PSN COLLEGE OF ENGINEERING AND TECHNOLOGY (Autonomous)
Melathediyoor, Tirunelveli – 627152

Department of Computer Science and Engineering

COURSE FILE
(Regulation 2022)

Subject Code   : **CS630204**

Subject Name   : **OPERATING SYSTEMS**

Regulation   : REGULATION 2022

Semester   : III

Academic Year   : 2023 - 2024

Department   : COMPUTER SCIENCE AND ENGINEERING

Degree &Programme   : B.E. COMPUTER SCIENCE ANDENGINEERING

Prepared By

Name   : Mr. N. Ponnithish

Designation   : Assistant Professor

Department   : Computer Science and Engineering

Course File Verification and Auditing

Part-I
(At the beginning of the semester)

Submission Date	Check List								Verified by HOD	Verified by Academic Auditor
	Vision and Mission	Course Description, Objective and Outcomes	CO-PO mapping	Course Plan and Target	Syllabus and Content beyond Syllabus	Assignments & additional resources	Course Delivery Plan	University Question Papers		

Part-II
(After CAT - I)

Submission Date	Check List					Verified by HOD	Verified by Academic Auditor
	Syllabus Coverage	Notes and Other Materials	Performance Analysis	Feedback	Proof for Participatory Learning		

Part-III
(After CAT - II)

Submission Date	Check List					Verified by HOD	Verified by Academic Auditor
	Syllabus Coverage	Notes and Other Materials	Performance Analysis	Question Papers and Keys	Proof for Participatory Learning		

Part-IV
(After Model examination)

Submission Date	Check List					Verified by HOD	Verified by Academic Auditor
	Syllabus Coverage	Notes and Other Materials	Performance Analysis	Question Papers and Keys	Proof for Participatory Learning		

Semester Academic Audit

Audit Remarks:
Signature of the Auditor(s):

Signature of Dean Academics   Signature of Principal

Contents

33	Students' group list for topic discussion	
34	Course Review & Closure Report	

COURSE PLAN

R- 2022

Subject Name & Code	**OPERATING SYSTEM &CS630204**
Course Type	**Core Paper**
Programme	**B. E Computer Science an d Engineering**
Year/ Semester/ Section	**II / III/'A'**
Nature of Course / Credit	**Theory / 3**
Course Coordinator	**Mr. N. Ponnithish**

VISION AND MISSION OF THE INSTITUTE:

Institution Vision		To emerge as a pioneer institute inculcating engineering education, skills, research, values and ethics.
Institution Mission	IM-1	To achieve greater heights of excellence in technical knowledge and skill development through innovative teaching and learning practices.
	IM-2	To develop the state of art infrastructure to meet the demands of technological revolution.
	IM-3	To improve and foster research in all dimensions for betterment of society.
	IM-4	To develop individual competencies to enhance innovation, employability and entrepreneurship among students.
	IM-5	To instill higher standards of discipline among students, inculcating ethical and moral values for societal harmony and peace.

VISION AND MISSION OF THE DEPARTMENT:

Department Vision		To emerge as a preeminence program to produce quality Computer Science and Engineering graduates
Department Mission	DM-1	To train the students according to their discipline to meet dynamic needs of the society
	DM-2	To promote research and continuing education

	DM-3	To enhance professional and entrepreneurial skills through industry institute interaction to enable them in getting better placement

1.PRE REQUISITES

- Good knowledge of C, Computer Organization and Architecture, x86 Assembly level programming.

2.COURSE DESCRIPTIONS

- This course teaches basic operating system abstractions, mechanisms, and their implementations.
- The core of the course focuses on OS support for concurrency (threads) and synchronization, resource management (CPU, memory, I/O), and distributed services

3. CAREER OPPORTUNITIES:

- Application Support Engineer - Linux OS/Windows OS
- Operating System Developer_Graphics
- Opportunity for Operating System Developer
- HP UX Server Operating System Management

4.SYLLABUS

UNIT–I	OPERATING SYSTEMS OVERVIEW	Hrs
Operating system – Main frame systems – Desktop systems – Multiprocessor systems – Distributed systems – Clustered systems – Real-time systems – Handheld systems – Operating System structures: System components – Operating system services - System calls – System programs – System structure		6
UNIT-II	**PROCESSES AND THREADS**	**Hrs**
Process: Process concept – Process scheduling – Operations on processes – Cooperating processes – Interprocess communication – Communication in client-server systems - Threads: Overview - Multithreading models – Threading issues – Pthreads - CPU Scheduling: Basic concepts - Scheduling criteria – Scheduling algorithms – Multiple-processor scheduling – Real time scheduling		6
UNIT-III	**PROCESS MANAGEMENT**	**Hrs**
Process synchronization: The critical-section problem – Synchronization hardware – Semaphores – Classic problems of synchronization – Critical regions – Monitors –Deadlocks: System model – Deadlock characterization – Methods for handling deadlocks – Recovery from deadlock		6
UNIT –IV	**STORAGE MANAGEMENT**	**Hrs**
Memory Management: Background -Swapping – Contiguous memory allocation – Paging – Segmentation – Segmentation with paging - Virtual Memory: Background – Demand paging – Process creation – Page replacement – Allocation of frames – Thrashing		6
UNIT–V	**I/O SYSTEMS**	**Hrs**

