

GLS UNIVERSITY
Bachelor of Computer Applications (BCA)
(Core Course)
Semester-III
210301304 FUNDAMENTALS OF OPERATING SYSTEM

1. Course Objective:

- To understand basic concepts of OS.
- To understand the different scheduling policies.
- To understand the different Memory Management techniques, Process Concurrency, Synchronization and deadlocks.
- To understand the concepts of Disk Management, Security Issues, File Management and Protection Management.

2. Course Duration:

The course will have sessions which are divided into five modules. Each module consists of nine sessions of 60 minutes each and carries a weightage of 20%.

3. Course Contents:

Module No.	Modules/Sub-Modules	No. of Sessions	Marks Weightage
I	Introduction to Operating System <ul style="list-style-type: none">• Definition of Operating System• The need for Operating System• Types of Operating System<ul style="list-style-type: none">○ Multi-programming systems○ Multi-user time sharing systems○ Real time Operating System○ Embedded Operating System○ Network Operating System○ Multi-tasking Systems○ Uni- processor Operating System○ Multi processor Operating System○ Distributed Operating System• Functions of Operating System<ul style="list-style-type: none">○ User View○ System View	09	20%
II	Process Management <ul style="list-style-type: none">• Fundamentals of Process Management<ul style="list-style-type: none">○ Introduction○ Terminology• Relationship between Processes• Life cycle of Process<ul style="list-style-type: none">○ Process State and State Transitions○ Suspended Processes and their state transitions	09	20%

	<ul style="list-style-type: none"> • Process Control Block • Schedulers <ul style="list-style-type: none"> ○ Long-term scheduler ○ Short-term scheduler ○ Medium-term scheduler • Scheduling Algorithms <ul style="list-style-type: none"> ○ First come first serve (FCFS) ○ Priority Scheduling ○ SJN ○ Round Robin ○ SRT 		
III	Process Communication and Synchronization <ul style="list-style-type: none"> • Introduction to Process • Concurrent Processes <ul style="list-style-type: none"> ○ Process Communication • Semaphores • Solution of Classic Synchronization Problem using Semaphores <ul style="list-style-type: none"> ○ Solution of Dining Philosophers Problem • Deadlocks <ul style="list-style-type: none"> ○ Introduction ○ Defining Deadlocks ○ Conditions for Deadlocks • Dealing with deadlock • Thread <ul style="list-style-type: none"> ○ Process and Thread ○ Multi-Tasking vs. Multi-Threading ○ Thread Control Block ○ Usage of Multi Thread ○ Types of Thread 	09	20%
IV	Memory Management <ul style="list-style-type: none"> • Basic Memory Management <ul style="list-style-type: none"> ○ Introduction ○ Basic Concepts <ul style="list-style-type: none"> ▪ Static and Dynamic Allocation ▪ Logical and Physical addresses ▪ Fixed and Variable Memory Partitioning ▪ Fragmentation ▪ Swapping ▪ Contiguous Memory Allocation ▪ Compaction ▪ Memory Allocation Techniques ○ Paging Concept ○ Segmentation • Virtual Memory <ul style="list-style-type: none"> ○ Introduction ○ Need for virtual Memory ○ Demand Paging 	09	20%

	<ul style="list-style-type: none"> ○ Page Replacement Algorithm <ul style="list-style-type: none"> ▪ FIFO ▪ LRU ○ Thrashing 		
V	<p>File Management, Disk Management, Security and Protection</p> <ul style="list-style-type: none"> • File System <ul style="list-style-type: none"> ○ Introduction ○ Files and File System ○ File Structure ○ File Naming and File Type ○ File Access • Disk Management <ul style="list-style-type: none"> ○ Introduction ○ Disk Scheduling Algorithm <ul style="list-style-type: none"> ▪ FCFS ▪ SSTF ▪ SCAN ▪ LOOK and C-LOOK • Solid State Drive <ul style="list-style-type: none"> ○ SSD structure ○ SSD features ○ File system in SSD <ul style="list-style-type: none"> ▪ Ext4 ▪ BtrFS ▪ XFS ▪ F2FS ○ Logical Block Mapping in SSD ○ SSD applications ○ SSD vs. HDD • Mobile Operating System <ul style="list-style-type: none"> ○ Introduction ○ Roles of OS in Mobile Devices ○ Constraints and Requirements of Mobile OS ○ Types of Mobile Operating System <ul style="list-style-type: none"> ▪ Windows Mobile ▪ Palm OS ▪ Embedded Linux OS ▪ iOS ▪ Android 	09	20%

4. Teaching Methods:

The following pedagogical tools will be used to teach this course:

