

**Govt. of Karnataka, Department of Technical Education**  
**Diploma in Computer Science & Engineering**  
**Fourth Semester**  
**Subject: OPERATING SYSTEM**

**Contact Hrs / week: 4**

**Total hrs: 64**

**Table of content**

<b>Chapter No.</b>	<b>Content</b>	<b>No. of Hours</b>	<b>Marks</b>
	Section I		
1	Introduction to operating systems	8	20
2	Process management	10	26
3	Synchronization	2	5
4	Deadlocks	4	10
	Section II		
5	Memory management	10	26
6	Virtual memory management	6	15
	Section III		
7	File system	8	22
8	Implementing file system	8	21
	Seminars and Guest lectures from Industry and Institute	5	
	Tests	3	
	<b>Total</b>	<b>64</b>	<b>145</b>

**Detailed content**

<b>Chapter No.</b>	<b>Content</b>
01	<b>INTRODUCTION TO OPERATING SYSTEMS</b>
1.1	What operating systems do
1.2	Computer System architecture
1.3	Operating System structure
1.4	Operating System operations
1.5	Process management
1.6	Memory management
1.7	Storage management

	1.8	Protection and security
	1.9	Distributed system
	1.10	Special-purpose systems
	1.11	Computing environments.
	1.12	Open-source Operating Systems
2		<b>PROCESS MANAGEMENT</b>
	2.1	Process concept
	2.2	Process scheduling
	2.3	Operations on processes
	2.4	Inter-process communication
	2.5	Process Scheduling: Basic concepts
	2.6	Scheduling criteria
	2.7	Scheduling algorithms
3		<b>SYNCHRONIZATION</b>
	3.1	Background
	3.2	The critical section management and semaphores (Concepts only)
4		<b>DEADLOCKS</b>
	4.1	System model
	4.2	Deadlock characterization
	4.3	Methods for handling deadlocks
	4.4	Deadlock prevention
	4.5	Deadlock avoidance
	4.6	Deadlock detection
	4.7	Recovery from deadlock
5		<b>MEMORY MANAGEMENT -- STRATEGIES</b>
	5.1	Background
	5.2	Swapping
	5.3	Contiguous memory allocation
	5.4	Paging
	5.5	Structure of page table
	5.6	Segmentation

6		<b>VIRTUAL MEMORY MANAGEMENT</b>
	6.1	Background
	6.2	Demand paging
	6.3	Copy-on-write
	6.4	Page replacement
	6.5	Allocation of frames
7		<b>FILE SYSTEM</b>
	7.1	File concept
	7.2	Access methods
	7.3	Directory and disk structure
	7.4	File system mounting
	7.5	File sharing
	7.6	Protection
8		<b>IMPLEMENTING FILE SYSTEMS</b>
	8.1	File system structure
	8.2	File system implementation
	8.3	Directory implementation

**General Objectives:**

1. To provide a grand tour of the major components of the os.
2. To introduce notion of a process which forms the basis of all computation.
3. To introduce the critical – section problem whose solutions can be used to ensure the consistency of the shared data.
4. To develop a description of deadlocks.
5. To provide a detailed description of various memory management techniques.
6. To describe the benefits of a virtual memory system.
7. To explain the function of file system.
8. To describe the details of implementing local file systems and directory structures.

**Specific objectives:**

To understand What operating systems do
To develop Computer System architecture
To learn Operating System structure
To discuss Operating System operations
To understand Process management
To understand Memory management
To understand Storage management
To understand Protection and security
To define Distributed system
To define Special-purpose systems
To understand Computing environments.
To define Open-source Operating Systems
To define Process concept
To understand Process scheduling
To describe Operations on processes
To understand Inter-process communication
To understand Process Scheduling: Basic concepts
To define Scheduling criteria
To present Scheduling algorithms
To understand Background of synchronization
To define The critical section management and semaphores (Concepts only)
To understand System model for deadlock
To describe Deadlock characterization
To present Methods for handling deadlocks
To learn about Deadlock prevention
To learn about Deadlock avoidance
To learn about Deadlock detection
To learn about how to Recover from deadlock
To understand of Background memory management strategies
To learn about Swapping

