Course Title:	Operating Systems				Course Code:	R204GA05503
Class & Sem:	III B. Tech I Sem – Sec - A				Regulations:	SRIT R20
Course Structure:	**Theory**	**Tutorial**	**Lab**	**Credits**	**Core/Elective:**	**Core**
	3	1	-	3		
Instructor 1:	Mr. M. Narasimhulu			AY:	2022-23	

1. **Prerequisites:** C, Data structures, Computer Organization

2. Course Description: This course deals with the concepts of rapidly changing fields of operating systems and networking. This course includes detailed description of operating system services and functions, inter process communication, mass storage structures, handling deadlocks, file management techniques, I/O systems, protection and security of operating system.

3. Detailed Syllabus:

UNIT 1: Introduction to Operating Systems (15 Periods)
Introduction: Operating System Operations, Resource Management, Security and Protection, Virtualization, Distributed Systems, Computing Environments.
Operating-System Structures: Operating-System Services, User and Operating-System Interface, System Calls, System Services.

UNIT 2: Process Management (14 Periods)
Processes: Process Concept, Scheduling, Operations. Inter process Communication: Shared-Memory Systems, Message-Passing Systems, Examples, Communication in Client–Server Systems. CPU Scheduling**:** Scheduling Criteria, Scheduling Algorithms, Threads.
Process Synchronization: The critical-section problem, Petersons Solution, Synchronization Hardware, Mutex Locks, Semaphores, Classic problems of synchronization, Monitors.

UNIT 3: Memory Management (11 Periods)
Contiguous Memory Allocation, Swapping, Paging, Page Replacement algorithms, Thrashing, Memory Compression.
Deadlocks: System Model, Deadlock Characterization, Methods of handling Deadlocks, Deadlock prevention, Detection and Avoidance, Recovery from deadlock.

UNIT 4: Storage Management & File System (16 Periods)
Mass-Storage Structure: Overview of Mass-Storage Structure, Disk Scheduling, Storage Attachment, RAID Structure.
I/O Systems: I/O Hardware, Application I/O Interface, Kernel I/O Subsystem, Transforming I/O Requests to Hardware Operations.
File-System : File Concept, Access Methods, Directory Structure, Protection, Memory-Mapped Files, File system structure and Implementation.

UNIT 5: Security and Protection (12 Periods)
Protection: Goals, Principles and domain, Access Matrix, Implementation of Access Matrix and Access control, Revocation of Access Rights.
Security: The Security problem, Program threats, System and Network threats, Cryptography as a security tool.

Total Periods: 68

4. Text Books:
1. Operating System Concepts, Abraham Silberchatz, Peter B. Galvin, Greg Gagne, Wiley, Tenth Edition, 2018.
2. Operating Systems: Design And Implementation, Andrew S. Tanenbaum, Albert S. Woodhull, Pearson, 3rd Edition, 2015.

5. Reference Books
1. Operating Systems, A Spiral Approach, Ramez Elmasri, A.Gil Carrick, David Levine, McGrawHill Higher Education, 2010.
2. Operating Systems, Three Easy Pieces, Remzi H. Arpaci-Dusseau, Andrea C. Arpaci-Dusseau, Arpaci-Dusseau Books, 2015.
3. Operating Systems: and design Principles,5th Edition,William Stallings,PHI.

6. Course Outcomes:

On successful completion of this course, the students will be able to

S.No	Course Outcomes	Cognitive Level
1	Explain the fundamentals of operating systems like process, memory, storage, file system, security and protection.	Understand
2	Illustrate various operating System services, interfaces and system calls.	Apply
3	Demonstrate critics of process management and IPC.	Apply
4	Implement page replacement algorithms, memory management techniques and deadlock issues.	Apply
5	Illustrate architecture of file systems and I/O systems for mass storage structures.	Apply
6	Utilize the methods of operating system security and protection.	Apply

7. Lesson Plan

*(**Mode of delivery:** Chalk & Talk, ICT, Group Discussion, Demonstration, Tutorial, Industrial Visit, Seminar)*

