**CENTRAL UNIVERSITY**

**FACULTY OF ENGINEERING**

**DEPARTMENT OF COMPUTER SCIENCE AND INFORMATION TECHNOLOGY**

**FIRST SEMESTER 2021/2022 ACADEMIC YEAR**

**COURSE OUTLINE**

**Course: COMP303: Operating Systems Credits: 3**

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**Course description:**

This course introduces the basic features used in modern operating systems. It provides an overview of the organizational principles of operating systems for general-purpose computers. It will cover both the theoretical aspect and the practical aspect. Some of the topics to be covered are: operating system concepts, functions, Single and multi-user operating system, machine configuration, I/O and interrupt Programming, partitioned memory, re-locatable memory and paging. Other topics include: processor management, scheduling and synchronization, device management, I/O traffic control, I/O scheduling, device handlers.

**Course objectives:**

By the end of the course, students will be able to:

1. Recognize the importance of the operating systems.
2. Recognize how the applications interact with the operating system as the later working as intermediary program between the machine and the application.
3. Know how the operating systems transport the application requests to the hardware.
4. Understand how operating systems managing resources such as processors, memory and I/O.
5. Realize the efficiency or the deficiency of the different techniques used by some operating systems.

**Teaching Approaches:**

There would be formal and online lectures, practical lab work, assignments, reflections and discussions

**Minor Modifications:**

When minor modifications are made to this syllabus, those will be reflected in the online management system.

**Online Learning Materials and Activities:**

You can access all learning materials in the online management system, if you are a registered student. It is very important to participate in learning activities given in the online management system to learn this course

**Assessment:**

There would be two quizzes, two an unannounced quiz and a number of class exercises and assignments. These would constitute 40% of the total scores for the final grade. In addition, there is a final end of semester examination which would constitute 60% of the total scores for the final grade.

**Online Assignments:**

Online assignments, quizzes and other related form of assessment could be conducted on the online management system as well.

**Content:**

chapter 1: Introduction (give definition of operating system and the function).

* 1. Computer system organization (Computer H.W.) includes:
     1. Device
     2. Device controller.
     3. Interrupt.
     4. Device and CPU interaction
     5. Bootstrap program
  2. I/O structure (some related topics are in chapter 13)
     1. Polling, interrupt, and DMA
     2. How to resolve interrupt through interrupt vector.
     3. Computer System Architecture
     4. Single Processor System
     5. Multiple Processors System
        1. Parallel system
        2. Tightly coupled.
        3. advantages of using multiple processor system
  3. Operating System Structure
  4. Operating System Operations
     1. Dual Modes operation
     2. Timer
     3. Process management
     4. Storage management

Chapter 2: Processes

1. Process concept, PCB, Process state
2. Process scheduling (long, medium- and short-term schedulers)
3. Process operations
4. Intercrosses communication
5. Techniques of Intercrosses communication
6. Message passing
7. Shared memory
8. Client server

chapter 3: CPU scheduling (1st Assessment)

1. introduction and objectives
2. preemptive and non-preemptive scheduling
3. scheduling criteria
4. algorithms
   * 1. FCFS
     2. SJF + Prediction of next burst of SJF
     3. Priority Scheduling
     4. RR
     5. Multilevel Queues
     6. Multilevel feedback.

(Exclude thread scheduling)

e. Processor Scheduling

Chapter 4: Process Synchronization

1. Introduction and background
2. Critical section (C.S.) problem
3. Condition for the solutions of C.S.
4. Algorithms
   * 1. Peterson
     2. Hardware solutions

e. Semaphores

Chapter 5: Main Memory Management

1. Background
2. Basic Hardware for managing Memory
3. Address binding
4. Swapping
5. Contiguous allocation (based on fixed and variable partitions)
   * + 1. Relocation and protection problems
       2. Fragmentation
6. Non-contiguous allocation
   * + 1. Paging + hardware support)
       2. Segmentation
       3. Paging with Segmentation.

Chapter 6 : Virtual Memory

1. Background
2. Demand paging
3. Basic concept
4. Performance in demand paging
5. Page replacement algorithms.
6. Allocation of frames.
7. Allocation algorithms
   1. Thrashing and its causes
   2. Detecting thrashing

Chapter 7: File System

1. File system structure
2. Implementation
3. Partition and mounting
4. Allocation methods
   * 1. Contiguous
     2. Linked
     3. Indexed
5. Free space Management
   * 1. Bit vector
     2. Linked list
     3. Grouping
     4. Counting
     5. Efficiency reliability and file sharing
6. Selected Topics of chapter 12 and 13 depending the time availability of the semester

**REFERENCES**

1.Silberschatz, Galvin, Gagne. Operating System Concepts. John Wiley & sons , inc

2.Operating systems design and implementation, Andrew s. Tanenbaum, Prentice-Hall.

3.Silberschatz, A., Gagne, G., & Galvin, P. B. (2011). Operating systems concepts (8th ed.). Michigan, MI: Wiley.