

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.

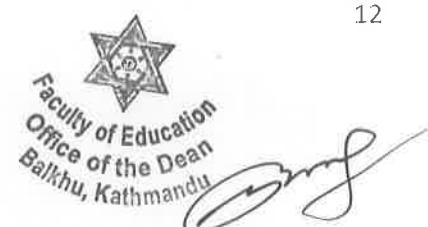
2. General Objectives

Following are the general objectives of this course:

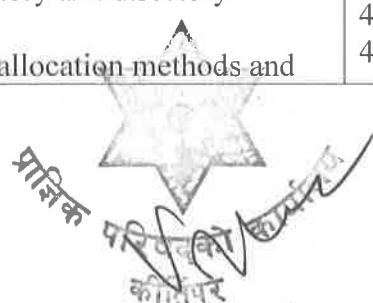
- To familiarize the basic concepts of operating systems.
- To develop both practical and theoretical concepts of process and thread concept, process synchronization and deadlock
- To make the student knowledgeable about memory management strategies, file system management and storage management.
- To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

3. Course Outlines:

| Specific Objectives | Contents |
|---|---|
| <ul style="list-style-type: none">• 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 | <p>Unit 1: Introduction (3)</p> <ul style="list-style-type: none">1.1. What operating system do?1.2. Operating Systems operations1.3. Operating System services1.4. Operating System Structures1.5. System Calls <p>Practical Work (3)</p> <ul style="list-style-type: none">– Write program to make use of command line arguments– Create different commands to support user operations |
| <ul style="list-style-type: none">• 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 | <p>Unit 2: Process Management (12)</p> <ul style="list-style-type: none">2.1. Process and Thread Concepts2.2. Operations on processes2.3. Interprocess Communication2.4. Process states2.5. Process Synchronization: critical section problems and solutions2.6. Peterson's Solution |



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| <ul style="list-style-type: none"> 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 | <ul style="list-style-type: none"> 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 |
| <ul style="list-style-type: none"> 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 | <p>Practical Works (9)</p> <ul style="list-style-type: none"> Demonstrate process creation and thread creation Simulate CPU Scheduling algorithms: FCFS, SJF, SRTF, Round Robin Simulate deadlock avoidance algorithm: Bunker's Algorithm <p>Unit 3: Memory Management (8)</p> <ul style="list-style-type: none"> 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 <p>Practical Works (7)</p> <ul style="list-style-type: none"> Write program to simulate paging Write program to simulate Page Replacement algorithms |
| <ul style="list-style-type: none"> 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 | <p>Unit 4: Storage Management (9)</p> <ul style="list-style-type: none"> 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 |



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| free space management | 4.9. Free Space Management Practical Works (7) <ul style="list-style-type: none">- 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.

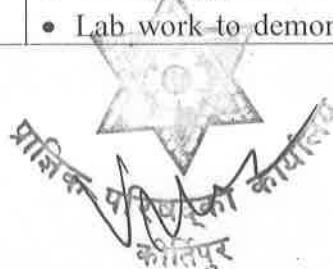
4.1. General Techniques

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 | <ul style="list-style-type: none"> • 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 | <ul style="list-style-type: none"> • 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 | <ul style="list-style-type: none"> • Demonstrate concepts of memory, swapping, paging, and virtual memory • Lab work on page replacement algorithms |
| Unit 4: Storage Management | <ul style="list-style-type: none"> • Demonstrate disk structure, RAID structure • To illustrate file and directory concepts • Lab work to demonstrate directory and file structure, and to |



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| | simulate disk scheduling algorithms and file management techniques |
| Unit 5: Case Study | <ul style="list-style-type: none"> • 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):

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| 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.

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| 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 | |

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, Peter 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

