جامعة الزيتونة الأردنية

Al-Zaytoonah University of Jordan

Course Syllabus

According to JORDAN National Qualification Framework (JNQF)

Course Name: Operating Systems

Course Number: 0130313

General Course Information:

Course Title	Operating Systems
Course Number	**0130313**
Credit Hours	3 credit hours
Education Type	Blended learning
Prerequisites/Co-requisites	Computer Organization and Architecture (0130212)
Academic Program	Computer Science
Program Code	130
Faculty	Faculty of Sciences and Information Technology
Department	Computer Science
Level of Course	3
Academic Year /Semester	2024 / 2025 1st Semester
Awarded Qualification	BSc
Other Department(s) Involved in Teaching the Course	-
Language of Instruction	English
Date of Production	10/2024
Date of Revision	10/2025

Course Coordinator:

Coordinator's Name	Ali Al Dahoud
Office No.	334
Office Phone Extension Number	326
Office Hours	9:30 – 11:00 Sunday-Wednesday
E-mail	aldahoud@zuj.edu.jo

Other Instructors:

Instructor Name	Ayman Abdalla, Sohair Al-Hakeem
Office No.	330
Office Phone Extension Number	
Office Hours	12-15
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Course Description *(English/Arabic)*:

English	*This course connects all computer architecture topics together, and help students to understand how properly the Operating Systems are working. This course introduces the Operating System and Machine Architecture. Operating system and its instruction, the services provided by the OS, process management and its scheduling to the processor, type of scheduling and its algorithms, scheduling criteria's, the modern methods of design and implementation of OS, threads and its models and implementation, deadlock, type of algorithms for prevents the deadlock, manipulation with files, access to the files, the proper storage media for files, memory management, RAM, and VIRUAL memory, paging.*

Arabic	يربط هذا المساق جميع موضوعات مكونات الكمبيوتر معًا ، وتياعد الطلاب على فهم مدى عمل نظام التشغيل بشكل صحيح. يقدم هذا المساق نظام التشغيل وهندسة الآلة. نظام التشغيل وتعليماته ، الخدمات التي يقدمها نظام التشغيل ، إدارة العمليات وجدولتها للمعالج ، نوع الجدولة وخوارزمياتها ، معايير الجدولة ، الأساليب الحديثة في تصميم وتنفيذ نظام التشغيل ، الخيوط ونماذجها وتنفيذها ، الجمود ، نوع من الخوارزميات لمنع الجمود ، والتلاعب بالملفات ، والوصول إلى الملفات ، ووسائط التخزين المناسبة للملفات ، وإدارة الذاكرة ، وذاكرة الوصول العشوائي ، والذاكرة الظاهرية ، والترحيل.

Textbook: *Author(s), Title, Publisher, Edition, Year, Book website.*

Greg Gagne, Abraham Silberschatz, and Peter B. Galvin, *Operating System Concepts*, 10th Ed, Wiley & Sons, 2021.

References: *Author(s), Title, Publisher, Edition, Year, Book website.*

1. Andrew S. Tanenbaum, *Modern Operating Systems*, Global Ed, Pearson, 2023.
2. Douglas Comer, *Operating System Design: The Xinu Approach*, 3rd Ed, 2025.
3. Greg Tomsho, *Guide to Operating Systems*, 6th Ed, Cengage Learning, 2020.
4. Remzi H. Arpaci-Dusseau, and Andrea C. Arpaci-Dusseau. *Operating systems: Three Easy Pieces*, CreateSpace, 2018.
5. William Stallings. *Operating systems: Internals and Design Principles*, 9th Ed, Pearson, 2017.

Course Educational Objectives (CEOs):

CEO1	**Students should explain complex technical concepts related to operating systems professionally.**
CEO2	Students should develop an awareness of security and reliability issues in operating systems.
CEO3	Apply student's operating systems knowledge and skills in problem solving and critical thinking.

Intended Learning Outcomes (ILO's):

Intended learning outcomes (ILOs)		Relationship to CEOs	Contribution to PLOs	Bloom Taxonomy Levels*	JNQF Descriptors**
K	Knowledge and Understanding				
ILO1	Define OS, Computer-System organization and Architecture, including OS operation, Storage Structure and I/O structure	CEO1	PLO2-K	Remembering	K
ILO2	Defining address binding, memory protection, Contiguous Allocation, Paging	CEO1	PLO2-K	Understanding	K
S	Intellectual skills				
ILO3	Design and Suggest solutions for Deadlocks System Model and necessary conditions	CEO2	PLO3-S	Analyzing	S
ILO4	Develop the ability to diagnose and resolve common operating system issues, such as system crashes, performance bottlenecks, and software conflicts.	CEO2	PLO4-S	Analyzing	S
ILO5	Acquire skills to interact with the operating system and develop applications using programming and scripting languages that are relevant to system-level tasks	CEO2	PLO4-S	Applying	S

C	Subject specific skills				
ILO6	Ability to analyze and design the architecture of existing operating systems and implement basic OS components, including creating processes, managing memory, handling I/O operations, and ensuring resource allocation and scheduling.	CEO3	PLO5-C	Analyzing, Creating	C
ILO7	Evaluate the performance of operating systems and apply optimization techniques, including measuring and analyzing system performance, identifying bottlenecks, and making appropriate improvement modifications.	CEO3	PLO6-C	Evaluating	C
D	Transferable skills:				

