. R.Shyamala, Associate Professor, Anna University College of Engineering Tindivanam, vasuchaaru@gmail.com*	2. Dr. M. Eliazer, Assistant Professor, 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 security services offered by the Operating system practically

Course Outcomes

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

CO1: Use the appropriate concepts of operating system for resource utilization.

CO2: Choose the relevant process and thread concepts for solving synchronization problems.

CO3: Exemplify different types of scheduling algorithms and deadlock mechanism.

CO4: Experiment the performance of different algorithms used in management of memory, file and I/O and select the appropriate one.

CO5: Demonstrate different device and resource management techniques for memory utilization with security mechanisms

COURSE ARTICULATION MATRIX

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

CO5	3	3	3	2								3			

LESSON PLAN

Hour #	Topic	CO	Ref.	Teaching Method	Assessment Method
1	Introduction, Computers- System Organization, Computer-System Architecture	CO1	T2	Brain Storming	Quiz, MCQ
2	Operating-System Structure, Operating-System Operations, Process Management, Memory Management, Storage Management.	CO1	T2	BB	Descriptive Questions
3	Protection and Security, Kernel Data Structures, Computing Environments	CO1	T1	Presentation	Quiz, MCQ, Descriptive Questions
4	Open-Source Operating Systems, Operating-System Services, User	CO1	T1,T2	BB	Quiz, MCQ, Descriptive Questions
5	Operating-System Interface, System Calls, Types of System Calls	CO1	T1	BB	Descriptive Questions
6	Operating-System Structure	CO1	T1,T2	BB	Quiz, MCQ, Descriptive Questions
7	Operating-System Debugging, System Programs,	CO1	T1,T2	Demo	Quiz, MCQ, Descriptive Questions
8	Operating-System Design and Implementation	CO1	T1,T2	Demo	Quiz, MCQ, Descriptive Questions
9	Operating-System Generation, System Boot.	CO1	T1,T2	BB	Quiz, MCQ, Descriptive Questions
10	PROCESS MANAGEMENT: Process Concept, Process Scheduling	CO2	T1	BB	Quiz, Open Book Test
11	Operations on Processes, Inter process Communication	CO2	T1	BB, Role Play	Quiz, Open Book Test
12	Communication in Client– Server Systems.	CO2	T1	Gaming/ Animation	Quiz, Open Book Test
13	Threads: Multicore Programming, Multithreading Models	CO2	T1	Gaming/ Animation	Quiz, Open Book Test, Project
14	Thread Libraries, Implicit Threading, Threading Issues	CO2	T1,T2	Role Play	Quiz, Open Book Test

15	Introduction to process synchronization	CO2		Gaming/ Animation	Quiz, Open Book Test, Assignment
16	The Critical- Section problem	CO2	T1	BB, Group Discussion	Quiz, Open Book Test
17	Peterson's solution	CO2	T1,T2	BB, Simulation	Quiz, Open Book Test, Assignment
18	Synchronization Hardware and Monitors.	CO2	T1,T2	BB, Brain Storming	Quiz, Open Book Test, Project
19	CPU Scheduling Basics	CO3	T1,T2	Presentation	Quiz, Open Book Test
20	Scheduling criteria, algorithms	CO3	T1,T2	Presentation	Quiz, Open Book Test
21	Thread scheduling	CO3	T1,T2	BB	Quiz, Open Book Test
22	Multiple process scheduling	CO3	T1,T2	BB	Quiz, Open Book Test
23	Real time scheduling	CO3	T1,T2	Presentation	Quiz, Open Book Test
24	Handling deadlocks	CO3	T1	Group Discussion	Quiz, Open Book Test, Assignment
25	Deadlock prevention	CO3	T1	Group Discussion	Quiz, Open Book Test, Assignment
26	Deadlock avoidance	CO3	T1	BB	Quiz, Open Book Test
27	Deadlock detection and recovery	CO3	T1	BB	Quiz, Open Book Test
28	Memory management - Basics	CO4	T1,T2	BB	Quiz, MCQ, Descriptive Questions
29	Main memory and swapping	CO4	T1,T2	BB	Quiz, MCQ, Descriptive Questions
30	Contiguous memory allocation	CO4	T1,T2	Presentation	Quiz, MCQ, Descriptive Questions

31	Segmentation and Paging	CO4	T1	Presentation	Quiz, MCQ, Descriptive Questions
32	Structure of page table	CO4	T1,T2	Role Play	Quiz, MCQ, Descriptive Questions, Project
33	Virtual Memory- Allocation of frames	CO4	T1	Flipping Classroom	Quiz, MCQ, Descriptive Questions
34	Thrashing, Memory mapped files, Allocating kernel memory	CO4	T1	BB	Quiz, MCQ, Descriptive Questions
35	Disk Structure, Disk Attachment, Disk Scheduling, Disk Management, Swap-Space Management, RAID Structure.	CO4	T1	BB	Quiz, MCQ, Descriptive Questions
36	File-System Interface: File Concept, Access Methods, Directory and Disk Structure, File-System Mounting, File Sharing, Protection. .	CO4	T1	Simulation	Quiz, MCQ, Descriptive Questions
37	Protection and security - Basics	CO5	T1,T2	Presentation	Quiz, MCQ, Descriptive Questions
38	Goals of Protection, Principles of Protection, Domain of Protection, Access Matrix.	CO5	T1,T2	Role Play/ Animation	Quiz, MCQ, Descriptive Questions
39	Implementation of the Access Matrix, Access Control, Revocation of Access Rights	CO5	T1,T2	Presentation	Quiz, MCQ, Descriptive Questions
40	Capability-Based System	CO5	T1,T2	Presentation	Quiz, MCQ, Descriptive Questions
41	Language-Based Protection, The Security Problem, Program Threats, System and Network Threats	CO5	T1,T2	BB	Quiz, MCQ, Descriptive Questions
42	Cryptography as a Security Tool	CO5	T1,T2	BB	Quiz, MCQ, Descriptive Questions
43	User Authentication, Implementing Security Defenses	CO5	T1,T2	Group Discussion	Quiz, MCQ, Descriptive Questions
44	Firewalling to Protect Systems	CO5	T1,T2	BB	Quiz, MCQ, Descriptive Questions
45	Networks, Computer-Security and classifications	CO5	T1,T2	BB	Quiz, MCQ, Descriptive Questions

