Course Title: Operating System
Nature of Course: Theoretical + Practical
Credit Hour: 3 hours (2T + 1P)
Teaching Hour: 80 hours (32 + 48)

Course No.: ICT Ed. 445
Level: B.Ed.
Semester: Fourth

1. Course Description

This course is focused on to develop knowledge about different concepts of operating systems. This course helps the students to develop both theoretical and practical knowledge about different concepts of operating systems such as basic concepts, process and thread, memory, storage, and I/O concepts related to operating system. This course also helps students to know the different aspects of some popular operating systems.

2. General Objectives

Following are the general objective of this course:

- To familiarize the basic concepts of operating systems.
- To develop both practical and theoretical concepts of process, memory, storage, and I/O management.
- To introduce some popular operating systems.

3. Course Outlines:

Specific Objectives	Contents
• To define and basic concepts of operating systems • To explain two different views of operating systems • To define the structure of operating systems • To define different types of operating systems • To work with system calls • To introduce shell • To illustrate the open source operating systems	**Unit 1: Introduction (3)** 1.1. What is operating system? 1.2. Two views of Operating Systems 1.3. Operating-System Structures 1.4. Types of Operating Systems 1.5. System Calls 1.6. Shell 1.7. Open-Source Operating Systems **Lab Work (3)** – Demonstrate Linux commands – Demonstrate Linux shell
• To define and differentiate process and thread • To schedule the process execution sequence • To define different operations of processes • To illustrate different process states • To explain inter-process communication • To explain different multithreading models • To solve critical-selection problem • To demonstrate process synchronization and its details • To define lock variables	**Unit 2: Process Management (13)** 2.1. Process and Thread Concepts 2.2. Process Scheduling 2.3. Operations on Processes 2.4. Process states 2.5. Interprocess Communication 2.6. Multithreading Models 2.7. The Critical-Section Problem 2.8. Process Synchronization 2.9. Lock Variable 2.10. Peterson's Solution 2.11. Mutex 2.12. Semaphores 2.13. Monitors

• To define Peterson's solution • To define about Mutex • To define about Semaphores • To define about Monitors • To explain concepts and importance of CPU scheduling • To develop knowledge of scheduling criteria • To use different CPU scheduling algorithms • To illustrate basic concept of deadlock • To explain different methods for handling deadlocks	2.14. CPU Scheduling Concepts 2.15. Scheduling Criteria 2.16. Scheduling Algorithms: First come First Serve, Shortest job First, Round Robin 2.17. Deadlocks 2.18. Methods for Handling Deadlocks **Lab Work (13)** – Demonstrate process creation and thread creation – Simulate Processor Scheduling and deadlock detection algorithms – Simulate the process synchronization mechanisms
• To explain the concepts of swapping • To explain the details of memory allocation • To illustrate about paging and the detail structure of page table • To explain basics and importance of virtual memory • To implement page replacement algorithms • To define segmentation	**Unit 3: Memory Management (8)** 3.1. Swapping 3.2. Memory Allocation 3.3. Paging 3.4. Structure of the Page Table 3.5. Virtual Memory 3.6. Page Replacement Algorithms 3.7. Segmentation **Lab Work (10)** – Demonstrate concept of virtual memory – Simulate Page Replacement algorithms
• To define the basics of mass-storage structure • To identify disk structure and disk scheduling • 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 about I/O systems and I/O hardware	**Unit 4: Storage Management (8)** 4.1. Overview of Mass-Storage Structure 4.2. Disk Structure 4.3. Disk Scheduling 4.4. RAID Structure 4.5. File Concept and Access Methods 4.6. Directory and Disk Structure 4.7. File-System Structure 4.8. File-System Implementation 4.9. Directory Implementation 4.10. I/O Systems Overview 4.11. I/O Hardware **Lab Work (12)** – Demonstrate Directory and File Attributes – Simulate Disk scheduling algorithms and file management techniques
• To identify, explain and implement the structure, processes, memory, IO,	**Unit 5: Case Study (10) - Practical** 5.1. The Linux System 5.2. Windows 7

storage, and File management in Linux and Windows operating system	

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 and open source 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 • To implement page replacement algorithms and segmentation • Lab work on page replacement algorithms and virtual memory
Unit 4: Storage Management	• Demonstrate disk structure, RAID structure • To illustrate file and directory concepts • To illustrate I/O system • 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 and Widows 7 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:

1)	Class Attendance	5 points
2)	Learning activities and class performance	5 points
3)	First assignment (written assignment)	10 points
4)	Second assignment (Case Study/project work with presentation)	10 points
5)	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 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)

6.1 Recommended books:

"Operating System Concepts" Abraham Silberschatz, Pter Baer Galvin and Greg Gagne, Ninth Edition

6.2 References materials:

"Modern Operating Systems" Fourth Edition Andrew S. Tanenbaum, Herbert Bos, Pearson