OPERATING SYSTEM
(5IT4-03)

Vision of the Institute

Vision To become a renowned centre of outcome based learning, and work towards academic, professional, cultural and social enrichment of the lives of individuals and communities.

Mission of the Institute

- Focus on evaluation of learning outcomes and motivate students to inculcate research aptitude by project based learning.
- Identify, based on informed perception of Indian, regional and global needs, areas of focus and provide platform to gain knowledge and solutions.
- Offer opportunities for interaction between academia and industry.
- Develop human potential to its fullest extent so that intellectually capable and imaginatively gifted leaders can emerge in a range of professions.

Vision of the Department

To establish outcome based excellence in teaching, learning and commitment to support IT Industry.

Mission of the Department

- To provide outcome based education..
- To provide fundamental & Intellectual knowledge with essential skills to meet current and future need of IT Industry across the globe.
- To inculcate the philosophy of continuous learning, ethical values & Social Responsibility.

COURSE OUTCOMES: OPERATING SYSTEM (5IT4-03)

On completion of this course, Graduates would be able:

- CO1: To explain the fundamentals of Operating System, Its architecture and its various application fields.
- CO2: To compare the functioning of operating system includes various management systems, synchronization, memory classification etc.
- CO3: To identify the various algorithms and hardware functioning related to operating system.
- CO4: To identify the working and features of various new Operating Systems.

Pre-requisite: Basic data Structures, Computer organization & programming level language like: C or Java.

Mapping of COs with POs:

H=3, M=2, L=1

Sem	Subject	Code	L/T/P	CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
V	OPERATING SYSTEM	5IT4-03	L	1. To explain the fundamentals of Operating System, Its architecture and its various application fields.	H	M	M	M	M	L	-	-	L	L	L	M
			L	2. To Compare the functioning of operating system includes various management systems, synchronization, memory classification etc.	H	M	M	M	M	L	-	-	L	L	L	M
			L	3. To identify the various algorithms and hardware functioning related to operating system.	H	H	M	M	M	L	-	-	L	L	L	M
			L	4. To identify the working and features of various new Operating Systems.	H	M	M	M	M	L	-	-	L	L	L	M

PROGRAM OUTCOMES

1. **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems in IT.
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 in IT.
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 using IT.
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 using IT.
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 in IT.
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 using IT.
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 in IT.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice using IT.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings in IT.
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.
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 IT projects and in multidisciplinary environments.
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 changes needed in IT.

Syllabus of Operating System:

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

SYLLABUS

III Year- V Semester: B.Tech. (Information Technology)

5IT4-03: Operating System

Credit: 3 **Max. Marks: 150(IA:30, ETE:120)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Introduction and history of Operating systems:** Structure and operations; processes and files Processor management: inter process communication, mutual exclusion, semaphores, wait and signal procedures, process scheduling and algorithms, critical sections, threads, multithreading	04
3	**Memory management:** contiguous memory allocation, virtual memory, paging, page table structure, demand paging, page replacement policies, thrashing, segmentation, case study	05
4	**Deadlock:** Shared resources, resource allocation and scheduling, resource graph models, deadlock detection, deadlock avoidance, deadlock prevention algorithms **Device management:** devices and their characteristics, device drivers, device handling, disk scheduling algorithms and policies	15
5	**File management:** file concept, types and structures, directory structure, cases studies, access methods and matrices, file security, user authentication	07
6	**UNIX and Linux operating systems as case studies;** Time OS and case studies of Mobile OS	08
	Total	40

JAIPUR ENGINEERING COLLEGE AND RESEARCH CENTER

Department of Information Technology

LECTURE PLAN

Subject: Operating System(5IT4-03) **Year/sem: III/ V**

No. of Lecture Req. / (Avl.): (40)/(40)Semester

Starting:…1/7/2020..... **Ending:**…4/12/2020.....

Unit No./ Total lec. Req.	Topics	Lect. Req.	Lect. No.	Date of Delivery	Remark/ Actual lect. Taken
Unit-1 (5)	Introduction and need of operating system, layered architecture/logical structure of operating system,.(CO-PO mapping)	1	1		
	Structure of OS & types	2	1,2		
	OS functions & operations	1	3		
	Kernel & types of Kernel	1	4		
	Concept of Process & thread	1	5		
Unit-2(11)	Process & Process States	1	6		
	Scheduling criteria's & FCFS	1	7		
	SJF	1	8		
	SRTF	1	9		
	Priority scheduling	1	10		
	Round Robin Scheduling	1	11		
	Multilevel & Multilevel Queue Scheduling	1	12		
	Process synchronization, Critical section	1	13		
	Critical section problem and its solution	1	14		
	Critical section problem and its solution part -2	1	15		
	Semaphores & Monitors	1	16		
Unit 3-(7)	Deadlock- System model, resource types, deadlock problem, deadlock characterization,	1	17		