		6
File-system interface: File concept – Access methods – Directory structure – File-system mounting – File sharing - Protection – File-system implementation: Directory implementation – Allocation methods – Free-space management – Mass storage structure: Disk structure - Disk scheduling – Disk management – Swap-space management		

Total:30Periods

5. COURSE OUT COMES

CO's	CO – STATEMENTS	BLOOMS LEVEL	PO's
CO 1	To gain knowledge about various advanced techniques and concepts involved in operating systems	K1	1,2,3,9,11,12
CO 2	To incorporate knowledge to processes and threads	K2	1,2,3,9,11
CO 3	To know the concept of semaphore and deadlock	K4	1,2,3,9,11,12
CO 4	To study about the various storage strategies	K4	1,2,3,9,11,12
CO 5	To study about the concepts of I/O systems	K2	1,2,3,9,11,12

6. INSTRUCTIONAL LEARNING OUTCOMES

UNIT	LEARNING OUTCOMES
I	The outcome will be assess through Observation, Class test -1, MCQ Test, CAT-I
II	The outcome will be assess through Observation, Class test -2, MCQ Test, CAT-I,CAT-I
III	The outcome will be assess through Observation Class test -3, MCQ Test, CAT-I, CAT-II.
IV	The outcome will be assess through Observation, Class test -4, MCQ Test, CAT-II, CAT-II.
V	The outcome will be assess through Observation, Class test-5, MCQ Test, CAT-II.
Practical	CAT III

7. PROGRAMME EDUCATIONAL OBJECTIVES (PEO's)

S. No	Objective	PEOs
PEO1	Fundamental Knowledge	Graduates will be able to perform in technical and managerial roles ranging from design, development and problem solving to suit to the industrial needs
PEO2	Career Development	Graduates will be able to successfully pursue higher education, Graduates will have the ability to adapt, contribute and

		innovate new technologies in different domains of computer science & Engineering
PEO3	Social Identity	Graduates will be ethically and socially responsible engineers in computer science & Engineering disciplines

8. PROGRAM OUTCOMES [PO's]

PO's No	KNOWLEDGE	STATEMENTS	APPLIANCE
1	Engineering Knowledge	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	Theory/ Practical / Project work
2	Problem Analysis	Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	Theory / Practical / Projects
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 the public health and safety, and the cultural, societal, and environmental considerations.	Theory / Practical / Projects
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.	Theory / Practicals
5	Modern Tool usage	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.	Theory / Practical / Project work
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.	Theory / Industrial visit / In plant training

7	Environment and Sustainability	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	Theory / Industrial Visit/ In plant Training
8	Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.	Theory / Industrial visit / In plant training
9	Individual and Team Work	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	Projects
10	Communication	Communicate effectively on complex engineering activities with the engineering community and with 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.	Projects/ Seminar/ Mini Project
11	Project Management and Finance	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	Projects
12	Life-long Learning	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	Projects / Higher Studies

9. PROGRAMME SPECIFIC OBJECTIVE (PSO's)

PSO1	Proficient and Innovative with a strong cognizance in the IOT,through the Application of acquired knowledge and skills.
PSO2	Design and Implement IOT based solutions for improving operational efficiency by investigating existing industrial environment.

10. CO- PO MAPPING

CO's NO	COURSE OUTCOME	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Understand the fundamental concepts of operating system	2	1	2						2		1	2		
CO2	Understand the concept of processes and threads scheduling	1	2	1						1		2			

CO	Description													
CO3	Analyze the various semaphores techniques and the deadlock handling mechanism	2	2	1					2		2	1		
CO4	Analyze the different storage management strategies	2	1	2					1		1	2		
CO5	Understand the concept of I/O systems	1	2	2					1		1	1		

11. TEXT BOOK & REFERENCE BOOK LIST

Sl. No	Description	Legend
Text Book(s):		
1	Silberschatz, Galvin and Gagne, "Operating System Concepts", Eighth Edition, John Wiley & Sons Inc., Reprint 2011	T1
Reference Book(s):		
1	William Stallings, " Operating Systems: Internals and Design Principles" Seventh Edition ,Pearson Education, 2011	R1
2	Pramod Chandra P Bhatt, "An Introduction to Operating Systems : Concepts and Practice", PHI Learning Pvt. Ltd.,2010	R2

12. Web Resources

Sl. No	Topic	Web link
1.	Web Operating System	https://www.geeksforgeeks.org/web-operating-system/

13. E- learning / NPTEL

NPTEL/ OTHER UNIVERSITY video lectures related to syllabus:	
Video	https://onlinecourses.nptel.ac.in/noc20_cs04/preview
Lecture Notes	file:///C:/Users/DELL/Downloads/lecture_note_440507181044270.pdf

