Department of Software & Informatics Engineering

College of Engineering

Salahaddin University

Subject: Operating Systems

Course Book – High Diploma – Second Semester

Lecturer's name: Mohammed Nasseh

Academic Year: 2023/2024

Course Book

1. Course name	**Operating Systems**
2. Lecturer in charge	**Mohammed Nasseh**
3. Department/ College	**Software Engineering/College of Engineering**
4. Contact	**e-mail: mohammed.mohammed@su.edu.krd**
5. Time (Hours / Week)	**Theory: 3**
9. Keywords	**Process, CPU Scheduling, Deadlock, Synchronization, and Memory Management**

10. Course overview:

This course presents an introduction to Operating Systems, understanding their tasks and how essential they are in any computer system.
In this course, the students will discover the techniques and algorithms used in Scheduling the tasks inside the memory.
The Synchronization issue will be discussed as well, then the problem of Deadlock and it's proposed solutions will be introduced.
In addition, Memory Management techniques will be studied during this course.

11. Course objective:

Operating systems are an essential part of any computer system. Similarly, a course on operating systems is an essential part of any computer-science education. An operating system is a program that manages the computer hardware. It also provides a basis for application programs. It acts as an intermediary between a user of a computer and the computer hardware for this reason it's very important to study this course. At the end of this course, students will be able to:

- Describe the purpose and function of operating systems.
- Identify the importance of operating systems in computer systems.
- Understand the fundamental of structure and architecture of operating systems.
- Install and gain basic of how operating system processes are scheduled.
- Understand the fundamental concepts of operating system processes.
- Write fundamental programs of operating system algorithms.

12. Student's obligation

Students are obliged to attend within the time stated in the lecture schedule for lessons that are many examples of solution during the lecture for closer understanding of the subject and that's what does not exist in the form reproduced obtained lectures, also the students responsible to solving homeworks and assignments.

13. Forms of teaching

There are three hours of scheduled instruction per week. New material will be formally presented in lectures. Students are expected to read in advanced the relevant sections and chapters from the essential text(s). Parts of some topics will not be lectured at all – instead,

students will be expected to read the corresponding material from the textbook. In such cases, lecture time will be used for discussing the concepts, studying examples, and solving problems. Whiteboard and pen have been mostly used and frequently clear the subject step by step. Homework, report, seminars and assignments are normally given throughout the course.

14. Assessment scheme

%10 Quizzes

%10 Reports

%10 Seminars

%20 Midterm

%50 Effort + **%50** Final exam

15. Student learning outcome:

At the end of this course, students will be able to:

1- Describe the purpose and function of operating systems.
2- Identify the importance of operating systems in computer systems.
3- Understand the fundamental of structure and architecture of operating systems.
4- Install and gain basic of how operating system processes are scheduled.
5- Understand the fundamental concepts of operating system processes.
6- Write fundamental programs of operating system algorithms.

16. Course Reading List and References:

▪ Key references: “Operating System Concepts”, 8th Edition. ABRAHAM SILBERSCHATZ, PETER BAER GALVIN and GREG GAGNE. JOHN WILEY & SONS. INC.

▪ Useful references: “Operating Systems Design and Implementation”, Third Edition. By Andrew S. Tanenbaum and Albert S. Woodhull. Prentice Hall.

17. The Topics:	Lecturer's name
1. Introduction to Operating System: Operating system definition and its main functions 2. Computer-System Structure and Operations 3. System Calls: what are system calls and how they are invoked?	Mohammed Nasseh

4. Operating system Design & Architecture: main designs and models of operating systems 5. Operating system Structure and Operations 6. Multiprogramming and Dual Mode systems 7. Operating System Services. 8. The Process Concept: what is process what are its states and how its represented in a computer system 9. Scheduling: what are schedulers, their types (long term and short term) 10. CPU Scheduling: including CPU Scheduling criteria's, context switching, … 11. FCFS Algorithm with examples and its advantages and disadvantages 12. SJF Algorithm: both non-preemptive and preemptive(SRTF) schemes with examples and advantages and disadvantages 13. Priority and RR Algorithms with examples, their advantages and disadvantages including starvation problem and aging solution 14. Other Algorithms: multilevel queue scheduling and multilevel feedback scheduling algorithms 15. Multiple-Processor Scheduling 16. Process Synchronization: what is process synchronization 17. Race condition: what is race condition with examples 18. Critical Section Problem Peterson's Solution 19. Synchronization hardware: including test and set instruction and swap instruction 20. Semaphores: what is semaphore and how it could be used in synchronization 21. Classic problems of synchronization: Bounded-Buffer Problem, Readers and Writers Problem and Dining-Philosophers Problem 22. Deadlocks: what is a deadlock prevention methods 23. Deadlock Avoidance Algorithm including the definition of safe state and safe sequence 24. Banker's Algorithm with examples 25. Deadlock detection algorithms 26. Deadlock recovery methods including process termination and preempting resources 27. Memory management: including physical – logical address mapping, swapping and contiguous memory allocation 28. Paging: talking about paging memory management scheme, implementation of paging tables and fragmentation	

29. Segmentation: which is an important aspect of memory management	