***Bloom Taxonomy Levels**:

Level #	1	2	3	4	5	6
Level Name	Remembering	Understanding	Applying	Analyzing	Evaluating	Creating

**** Descriptor (National Qualification Framework Descriptors): K: Knowledge, S: Skill, C: Competency.**

Program Learning Outcome (PLOs):

(PLOs)		JNQF Descriptors**		
		K	**S**	**C**
PLO1-K	Knowledge of professional ethics, social responsibility, and the regulations governing them.	X		
PLO2-K	Understanding various programming techniques, the stages of software development, and the fundamental principles of security.	X		
PLO3-S	Skill in applying mathematical concepts to analyze and design algorithms and verify their correctness		X	
PLO4-S	Skill in using different programming languages and applying them to develop software and computer applications.		X	
PLO5-C	The ability to analyze, design, and develop effective and reliable computer programs that meet user requirements and adhere to professional ethics.			X
PLO6-C	The ability to keep up with continuous advancements in computer science, innovate, and work independently or as part of a team.			X
PLO7-D	The ability to work collaboratively, communicate effectively, and demonstrate teamwork spirit.			X

**** Descriptors according to the national qualifications framework (K: knowledge, S: skill, C: Competency)**

Weekly Schedule *(please choose the type of teaching)*

- ☐ **Face to Face (F2F)**
- ☒ **Hybrid** *(One – To - One)*
- ☐ **Online**

Schedule of Simultaneous and their Topics:

Week	First Lecture (F2F)	Second Lecture (Activity)	ILOs	PLOs	JNQF Descriptors*
1	Introduction: What OS does (definition, user view)? History of OS	System view of OS, Computer-System organization: OS operation, Storage Structure and I/O structure	ILO1	PLO2	K
2	Operating System structure: Computer-system architecture, OS operation and Caching	Operating System structure OS Services User OS Interface	ILO2	PLO2	K
3	System calls system programs	Simple, layered, Modules and microkernel Structure	ILO2	PLO2	K
4	Process: Virtual machines Processes: process Control block, states of process, process scheduling: queues, context switch	Process: schedulers Operations on processes process creation process termination	ILO5	PLO4	S
5	Inter-process communication: Shared-memory & Message-Passing	Threads: definition, Multithreading Models	ILO5	PLO4	S
6	CPU Scheduling: CPU and I/O bursts, Scheduling Criteria	CPU Scheduling: FCFS scheduling algorithms	ILO5	PLO4	S
7	SJF Non-Preemptive and Preemptive scheduling	CPU Scheduling: Exercises	ILO5	PLO4	S
Midterm Exam (30%)					
9	CPU Scheduling: Priority Non-Preemptive and Preemptive Scheduling	RR scheduling algorithm, Multilevel and Multilevel-feedback queue scheduling	ILO5	PLO4	S
10	Process Synchronization: Race Condition, Critical Section & solution. Hardware Instructions: TestAndSet() and Swap() Semaphores, Spinlocks, Bounded-buffer problem	Readers-Writers problem, Dining-philosopher problem, Monitors. Transactions: definition, log-based recovery and checkpoints	ILO4	PLO4	S
11	Deadlocks: System Model and necessary conditions	Deadlocks: Safe State	ILO3	PLO3	S
12	Deadlocks: Resource Allocation Graph	Deadlock Avoidance: Banker's Algorithm	ILO3	PLO3	S
13	Deadlock Avoidance: Safety algorithm	Process Termination and resource preemption	ILO6	PLO5	C
14	Memory Management: definition, address binding, memory protection Contiguous Allocation,	Memory Management: Virtual Memory, Paging, Demand Paging and Page Replacement	ILO7	PLO6	C
15	**Projects Discussion**				
16	**Final Exam**				

* **K: Knowledge, S: Skills, C: Competency**

Teaching Methods and Assignments:

Development of ILOs is promoted through the following teaching and learning methods:

- Lecture.
- Flipped learning.
- Learning through projects.
- Learning through problem solving.
- Participatory learning

Course Policies:

A- Attendance policies:
The maximum allowed absences is 15% of the lectures.
B- Absences from exams and handing in assignments on time:
Midterm exam can be retaken based on approval of excuse by the instructor's discretion.
Not handing assignment on time will incur penalties.
C- Academic Health and safety procedures
D- Honesty policy regarding cheating, plagiarism, and misbehaviour:
Cheating, plagiarism, misbehaviour will result in zero grade and further disciplinary actions may be taken.
E- Grading policy:

- All homework is to be posted online through the e-learning system.
- Exams will be marked within 72 hours and the marked exam papers will be handed to the students.
- Online Activities (Course Videos, Practice labs, Discussion Forums, Quizzes, Project) **20%**
- Midterm 30**%**
- Final Exam 50**%**

F- Available university services that support achievement in the course: **E-Learning Platform, Labs, Library.**

Required Equipment:

- PC / Laptop with webcam and mic
- Internet Connection
- Access to the ZUJ E-Learning Platform
- Satisfaction questionnaires for online and face-to-face learning
- Software for e-learning
- Training

Assessment Tools Implemented in the Course:

- Final Exam
- Midterm Exam
- Quizzes
- Homework
- Discussion Forums
- Project / Presentation

Responsible Persons and their Signatures:

Course Coordinator		**Completed Date**	/ /
		Signature	
Received by (Department Head)		**Received Date**	/ /
		Signature	