Tribhuvan University
Central Department of Computer Science
&
Information Technology

Level	:	Bachelor	Full Marks: 60+20+20		
Course	:	B.Sc. CSIT	Pass Marks: 24+8+8		
Subject	:	**Operating System**			
Subject Code	:	CSC-203	Year	:	II
Credit Hour	:	3 CH			
Lecture Hour	:	7 LH (3 Theory, 1 Tutorial, 3 Lab)	Semester	:	I

Unit	Description	Lecture Hour	Remarks
1	**INTRODUCTON**	**6 Hours**	
	1.1 History of Operating System: • The First Generation of Computer • The Second Generation of Computer • The Third Generation of Computer • The Fourth Generation of Computer **1.2 Operating System Concept:** • Real-Time & Time Sharing • Mainframe Operating System • Personal Computer (PC) Operating System • Introduction To System Calls • The Shell **1.3 Operating System Structure:** • Monolithic Systems • Layered Systems • Virtual Machines • Client-Server Model		
2	**PROCESS MANAGEMENT**	**14 Hours**	
	2.1 Introduction to Processes: • The Process Model • Implementation of Processes • Threads • Thread Model • Thread Usage • Implementing Thread In User Space **2.2 Interprocess Communication & Synchronization:** • Race Conditions • Critical Regions • Mutual Exclusion with Busy Waiting		

	• Sleep & Wakeup • Semaphores • Introduction To Message Passing • The Dining Philosophers Problem **2.3 Process Scheduling:** • Round Robin Scheduling • Priority Scheduling • Multiple Queues		
3	**MEMORY MANAGEMENT**	**7 Hours**	
	3.1 Memory Management without Swapping or Paging: • Monoprogramming without Swapping & Paging • Multiprogramming and Memory Usage • Multiprogramming and Fixed Partition **3.2 Swapping:** • Memory Management with Bit Maps • Memory Management with Linked Lists • Memory Management with Buddy System • Allocation of Swap Space • Analysis of Swapping Systems **3.3 Virtual Memory:** • Paging • Page Tables • Example of Paging Hardware • Associative Memory **3.4 Page Replacement Algorithms:** • The optimal Page Replacement Algorithms • The First-in, First-out • The Second Chance Page Replacement Algorithms • The Least Recently Used • Modeling Paging Algorithms (Stack Algo.) **3.5 Segmentation:** • Implementation of Pure Segmentation • Segmentation with Paging: MULTIC • Segmentation with Paging: The Intel		
4	**FILE SYSTEM**	**6 Hours**	

	4.1 Files: • File Naming • File Structure • File Types • File Access • File Attributes • File Operations • Memory Mapped Files **4.2 Directories:** • Hierarchical Directory System • Path Names • Directory Operations **4.3 File System Implementation:** • Implementing Files • Implementing Directories • Shared Files • Disk Space Management • File System Reliability • File System Performance		
5	**DEVICE MANAGEMENT**	**12 Hours**	
	5.1 Principle of I/O Hardware: • I/O Device • Device Controller • Direct Memory Access **5.2 Principle of I/O Software:** • Goals of I/O Software • Interrupt Handlers • Device Drivers **5.3 Disk Management:** • Disk Structure • Disk Scheduling Algorithm • Error Handling and Formatting • Stable Storage Management **5.4 Terminals:** • Terminal Hardware • Memory-Mapped Terminals • Input/Output Software		
5	**DEADLOCKS**		
	6.1 Deadlocks: Conditions for Deadlock Deadlock Modeling	**45 Hours**	

	6.2 Deadlock Detection, Recovery and Prevention: Deadlock Detection with One Resource of Each Type Deadlock Detection with Multiple Resource of Each Type Deadlock Prevention		
	Total Lecture Hour		

Text Books:

1. Modern Operating System – Andrew S. Tanenbaum, 2nd Edition
2. An Introduction to Operating System Concepts and Practice – Pramod Chandra P. Bhatt, 2nd Edition
3. Operating System Concept - Silberschatz, Galvin adn Gagne, 6th Edition

Laboratories Works:

Small type of programming (using C programming) of:

- Process Creation
- Process Termination
- Process Deletion
- Process Communication
- Classical Interprocess Communication Problems
- Filing System
- I/O Handling

Assignments:

- 10 Assignments

Tests:

- Internal Tests

Teaching Techniques:

- Lectures
- Demonstration
- Assignment (after completion of a unit)
- Oral/Viva

Working Environment:

- Linux/Windows Based

Case Study:

- Any One Operating System

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SECTION "A"
(2Q x 10 = 20 Marks)

Any Two Questions:

1. What is Files? Discuss the must common system calls relating to files.
   OR
   What is System Calls? Explain the system call flow with the help of a block diagram.
2. Explain the four basic modes of Input/Output operations.
3. a) How is the Direct Memory Access (DMA) set up?
   b) Explain the concept of Buffering.
   c) How interrupt is enabling and detected?

SECTION "B"
(8Q x 5 = 40 Marks)

Any Eight Questions:

4. What are the main motivations and issues in primary memory management?
5. List some differences between Personal Computer Operating Systems and Mainframe Operating Systems.
6. Explain the difference between Busy Waiting and Blocking.
7. Explain why two-level and scheduling is commonly used.
8. Explain the Hierarchical Directory Systems with diagrammatic examples.
9. What is the difference between Program and Process?
10. Give briefly at least three different ways of establishing interprocess communication?
11. A system has four processes P1 through P4 and two resource types R1 and R2. It has 2 units of R1 and 3 units of R2. Given that:
    P1 request 2 units of R2 and 1 unit of R1
    P2 holds 2 units of R1 and 1 unit of R2
    P3 holds 1 unit of R1
    P4 requests 1 unit of R1
    Show the resource graph for the state of the system. Is the system in deadlock, and if so, which processes are involved.
12. Write short notes on:
    a) File Structure
    b) The First-In, First-Out (FIFO) Page Replacement Algorithms.