To understand Contiguous memory allocation
To learn about Paging
To present Structure of page table
To learn about Segmentation
To understand Background virtual memory management
To learn about Demand paging
To define Copy-on-write
To understand Page replacement
To present Allocation of frames
To define File concept
To learn the various Access methods
To discuss Directory and disk structure
To learn how to perform File system mounting
To define File sharing
To understand Protection
To understand File system structure
To describe File system implementation
To describe Directory implementation

**TEXT BOOK:**

1. Operating System Principles – Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, 8<sup>th</sup> edition, Wiley-India. (Chapters-1, 3, 5, 6, 7, 8, 9, 10 and 11)  
ISBN- 9788126520510
2. Operating System By Niranjana A, Sapna Publications

**Reference Books:**

1. Modern Operating System, Tanenbaum, Third Edition, PHI Publication.
2. System Programming and Operating system, Dhamdhre , TMH
3. Operating Systems a practical approach , 2010 edition , E R Rajiv Chopra ,  
S Chand publication

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Max. Marks: 100

Max. Time: 3 Hours

Model Question Paper

- Note: 1. Section –I is compulsory.  
2. Answer any TWO questions from each remaining Sections.

Marks

Section – I

1. a) Fill in the blanks with appropriate word/s 5x1=5
- i. The program in execution is .....
  - ii. A new process is created by .....
  - iii . .... is the number of processes that are executed per unit.
  - iv. In two-level directory structure, each user has .....
  - v. The file system implementation is done through .....
- b) Write a note on Protection and security. 5

Section – II

2. a) What are the advantages of multiprocessor systems? Explain. 5
- b) Explain clustered systems. 5
- c) Distinguish between traditional computing and client server computing. 5
3. a) Define the process. Explain the process states with diagram. 6
- b) Differentiate between long term scheduler v/s c p u scheduler. 4
- c) What are the reasons for process co operation? Explain. 5
4. a) Which are the CPU scheduling criteria? Explain 5
- b) Consider the following set processes, with the length of CPU burst 10  
given in milliseconds:

<u>Process</u>	<u>Burst time</u>	<u>Priority</u>
P1	10	3
P2	1	1
P3	2	3
P4	1	4

The processes are assumed to have arrived in the order p1, p2, p3, p4, p5 all at time 0.

- i). Draw the Gantt charts for FCFS and priority scheduling.
- ii). What is the turnaround time for each process for each of scheduling algorithms in part i ?
- iii). Calculate average waiting time of each process.

#### Section – III

- |    |   |    |
|----|---|----|
| 5. | a) Explain how solve the problem of critical-section through semaphores         | 5  |
|    | b) Explain the four necessary conditions for deadlock.                          | 8  |
|    | c) What do you mean by deadlock avoidance?                                      | 2  |
| 6. | a) What is the significance of swapping ? Explain.                              | 5  |
|    | b) Explain in detail the paging memory management scheme.                       | 10 |
| 7. | a) Explain first-fit ,best-fit and worst-fit strategies for memory allocation . | 6  |
|    | b) What is the user view of segmentation? Explain.                              | 5  |
|    | c) Explain the concept of virtual memory.                                       | 4  |

#### Section – IV

- |     |   |    |
|-----|---|----|
| 8.  | a) Consider the following page reference string<br>1,2,3,4,2,1,5,6,2,1,2,3,7,6,3,2,1,2,3,6.<br>How many page faults would occur for the following replacement algorithms,<br>assuming 4 page frames ? |    |
|     | i) LRU replacement  |    |
|     | ii) FIFO replacement  |    |
|     | iii) Optimal replacement  | 10 |
|     | b) What is a file? Explain its attributes.  | 5  |
| 9.  | a) What are the operations performed on a directory ? Explain.  | 6  |
|     | b) Explain two-level and tree-structured directories.   | 9  |
| 10. | a) How to implement a file system ? Explain in detail .   | 9  |
|     | b) What is the significance of the virtual file system? Explain.  | 6  |