

## Course E-Syllabus

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|----|--|--|
| 1  | Course title   | Operating System                           |
| 2  | Course number  | 1901473                                    |
| 3  | Credit hours (theory, practical)                     | 3  |
|    | Contact hours (theory, practical)                    | 0  |
| 4  | Prerequisites/corequisites                           | Computer Organization (1901321) or 0907335 |
| 5  | Program title  | CS   |
| 6  | Program code   | 1  |
| 7  | Awarding institution                                 | The University of Jordan                   |
| 8  | Faculty  | IT   |
| 9  | Department   | CS   |
| 10 | Level of course                                      | 3  |
| 11 | Year of study and semester (s)                       | Fall 2022                                  |
| 12 | Final Qualification                                  | BS.C                                       |
| 13 | Other department (s) involved in teaching the course | -  |
| 14 | Language of Instruction                              | English                                    |
| 15 | Date of production/revision                          | -  |
| 16 | Required/ Elective                                   | Required                                   |

**16. Course Coordinator:**

Maen Al Assaf e-mail: m\_lassaf@ju.edu.jo  
Office numbers, 22587 office hours 1-2 PM S,M,TH.

**17. Other instructors:**

*Prof. Mohammed Qatawneh – mohd.qat@ju.edu.jo*

**18. Course Description:**

*This course enables students to understand and implement operating systems functions in managing computer systems component. It includes the following major topics: Introduction to Hardware and Software Concepts; Process and CPU scheduling, Threads, Synchronous and Concurrent Execution, Deadlock and Indefinite Postponement; Memory management: Physical and Virtual Memory; Management of external storage and I/O devices: Files management; Performance and Optimization; Security and Protection; and Distributed Systems. Linux Assignments*



**A- Aims:**

The Goal:

The main goal of this course is to equip students with knowledge and skills on how the operation systems manage the computer system components and allocate resources to users in optimized and convenient ways.

Objectives

Enable students to:

1. Understand the tasks of the operating systems in handling hardware, software and users of computer systems.
2. Understand the techniques used by the operating system to manage processes, CPU, Internal and external memory, I/O devices, Networks, and Files.
3. Compare between techniques to operate CPU, Memory and I/O devices and select the best
4. Analyze basic process management, synchronization, and memory management techniques, Processor scheduling and process synchronization problems.
5. Implement some of the techniques used for managing CPU scheduling and processes, memory partitioning, allocation and replacement, deadlock handling, process synchronization, and storage accessing.
6. Highlight issues related to Protection and Security, Concurrent Programming, Multiprocessor Management, and Distributed Systems.

**B- Intended Learning Outcomes (ILOs):** Upon successful completion of this course students will be able to

...

Successful completion of this course enables a student to:

A- Knowledge and Understanding:

- A1) Know and Understand the basic concepts of operating system.
- A2) Understand how does operating system manage resources: CPU, Main memory, external storage, Input/output Devices, and Files.

B- Cognitive and Intellectual skills:

- B1) Analyze and recognize the significance of several processor scheduling techniques
- B2) Analyze and recognize the significance of several synchronization techniques.
- B3) Design a simple monitor.
- B4) Analyze and recognize the significance of several deadlock handling approaches.
- B3) Analyze and recognize the significance of several memory management techniques
- B4) Analyze and recognize the significance of several disk scheduling and I/O device techniques
- B5) Compare between Protection and Security in sequential and Distributed systems

C– Subject specific skills – with ability to ...

C1) Implement typical operating system CPU scheduling techniques.

C2) Implement typical operating system techniques for process synchronization.

C3) Implement typical operating system techniques for deadlock handling.

C4) Implement typical operating system techniques for memory management.

C5) Implement typical operating system techniques for File and Disk management.

D– Transferable skills – with ability to

D1) Discuss and design and implement simple operating system. techniques.

D2) Present output of assignments on Linux

## 20. Topic Outline and Schedule:

| Week | Lecture | Topic  | SO    | ILOs              | Teaching Methods<br>*/platform | Evaluation Methods | Reference |
|------|---------|--|-------|-------------------|--------------------------------|--------------------|-----------|
| 1    |         | <b>Introduction:</b> Computer system components, O.S. history, Batch, real time, Multiprogramming, Multiprocessor, time sharing and Distributed systems  | 1,2   | A1, A2            | Lecture                        | Quiz and Exam      | Textbook  |
| 2    |         | <b>O.S. Structures:</b> system components, O.S. services, System calls, communication, system structure, virtual Machines, samples of operating systems  | 1,2   | A1, A2            | Lecture                        | Quiz and Exam      | Textbook  |
| 3    |         | <b>Process:</b> concepts, PCB, process scheduling, operations on processes, cooperating processes, interposes communications)  | 1,2,6 | <b>A2,</b>        | Lecture                        | Quiz and Exam      | Textbook  |
| 4    |         | <b>CPU scheduling :</b> concepts, scheduling criteria, Scheduling Algorithms)  |       | A2, B1, C1, D1    | Lecture                        | Quiz and Exam      | Textbook  |
| 5    |         | <b>Threads:</b> Motivation, benefits, user and kernel threads, Multithreading Models.  |       | A2,               | Lecture                        | Quiz and Exam      | Textbook  |
| 6    |         | <b>Process Synchronization:</b> Background, Critical Section Problem and its three solutions, Multiple Process Solution, Synchronization Hardware). Semaphores: (usage, implementation, Classic Problems of Synchronization) |       | <b>A1, B2, C2</b> | Lecture                        | Quiz and Exam      | Textbook  |
| 7    |         | <b>Deadlock:</b> System Model, Deadlock characterization, Methods for handling Deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock)  |       | C3, D2            | Lecture                        | Quiz and Exam      | Textbook  |