BB – Black Board Teaching, MCQ-Multiple Choice Questions

Text Books:

T1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, John Wiley & Sons

(Asia) Pvt. Ltd, Tenth Edition, 2018

T2. RamazElmasri, A. Gil Carrick, David Levine, “Operating Systems – A Spiral Approach “, Tata McGraw Hill Edition,

2010

T3. Dhananjay M. Dhamdhere, “Operating Systems – A Concept Based Approach”, Third Edition, Tata McGraw Hill

Edition, 2019

T4. Andrew S. Tanenbaum, “Modern Operating Systems”, Fourth Edition, Global Edition, Pearson, 2015.

T5. William Stallings, “Operating Systems: Internals and Design Principles”, Pearson Education, Sixth Edition, 2018.

T6. Charles Crowley, “Operating Systems: A Design-Oriented Approach”, Tata McGraw Hill Education, 2017.

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 (10%)	**CLAT2 (10%)**	**CLAT3 & 4 (10%)**	**CLAT5 (15%)**	**CLAP1(7.5 %)+ CLAP2(7.5 %)**				**(40 % Weightage)**	
	Theory				Practical				Theory	
Remember	10%	10%		10%					20%	
Understand	10%	10%	10%	10%	10%	10%	10%	10%	40%	
Apply			10%	10%	10%	10%	10%	10%	20%	
Analyze			10%	10%	10%				10%	
Evaluate				10%	10%				10%	
Create										

COURSE ASSESSMENT PLAN

Course Outcomes (CO)	Weightage	CLA1	CLA2	CLA3	CLA4	CLP1	End-Sem
CO 1- Use the appropriate concepts of operating system for resource utilization.	22%	√			√	√	√
CO2 - Choose the relevant process and thread concepts for solving synchronization problems.	19%		√		√	√	√
CO3 - Exemplify different types of scheduling algorithms and deadlock mechanism.	22%		√		√	√	√
CO4 - Experiment the performance of different algorithms used in management of memory, file and I/O and select the appropriate one.	19%			√	√	√	√
CO5 - Demonstrate different device and resource management techniques for memory utilization with security mechanisms	18%			√	√	√	√
Weightage	**--**	**10%**	**10%**	**10%**	**15%**	**15%**	**40%**

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 and 2

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

CYCLE TEST II
PORTION, SCHEDULE AND QUESTION PATTERN

Theory

Portion : Unit 3 and 4

Schedule : 100 Minutes Test

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

SHELL CODE ANALYSIS

Theory

Pattern : Analysis, Implementation : 10 Marks

Maximum Marks : 10 Marks

ASSIGNMENT

Theory

Pattern : Case study : 10 Marks

Maximum Marks : 10 Marks

MINI PROJECT

Theory

Pattern : Analysis and Design : 10 Marks
Implementation, Testing and Report : 40 Marks
Maximum Marks : 50 Marks

LAB ASSESSMENT

CLAP1 – From Experiment 1 to Experiment 6

Method of evaluation – 2 lab exercise (5 Marks) + viva (2.5 Marks)

CLAP2 – From Experiment 7 to Experiment 15

Method of evaluation – 2 lab exercise (5 Marks) + viva (2.5 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. Annie Uthra R, Prof. & Head
Department of Computational Intelligence
Dr. V. Kavitha, Professor
Department of Data Science and Business Systems

Course Coordinator (School of Computing) **:** Dr. V. Joseph Raymond, Asst. Prof. /NWC

Course Coordinator (NWC- Lab) **:** Dr. G. Sujatha/NWC

Course Coordinator (CTECH) **:** Dr. Kalaivani Asst. Prof./CTECH

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

Course Coordinator (CINTEL) **:** Dr. Kanipriya, Asst. Prof./CINTEL

RESPONSIBILITIES

S. No	Component	PPT, Question Bank, Video Lectures	Portion	Overall Result Analysis
1	Cycle Test -I	CTECH	Unit – I and II	CTECH
2	Cycle Test -II	NWC, DSBS	Unit – III ,IV,V	NWC, DSBS
3	Mini Project	-	Continuous Assessment	NWC
4	Case Study/ Assignment/ Shell Code Analysis	CINTEL	Continuous Assessment	CINTEL
5	Lab	DSBS	Continuous Assessment	DSBS