	Methods for deadlock handling, deadlock prevention,	1	18		
	Deadlock avoidance,	1	19		
	Deadlock detection, recovery from deadlock.	1	20		
	Memory management- concepts, functions, logical and physical address space, Memory management address binding, degree of multiprogramming,	1	21		
	Contiguous and Non-Contiguous memory allocation	1	22		
	Memory allocation schemes- first fit, next fit, best fit, worst fit, and quick fit.	1	23		
Unit 4- (9)	Virtual Memory- concept, virtual address space, paging scheme, pure segmentation	1	24		
	Paging TLB	1	25		
	Numerical on address to space translation & space to address translation.	1	26		
	page size, separate instruction and data spaces, shared pages, cleaning policy, TLB (translation look aside buffer) reach	1	27		
	MTT1 discussion with questions	1	28		
	Discussion on weak students assignment	1	29		
	Virtual memory Concepts	1	30		
	page replacement algorithms- optimal, NRU, FIFO, second chance, LRU, LRU- approximation clock, WS clock; Belady's anomaly,	1	31		
	inverted page table, I/O interlock, program structure, page fault handling, Basic idea of MM in Linux & windows.	1	32		
Unit 5- (8)	File System- concepts, naming, attributes, operations, types, structure	1	33		
	file organization & access(Sequential, Direct ,Index Sequential) methods, memory mapped files	1	34		
	directory structures- one level, two level, hierarchical/tree, acyclic graph, general graph, file system mounting, file sharing, path name, directory operations, overview of file system in Linux & windows.	1	35		
	Input/ Output subsystems- concepts, functions/goals, input/output devices- block and Input/Output subsystems character,	1	36		
	Disk structure & operation, disk attachment, disk storage capacity, disk scheduling algorithm- FCFS,	1,2	37,38		
	SSTF, scan scheduling, C-scan schedule.	1	39		
	Remedial Class	1	40		

Recommended books:

1. A. Silberschatz and Peter B Galvin: Operating System Principals, Wiley India Pvt. Ltd.
2. Achyut S Godbole: Operating Systems, Tata McGraw Hill

Slow learner CO-wise Assignments

CO1: To explain the fundamentals of Operating System, Its architecture and its various application fields.

Q1/CO1 (a): What is Operating System explain with their functions.
Q1/CO1 (b): What is Process? Explain the states of Process in detail with Diagram.

Q1/CO1(c): Using Banker's Algorithm:

Process	**Max**	**Allocation**	**Available**
A, B, C, D	A, B, C, D	A, B, C, D	A,B,C,D
P0	6 0 1 2	4 0 0 1	3 2 1 1
P1	2 7 5 0	1 1 0 0	
P2	2 3 5 6	1 2 5 4	
P3	1 6 5 3	0 6 3 3	
P4	1 6 5 6	0 2 1 2	

i) How many resources of type A, B, C, D are there?

ii) What are the contents of need matrix?

iii) Find if the system is in safe state? If it is, find the safe sequence.

CO2: To compare the functioning of operating system includes various management Systems, synchronization, memory classification etc.

Q2/CO2 (a): Explain Critical Section Problem. How are Semaphores used for solving critical section problem?
Q2/CO2 (b): Explain Dining Philosopher Problem and Producer & Consumer problem.
Q2/CO2 (c): Calculate average waiting time for following process using SRTF Scheduling.

Process	Burst time	Arrival time
P1	5	00
P2	10	01
P3	04	03

P4	02	04
P5	10	05

OR

Q3/CO2 (a): What do you mean by Monitor? Explain
Q3/CO2 (b): What do you mean by Race Condition, Aging in process synchronization?
Q3/CO2 (c): Calculate average waiting time for following process using RR Scheduling. Time Slice =3

Process	Burst time	Arrival time
P1	20	01
P2	10	02
P3	04	03
P4	02	04
P5	10	05

CO3: To identify the various algorithms and hardware functioning related to operating system.

Q.1./ CO3: Consider three CPU-intensive processes, which require 10, 20 and 30 time units and arrive at times 0, 2 and 6, respectively. How many context switches are needed if the operating system implements a shortest remaining time first scheduling algorithm? Do not count the context switches at time zero and at the end.

Q.2./ CO3: At a particular time of computation the value of semaphore is 7. Then 20 Wait & 15 signal operations were completed on this semaphore. Find out the resulting value of Semaphore.

Q.3./ CO3: Explain Dining Philosopher problem with diagram.

CO4: To identify the working and features of various new Operating Systems.

Q.1/CO4: Write all the compulsory conditions of Deadlock. Write all the methods of deadlock handling.

Q.2/CO4. Consider a user program of logical address of size 6 pages and page size is 4 bytes. The physical address contains 300 frames. The user program consists of 22 instructions a, b, c, . . . u, v . Each instruction takes 1 byte. Assume at that time the free frames are 7, 26, 52, 20, 55, 6, 18, 21, 70, and 90. Find the following?

A) Draw the logical and physical maps and page tables?
B) Allocate each page in the corresponding frame?
C) Find the physical addresses for the instructions m, d, v, r?
D) Calculate the fragmentation if exist?