1. Lectures and Discussions
2. Assignments and Presentations
3. Quiz

5. Evaluation:

The students will be evaluated on a continuous basis and broadly follow the scheme given below:

1.	Assignments / Presentations / Quizzes, etc.	30% (Internal Assessment)
2.	Internal Examination	20% (Internal Assessment)
3.	External Examination	50% (External Assessment)

6. Basic Text Books:

Sr. No	Author/s	Name of the book	Publisher	Edition
T1	Naresh Chauhan	Principles of Operating Systems	Oxford	2014 Edition

7. Reference Books:

Sr. No	Author/s	Name of the book	Publisher	Edition
R1	Dr. R.C.Joshi Dr. Shashikala	Operating Systems	Dreamtech Press	2014 Edition
R2	Sibsankar Halder Alex A. Aravind	Operating Systems	Pearson	New
R3	Prasant Kumar Pattnaik Rajib Mall	Fundamentals of Mobile Computing	PHI	Latest

8. List of Journals / Periodicals / Magazines / Newspapers etc.:

Sr. No	Link
1	OS_8th_Edition.pdf
2	www.pearsoned.co.in/SibsankarHalder
3	http://physinfo.ulb.ac.be/cit_courseware/opsys/ostart.htm
4	http://www.nptel.ac.in/courses/106108101/pdf/Lecture_Notes/Mod%201_LN.pdf
5	http://www.nptel.ac.in/courses/106108101/pdf/Lecture_Notes/Mod%202_LN.pdf
6	http://www.nptel.ac.in/courses/106108101/pdf/Lecture_Notes/Mod%203_LN.pdf
7	http://www.nptel.ac.in/courses/106108101/pdf/Lecture_Notes/Mod%204_LN.pdf
8	http://www.nptel.ac.in/courses/106108101/pdf/Lecture_Notes/Mod%206_LN.pdf
9	https://www.slideshare.net/tissue01/ssd-solid-state-drive?next_slideshow=1
10	https://www.addictivetips.com/ubuntu-linux-tips/best-ssd-friendly-file-systems-on-linux/
11	https://codecapsule.com/2014/02/12/coding-for-ssds-part-3-pages-blocks-and-the-flash-translation-layer/

9. Session Plan:

Session No.	Topics / Chapters
1-3	Introduction to Operating System: The need for Operating System, Types of Operating System, Batch Processing Systems, Multi-programming systems Multi-user time-sharing systems, Real time Operating System
4-5	Embedded Operating System, Network Operating System, Multi-tasking Systems, Multi Process Operating System, Distributed Operating System
6-9	Functions of Operating System, User View, System View
10-12	Process Management: Fundamentals of Process Management, Introduction,

	Terminology, Relationship between Processes, Life cycle of Process
13-15	Process State and State Transitions, Suspended Processes and their state transitions, Process Control Block
16-18	Schedulers, Long-term scheduler, Short-term scheduler, Medium-term scheduler Scheduling Algorithms: First come first serve (FCFS), Priority Scheduling SJN, Round Robin, SRT
19-21	Process Communication and Synchronization, Introduction to Process Concurrent Processes, Process Communication, Deadlocks□□
22-24	Semaphores, Solution of Classic Synchronization Problem using Semaphores, Solution of Dining Philosophers Problem
25-27	Deadlocks: Introduction, Defining Deadlocks, Conditions for Deadlocks Dealing with deadlock, Thread, Process and Thread, Multi-Tasking vs. Multi-Threading, Thread Control Block, Usage of Multi Thread, Types of Thread
28-30	Memory Management, Introduction to Basic Concepts, Static and Dynamic Allocation, Logical and Physical addresses, Fixed and Variable Memory Partitioning, Fragmentation, Swapping
31-33	Contiguous Memory Allocation, Compaction, Memory Allocation Techniques Paging Concept, Segmentation
34-35	Virtual Memory, Introduction, Need for virtual Memory, Demand Paging, Page Replacement Algorithm: FIFO, LRU, Thrashing
36-39	File System, Introduction, Files and File System, File Structure, File Naming and File Type, File Access, Disk Management, Introduction
40 - 45	Disk Scheduling Algorithm: FCFS, SSTF, SCAN, LOOK and C-LOOK, Solid State Drive: SSD structure, SSD features, File system in SSD, Logical Block, Mapping in SSD, SSD applications, SSD vs. HDD

10. Learning Outcome:

Upon the completion of this course, students will be able to:

- Gain knowledge of concepts, structure and types of Operating System.
- Compare performance of Process Scheduling Algorithms.
- Learn concepts related to Process Management, Concurrent Processes, Virtual Memory, Paging, Deadlocks and File System.
- Apply optimization techniques for the improvement of System Performance.