|             |  |  |  |                       |         |               |          |
|-------------|--|--|--|-----------------------|---------|---------------|----------|
|             |  | <b>Midterm exam</b>  |  |                       |         |               |          |
| <b>8</b>    |  | <b>Main Memory:</b> Address binding, Logical & physical addresses, Dynamic loading and Linking   |  | <b>A1, A2, B3, C4</b> | Lecture | Quiz and Exam | Textbook |
| <b>9+10</b> |  | <b>Virtual Memory:</b> Background, Demand Paging, Process allocation, replacement strategies   |  | A2, B3, C4, D1, D2    | Lecture | Quiz and Exam | Textbook |
| <b>11</b>   |  | <b>File System Interface:</b> File Concept, Access Methods, Directory Structure, File-System Mounting, File Sharing, and Protection.                               |  | A2, B4, C5, D1        | Lecture | Quiz and Exam | Textbook |
| <b>12</b>   |  | <b>Mass Storage Structure:</b> Basic Method, Hardware Support, Protection, Page Table structure, Shared Pages  |  | A2, B4, C5            | Lecture | Quiz and Exam | Textbook |
| <b>13</b>   |  | <b>I/O Systems:</b> Overview, I/O Hardware, Application I/O Interface, Kernel I/O Subsystem, Transforming I/O Requests to HW Operations, Streams, and Performance. |  | A2, B4, C5            | Lecture | Quiz and Exam | Textbook |
| <b>14</b>   |  | <b>Protection, Security, and Distributed System structure:</b> Protection, security ; Distributed system and networking topologies.                                |  | <b>A2, B5</b>         | Lecture | Quiz and Exam | Textbook |
| <b>15</b>   |  | <b>Review</b>  |  |                       |         |               |          |
| <b>16</b>   |  | <b>Final Exam</b>  |  |                       |         |               |          |

## 21. Teaching Methods and Assignments:

Teaching (T) Strategies: Class Contact is 3 Hours per week. The Course will be delivered using different means like lecture, presentations, seminars, discussion and case studies.

Learning (L) Methods: Students attend classes, ask questions and participate in discussions, do the home works, present the assignments and demo their works. A student will use the lab and select a programming language to implement the assignments. Students will access the e-learning platform for more instruction and supported learning materials.

## 22. Evaluation Methods and Course Requirements:

Assessment (A) Methods: There will be several assessment methods of evaluation the performance of the students such as attending and class participation, grading the homework, quizzes and assignments (20%); conducting the Midterm (30%) and the Final Exam (50%). Every student is expected to completely adhere to the assignments and project strict deadlines, absolutely no exceptions will be given.

## 23. Course Policies:

### **A- Attendance policies:**

*Maximum allowable absence 15% of number of Lectures/Semester*

### **B- Absences from exams and handing in assignments on time:**

*It is the student's responsibility to ensure that he/she is aware of all assignments, announcements and contents of missed sessions*

### **C- Health and safety procedures:**

*University Regulations*

### **D- Honesty policy regarding cheating, plagiarism, misbehavior:**

*It is the student's responsibility to ensure that he/she is adhere with cheating, plagiarism, misbehavior.*

## 24. Required equipment:

Linux machine

## 25. References:

**Text book (TB):**

Avi Silberschatz, P. Galvin, and G. Gange (2011), Operating System Concepts, (8th Edition, John Wiley & Sons. INC. References:

1. Operating Systems, By W. Stallings.
2. Operating Systems, By : A. Tanenbaum.
3. Operating Systems, By: Davis and Rajkumar.
5. [www.howstuffworks.com/operating-system.htm](http://www.howstuffworks.com/operating-system.htm) - 49k -
6. [www.webopedia.com/TERM/o/operating\\_system.html](http://www.webopedia.com/TERM/o/operating_system.html) - 53k -
7. [www.linux.org/](http://www.linux.org/)

**26. Additional information:**

N/A

Name of Course Coordinator: Maen Al Assaf. Signature: Maen al Assaf Date: 25-1-2023

Head of curriculum committee/Department: ----- Signature: -----

Head of Department: ----- Signature: -----

Head of curriculum committee/Faculty: ----- Signature: -----

Dean: ----- -Signature: -----