Course Title: Operating System
Nature of Course: Theoretical + Practical
Credit Hour: 3 hours (2T + 1P)
Teaching Hour: 64 hours (32 + 32)

Course No.: ICT Ed. 445
Level: Bachelor
Program: BICTE
Semester: Fourth

1. Course Description

This course is focused on how operating system (OS) manages resources to support the functioning of computer system. This course also helps the students to understand both theoretical and practical knowledge about different concepts of operating systems such as system structure of OS, process and thread management, memory management, storage management, and I/O management concepts.

2. General Objectives

Following are the general objectives of this course:

- To familiarize the basic concepts of operating systems.
- To develop both practical and theoretical concepts of process and thread concept, process synchronization and deadlock
- To make the student knowledgeable about memory management strategies, file system management and storage management.
- To be able to make distinction between available operating systems in terms of their design and working principle.

3. Course Outlines:

Specific Objectives	Contents
• To define and basic concepts of operating systems • Identify and state different types of operating systems • To explain different operations of operating systems • To define different structure of operating systems • To introduce system calls	**Unit 1: Introduction (3)** 1.1. What operating system do? 1.2. Operating Systems operations 1.3. Operating System services 1.4. Operating System Structures 1.5. System Calls **Practical Work (3)** – Write program to make use of command line arguments – Create different commands to support user operations
• To define and differentiate process and thread • To define different operations of processes • To illustrate different process states • To explain inter-process communication • To solve critical-selection problem	**Unit 2: Process Management (12)** 2.1. Process and Thread Concepts 2.2. Operations on processes 2.3. Interprocess Communication 2.4. Process states 2.5. Process Synchronization: critical section problems and solutions 2.6. Peterson's Solution

• To demonstrate process synchronization and its details • To develop knowledge of scheduling criteria • To make use of different CPU scheduling algorithms • To illustrate different concept of deadlock • To explain different methods for handling deadlocks	2.7. Mutex Locks 2.8. Semaphores 2.9. Monitors 2.10. CPU Scheduling Concepts 2.11. Scheduling Criteria 2.12. Scheduling Algorithms: First come First Serve (FCFS), Shortest Job First (SJF), Shortest Remaining Time First (SRTF), Round Robin 2.13. Deadlocks: characterization, prevention, avoidance, detection and recovery **Practical Works (9)** – Demonstrate process creation and thread creation – Simulate CPU Scheduling algorithms: FCFS, SJF, SRTF, Round Robin – Simulate deadlock avoidance algorithm: Banker's Algorithm
• To understand different memory management strategies • To explain the concepts of swapping • To illustrate about paging techniques and the detail structure of page table • To know about segmentation • To make distinction between paging and segmentation • To explain importance of virtual memory management • To implement page replacement algorithms	**Unit 3: Memory Management (8)** 3.1. Main Memory Management 3.2. Swapping 3.3. Memory allocation strategies 3.4. Paging and its types 3.5. Structure of the Page Table 3.6. Segmentation 3.7. Virtual memory management 3.8. Page replacement algorithms **Practical Works (7)** – Write program to simulate paging – Write program to simulate Page Replacement algorithms
• To identify disk structure • To make use of disk scheduling algorithms • To explain the basics and importance of RAID • To define file concepts, different file access methods, file-system structure, and file-system implementation • To explain directory and directory implementation • To demonstrate allocation methods and	**Unit 4: Storage Management (9)** 4.1. Disk Structure 4.2. Disk Scheduling algorithms: FCFS, SSTF, SCAN, C-SCAN, LOOK, C-LOOK 4.3. RAID Structure 4.4. File Concept and Access Methods 4.5. Directory Structure 4.6. Directory Implementation 4.7. File System Structure and operations 4.8. Allocation Methods

free space management	4.9. Free Space Management **Practical Works (7)** – Demonstrate Directory and File Attributes – Write program to simulate disk scheduling algorithms: FCFS, SSTF, SCAN, C-SCAN, LOOK, C-LOOK
• Prepare case study summary report to understand different aspect of Linux system and Windows system	**Unit 5: Case Study (Practical Works) (6)** 5.1. The Linux System 5.2. Windows OS 5.3. Android OS

4. Instructional Techniques

The instructional techniques for this course are divided into two groups. First group consists of general instructional techniques applicable to most of the units. The second group consists of specific instructional techniques applicable to particular units.

4.1. General Techniques

Reading materials will be provided to students in each unit. Lecture, Discussion, use of multi-media projector, brain storming are used in all units.

4.2. Specific Instructional Techniques

Demonstration is an essential instructional technique for all units in this course during teaching learning process. Specifically, demonstration with practical works will be specific instructional technique in this course. The details of suggested instructional techniques are presented below:

Units	Activities
Unit 1: Introduction	• Demonstrate the working mechanism of operating systems • Monitoring of students' work by reaching each student and providing feedback for improvement • Presentation by students on at least 5 operating systems
Unit 2: Process Management	• Demonstrate process and thread concepts • To define the CPU scheduling and interprocess communication • To define process synchronization, scheduling, and deadlock • Lab work to demonstrate process creation and thread creation and simulate Processor Scheduling and deadlock detection algorithms
Unit 3: Memory Management	• Demonstrate concepts of memory, swapping, paging, and virtual memory • Lab work on page replacement algorithms
Unit 4: Storage Management	• Demonstrate disk structure, RAID structure • To illustrate file and directory concepts • Lab work to demonstrate directory and file structure, and to

	simulate disk scheduling algorithms and file management techniques
Unit 5: Case Study	• Presentation by students on different concepts of Linux, Android OS and Windows 10 Operating Systems

5. Evaluation :

Internal Assessment	External Practical Exam/Viva	Semester Examination	Total Marks
40 Points	20 Points	40 Points	100 Points

Note: Students must pass separately in internal assessment, external practical exam and semester examination.

5.1. **Internal Evaluation (40 Points):**

Internal evaluation will be conducted by subject teacher based on following criteria:

6) Class Attendance	5 points
7) Learning activities and class performance	5 points
8) First assignment (written assignment)	10 points
9) Second assignment (Case Study/project work with presentation)	10 points
10) Terminal Examination	10 Points
Total	**40 Points**

5.2. **Semester Examination (40 Points)**

Examination Division, Dean Office will conduct final examination at the end of semester.

1) Objective question (Multiple choice 10 questions x 1mark)	10 Points
2) Subjective answer questions (6 questions with 2 OR x 5 marks)	30 Points
Total	**40 points**

5.3. **External Practical Exam/Viva (20 Points):**

Examination Division, Dean Office will conduct final practical examination at the end of semester.

6. Recommended books and References materials (including relevant published articles in national and international journals)

Abraham Silberschatz, Pter Baer Galvin and Greg Gagne, Operating System Concepts, (2018). 10th Edition, John Wiley & Sons Inc

Andrew S. Tanenbaum, Herbert Bos, Modern Operating Systems, 4th Edition, Pearson

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