Sr. No.	Topics to be covered	Mode of Delivery	Periods Required	Books followed	Scheduled Date
UNIT 1: Introduction to Operating Systems					
1	Introduction	C&T	1	T1	22-08-22
2	Operating System Operations,	ICT, C&T	2	T1	24-08-22
3	Resource Management, Security and Protection,	ICT, C&T	1	T1	25-08-22
4	Virtualization, Distributed Systems	ICT, C&T	2	T1	26-08-22
5	Distributed Systems	ICT, C&T	1	T1	1-09-22
6	Computing Environments.	ICT, C&T	2	T1	2-09-22
7	Operating-System Services,	ICT, C&T	2	T1	7-09-22
8	User and Operating-System Interface,	ICT, C&T	1	T1	9-09-22
9	System Calls, System Services.	ICT, C&T	3	T1	13-09-22
Total Classes required for Unit-1			15		
UNIT 2: Process Management					
10	**Processes:** Process Concept,	ICT, C&T	1	T1	15-9-22
11	Scheduling, Operations.	ICT, C&T	3	T1	16-9-22
12	Inter process Communication: Shared-Memory Systems, Message-Passing Systems, Examples,	ICT, C&T	2	T1	21-9-22
13	Communication in Client–Server Systems.	ICT, C&T	1	T1	23-9-22
14	CPU Scheduling**:** Scheduling Criteria,	ICT, C&T	1	T1	27-9-22
15	Scheduling Algorithms, Threads.	ICT, C&T	2	T1	28-9-22
16	**Process Synchronization:** The critical-section problem,	ICT, C&T	½	T1	29-9-22
17	Petersons Solution,	ICT, C&T	½	T1	29-9-22
18	Synchronization Hardware,	ICT, C&T	½	T1	30-9-22
19	Mutex Locks, Semaphores,	ICT, C&T	½	T1	30-9-22
20	Classic problems of synchronization	ICT, C&T	1	T1	6-10-22
21	, Monitors.	ICT, C&T	1	T1	7-10-22
Total Classes required for Unit-2			14		
UNIT 3: Memory Management					
22	Memory Management, Contiguous Memory Allocation,	ICT, C&T	1	T1	11-10-22
23	Swapping, Paging, Page Replacement algorithms,	ICT, C&T	2	T1	12-10-22
24	Thrashing, Memory Compression.	ICT, C&T	2	T1	13-10-22
25	Deadlocks: System Model, Deadlock Characterization,	ICT, C&T	2	T1	16-10-22
26	Methods of handling Deadlocks,	ICT, C&T	2	T1	25-10-22
27	Deadlock prevention, Detection and Avoidance, Recovery from deadlock.	ICT, C&T	2	T1	27-10-22
Total Classes required for Unit-3			11		

	UNIT 4: Storage Management & File System					
28	**Mass-Storage Structure:** Overview of Mass-Storage Structure	ICT, C&T	1	T1	1-11-22
29	, Disk Scheduling,	ICT, C&T	2	T1	2-11-22
30	Storage Attachment, RAID Structure.	ICT, C&T	2	T1	3-11-22
31	**I/O Systems:** I/O Hardware,	ICT, C&T	2	T1	9-11-22
32	Application I/O Interface,	ICT, C&T	2	T1	10-11-22
33	Kernel I/O Subsystem,	ICT, C&T	1	T1	15-11-22
34	Transforming I/O Requests to Hardware Operations.	ICT, C&T	1	T1	16-11-22
35	**File-System :** File Concept, Access Methods,	ICT, C&T	2	T1	16-11-22
36	Directory Structure and Implementation	ICT, C&T	3	T1	22-11-22
	Total Classes required for Unit-4		**16**		
	UNIT 5: Security and Protection					
37	**Protection**: Goals, Principles and domain,	ICT, C&T	2	T1	24-11-22
38	Access Matrix, Implementation of Access Matrix	ICT, C&T	2	T1	29-11-22
39	Access control, Revocation of Access Rights.	ICT, C&T	2	T1	30-11-22
40	**Security:** The Security problem, Program threats,	ICT, C&T	1	T1	1-12-22
41	System and Network threats,	ICT, C&T	2	T1	2-12-22
42	Cryptography as a security tool.	ICT, C&T	3	T1	7-12-22
	Total Classes required for Unit-5		**12**		
	Total Number of Classes Required : 68				

8. Additional Topics:

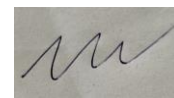| Sr. No.	Topic	Course Outcome
1	Open Source systems as Learning Tools	**CO1**
2	Computer system Architecture and its components organized	**CO1**

9. Course Assessment & Evaluation:

Mode of assessment	Frequency	Marks
Mid-Term Examinations (Internal)	Two exams CIE-1 and CIE-2 will be conducted. The consolidated CIE marks will be arrived by considering the marks secured by the student in both the CIEs with 80% weightage given to the better CIE and 20% to the other. For each theory course, during the semester, there shall be two CAAs. Each CAA will be evaluated for 10 marks. The consolidated CAA marks will be arrived by considering the average of marks secured by the student in both the CAAs. The final marks for CIA (for 40 marks) = Consolidated CIE marks (for 30 marks) + Consolidated CAA marks (for 10 marks)	40
University Examinations (External)	Once	60
Total		**100**

10. Mapping(X) of Course Outcomes with Program Outcomes & Program Specific Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	X				X									X	
CO2	X				X									X	
CO3	X	X			X									X	
CO4	X	X			X									X	
CO5	X	X			X									X	
CO6	X				X									X	

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2				1									1	
CO2	2				1									1	
CO3	2	4			1									1	
CO4	2	6			1									1	
CO5	2	5			1									1	
CO6	2				1									1	

Signature