14. MAGAZINE & JOURNALS

Magazine	https://biztechmagazine.com/software/operating-systems

Journals	https://www.springer.com/journal/11227

15.   LESSON PLAN

S.No.	Topic to be covered	Hours Needed	Mode of Teaching+	Text/ Ref. Book	Page No.
	UNIT I - OPERATING SYSTEMS OVERVIEW				
1	Operating system – Main frame systems – Desktop systems – Multiprocessor systems – Distributed systems	1	**BB**	**T1**	**3-9**
2	Clustered systems – Real-time systems – Handheld systems	1	**BB**	**T1**	**9**
3	Operating System structures: System components	1	**BB**	**T1**	**27**
4	Operating system services - System calls-System programs	2	**BB**	**T1**	**49-66**
5	System programs -System structure	1	**BB**	**T1**	**66-70**
6	**O.S Debugging***	1	**PPT**	**NPTEL**	**-**
	UNIT II – PROCESSES AND THREADS				
7	Process: Process concept	1	**BB**	**T1**	**101**
8	Process scheduling – Operations on processes-Cooperating processes	1	**BB**	**T1**	**105-112**
9	Inter process communication-Communication in client-server systems	1	**BB**	**T1**	**116-128**
10	Threads: Overview - Multithreading models – Threading issues– Pthreads	1	**BB**	**T1**	**153**
11	CPU Scheduling: Basic concepts - Scheduling criteria	1	**BB**	**T1**	**157**
12	Scheduling algorithms-Multiple-processor scheduling – Real time scheduling	1	**BB**	**T1**	**159-188**

UNIT III – PROCESS MANAGEMENT
13	Process synchronization: The critical-section problem	1	**BB**	**T1**	**225**
14	Synchronization hardware – Semaphores	1	**BB**	**T1**	**227**
15	Classic problems of synchronization	1	**BB**	**T1**	**231**
16	Critical regions – Monitors	1	**BB**	**T1**	**234**
17	Deadlocks: System model – Deadlock characterization	1	**BB**	**T1**	**239**
18	Methods for handling deadlocks-Recovery from deadlock	1	**BB/ Tutorial**	**T1**	**283-285**
19	**Real time examples of deadlock***	1	**PPT**	**NPTEL**	**-**
UNIT IV – STORAGE MANAGEMENT
20	Memory Management: Background	1	**BB**	**T1,R1**	**314-320**
21	Swapping – Contiguous memory allocation	1	**BB**	**T1,R1**	**322-324**
22	Paging-Segmentation – Segmentation with paging	1	**BB**	**T1**	**326-342**
23	Virtual Memory: Background	1	**BB**	**T1**	**346**
24	Demand paging – Process creation	1	**BB**	**T1**	**361**
25	Page replacement – Allocation of frames-– Thrashing	1	**BB**	**T1**	**369-371**
26	**Case study of Thrashing***	1	**PPT**	**NPTEL**	**-**
UNIT V - I/O SYSTEMS
27	File-system interface: File concept-Access methods	1	**PPT**	**T1**	**421-433**
28	Directory structure – File-system mounting-File sharing - Protection	1	**BB**	**T1**	**444-451**
29	File-system implementation: Directory implementation	1	**BB**	**T1**	**470**
30	Allocation methods – Free-space management	1	**BB**	**T1**	**479**
31	Mass storage structure: Disk structure-Disk scheduling-Disk management	1	**BB**	**T1,R3,R4**	**508-520**
32	Swap-space management	1	**BB**	**T1**	**522**
	Real time Operating systems*	1	**PPT**	**NPTEL**	**-**
Total Hours Needed: 30 +4 = 34 Hours

* Content beyond Syllabus

PRACTICAL EXERCISES

S.NO	EXERCISES	Hours Needed
1	Create new processes and do communicate using pipe	3hrs
2	Make communication between the processes using shared memory and message queue	3hrs
3	Simulate the following CPU scheduling algorithms a) FIFO b) SJF c) Priority d) Round Robin	3hrs
4	Implement Peterson's solution using semaphore	3hrs
5	Implement dinning philosopher problem using semaphore	3hrs
6	Simulate Bankers Algorithm for Dead Lock Avoidance	3hrs
7	Simulate Bankers Algorithm for Dead Lock Prevention	3hrs
8	Simulate all File Organization Techniques a) Single level directory b) Two level c) Hierarchical d) DAG	3hrs
9	Simulate Paging Technique of memory management	3hrs
10	Simulate all page replacement algorithms a) FIFO b) LRU c) LFU	3hrs
	Total Hours	30hours

Signature	Prepared by:	Approved by:		
Name :	Mr. N. Ponnithish	Dr.M.VARGHEESE	Dr.S.P.Umayal	Dr. V. Manikandan
Designation:	Assistant Professor	HoD / CSE	Dean Academic	Principal
Date:				