Third Year B.C.A. (Under Science) Semester V

Course Code: BCA504 **Course Title: Operating Systems**

Total Contact Hours: 48 hrs. (60 Lectures) **Total Credits: 04** **Total Marks: 100**

Teaching Scheme: Theory- 05 Lect./ Week

Pre-requisites : Knowledge of fundamentals of Computer Organization

Course Objectives:

1. To understand the objectives, structure and functions of operating system
2. To learn about concept of processes, threads and its scheduling algorithms
3. To understand design issues in process synchronization and deadlock management
4. To study various memory management schemes
5. To learn about concept file and I/O management in detail.

Unit No.	Content	No. of Lecctures
Unit 1	**1. Introduction to Operating System Concepts** 1.1 Operating System Objectives and Functions - Definition of Operating System ,Role and Objectives of Operating System, Operating System as a User View and System View 1.2 Evolution Of Operating Systems - Batch Operating System, Multi-Programming Operating System ,Time-Sharing Operating System, Desktop Operating Systems, Real-Time Operating System, Distributed Operating System, Parallel Systems, Multimedia Systems, Handheld Systems 1.3 Computer System Architecture - Single-Processor Systems, Multi-Processor Systems, Clustered Systems 1.4 Operating System Operations- Dual-Mode And Multimode Operation, Timer 1.5 Operating System as Resource Management- Process Management, Memory Management, Storage Management(File system ,Mass storage ,Caching I/O systems), Protection And Security 1.6 Computing Environment-Traditional Computing, Client Server Computing, Peer To Peer Computing, Virtualization, Cloud Computing	**06**
Unit 2	**2. System structure** 2.1 Operating System Services 2.2 System Calls 2.3 Types of system Calls- Process Control, File Management, Device Management, Information Maintenance, Communication, Protection 2.4 System Programs	**05**

	2.5 Operating System Structuring Methods Simple Structure, Layered Approach , Micro Kernel, Modules, Virtual Machines – Architecture , Benefits , Exokernel **2.6** System Boot	
Unit 3	**3. Process and Thread Management** 3.1 Process Concept – Process , Process Model , Process Control Block 3.2 Operations on Process – Process creation , Process Termination 3.3 Process Scheduling - Scheduling queues, Schedulers, Context switch 3.4 Inter Process Communication –Cooperating Process, Shared Memory Systems, Message Passing Systems 3.5 Overview of Threads 3.6 Concept of Multithreaded Programming and Multicore Programming 3.7 Types of threads – User and Kernel 3.8 Multithreading Models – Many to One , One to Many, Many to Many	**06**
Unit 4	4 **Process Scheduling** 4.1 Basic Concept – CPU-I/O burst cycle, CPU scheduler, Preemptive scheduling, Dispatcher 4.2 Scheduling Criteria 4.3 Scheduling Algorithms – FCFS, SJF, Priority scheduling, Round-robin scheduling, Multiple queue scheduling, Multilevel feedback queue scheduling 4.4 Thread Scheduling	**07**
Unit 5	5 **Process Synchronization** 5.1 Background – Problems with Concurrency , Race Condition 5.2 Critical Section Problem – Peterson's Solution(for two process) 5.3 Semaphores: Usage, Implementation 5.4 Classic Problems of Synchronization – Producer Consumer problem, Reader Writer problem, Dining Philosopher Problem	**05**
Unit 6	6 **Deadlocks** 6.1 System Model 6.2 Deadlock Characterization – Necessary Conditions, Resource Allocation Graph 6.3 Deadlock Prevention 6.4 Deadlock Avoidance - Safe State, Resource Allocation Graph Algorithm, Banker's Algorithm 6.5 Deadlock Detection 6.6 Recovery From Deadlock – Process Termination, Resource Preemption	**08**
Unit 7	7 **Memory Management** 7.1 Background – Basic Hardware, Address Binding, Logical Versus Physical Address Space, Dynamic Loading, Dynamic Linking and Shared Libraries, Overlays	**11**

	7.2 Swapping 7.3 Contiguous Memory Allocation – Memory Mapping and Protection, Memory Allocation, Fragmentation 7.4 Paging – Basic Method, Hardware Support, Protection, Shared Pages 7.5 Segmentation – Basic Concept, Hardware 7.6 Virtual Memory Management – Background, Demand Paging 7.7 Page Replacement Algorithms – FIFO, OPT, LRU, Second Chance Page Replacement 7.8 Thrashing – Cause of thrashing , Working-set Model	
Unit 8	8 **File System** 8.1 File concept 8.2 Access Methods – Sequential, Direct, Other access methods 8.3 Directory and Disk Structure – Storage structure, Directory overview, Single level directory, Two level directory, Tree structure directory, Acyclic graph directory, General graph directory 8.4 Allocation Methods – Contiguous allocation, Linked allocation, Indexed allocation 8.5 Free Space Management – Bit vector, Linked list, Grouping, Counting, Space maps	**06**
Unit 9	9 **I/O Systems and Disk Management** 9.1 I/O Hardware - polling, interrupts, DMA 9.2 Application I/O Interface - block and character devices, network devices, clocks and timers, blocking and non blocking I/O 9.3 Kernel I/O subsystems - (I/O scheduling, buffering, caching, spooling and device reservation, error handling) 9.4 Disk Structure 9.5 Disk Scheduling – Disk Performance Parameters, Scheduling algorithms(FCFS, SSTF, SCAN,LOOK)	**06**

Reference Books:

1. "Operating System Concepts", 9th Edition ,by Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, John Wiley & Sons (ASIA) Pvt. Ltd, 2013.
2. "Operating Systems: Internals and Design Principles", 7th Edition, by William Stallings, Prentice Hall, 2011
3. "Modern Operating Systems", 4th Edition, by Andrew S. Tanenbaum, Prentice Hall of India Pvt. Ltd, 2014.
4. "Operating Systems : Principles and Design" – Pabitra Pal Choudhary (PHI Learning Private Limited)
5. "An Introduction to Operating Systems, Concepts and Practice" by Pramod Chandra P. Bhatt , PHI, 2010