جامعة الإسراء
ISRA UNIVERSITY

# Course Syllabus

***According to JORDAN National Qualification Framework (JNQF)***

# Course Name: Operating Systems

# Course Number: 06083223

## General Course Information:

| | |
|---|---|
| Course title | **Operating Systems** |
| Course number | **06083223** |
| Credit hours | **3** |
| Education type | **Face-to-Face** |
| Prerequisites/corequisites | **Computer Architecture ( 06032122 )** |
| Academic Program | **Computer Science** |
| Program code | **608** |
| Faculty | **Information Technology** |
| Department | **Computer Science** |
| Level of course | **3rd year** |
| Academic year /semester | **2021/2022, Second Semester** |
| Awarded qualification | **Bachelor (Bsc)** |
| Other department(s) involved in teaching the course | **None** |
| Language of instruction | **English** |
| Date of production/revision | **2021/2022** |

## Course Coordinator:

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|---|---|
| **Coordinator's name** | **Prof. Faiz Al_Shrouf** |
| **Office No** | **HoD** |
| **Office Phone extension number** | **2464** |
| **Office Hours** | **[1-2],[3-4] (Sun - Tues)**<br>**[9:30-11:00] (Monday and Wednesday)** |
| **Email** | **Fayez.shrouf@iu,edu,jo** |

## Other Instructors:

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|---|---|
| **Instructor name** | |
| **Office No** | |
| **Office Phone extension number** | |
| **Office Hours** | |
| **Email** | |

## Course Description *(English/Arabic)*:

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|---|---|
| **English** | Operating system (OS) is system software that controls all the computer's resources and provides the base upon which the application programs are built. The aim of this course is to establish principles for understanding, designing and implementation topics of a number of operating systems and their components. Topics include Definition of operating system, review of hardware, software and firmware, operating systems organization and structure, Process Management(processes, threads, CPU scheduling, processes synchronization, deadlocks), memory management (real storage, virtual storage), distributed computing, disk performance optimization. |
| **Arabic** | يهدف المساق الى تعريف نظم التشغيل , انواع نظم التشغيل , والتعرف على تراكيب نظم التشغيل المستخدمه في مجال تطبيقات الحواسيب والاجهزه الحديثه, مجالات وخدمات نظم التشغيل واهميتها في نظم الشبكات , النظم الموزعه, ونظم تشغيل انظمة الوقت الحقيقي, فهم العمليات وتنفيذها , والخوارزميات المطبقه في انظمة التشغيل , ادارة العمليات , ادارة الذاكره الرئيسيه وطرق ادارة الملفات, ودور نظم التشغيل في ادارة العمليات المتزامنه, ادارة وحدات التخزين , وخوارزميات المستخدمه في مناطق العمليات المقفله |

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

**Abraham Silberschatz, Greg Gagne, Peter B. Galvin, "Operating System Concepts", 10th Edition, Wiley, (May, 2018)**

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

**Required book (s), assigned reading and audio-visuals:**

1. Abraham Silberschatz, Greg Gagne, Peter B. Galvin, "Operating System Concepts", 10th Edition, Wiley, (January 14, 2018)
2. Andrews Tanenbaum, "Modern Operating Systems", 4th edition, Pearson (March 20, 2014)
3. William Stallings "Operating systems, internals and design principles" , 8th edition, Pearson, (February 2, 2014)

## Course Educational Objectives (CEOs):

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|---|---|
| **1.** | How the operation systems manage the computer system components and allocate resources to users in optimized and convenient ways? |
| **2.** | The major operating system services such as process management, memory management, , I/O device control. Files management, disk performance optimization. |
| **3.** | Manage OS types, OS computing Structures, OS real time systems, and OS distributed computing. |
| **4.** | Operating systems interface, security and process protection and synchronization. |

## Intended Learning Outcomes (ILO's):

| | **Subject Intended learning outcomes (ILOs) describe what students are expected to know and be able to do at the end of the** | **Relationship to CEOs** | **Contribution to PLOs** | **Bloom Taxonomy Levels*** | **Descriptors**** |
|---|---|---|---|---|---|

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| | **course. These outcomes are related to the knowledge, skill and competence that students acquire:** | | | | |
| **A** | **Knowledge and Understanding:** | | | | |
| **A1** | **Manage the computer system components and allocate resources to users in optimized and convenient ways** | **1** | **a** | **1** | **K** |
| **A2** | **Understand Operating systems interface, services, security and protection** | **2** | **b** | **2** | **K** |
| **B** | **Intellectual skills:** | | | | |
| **B1** | **Apply Specific related skills in OS Synchronization, Threads, and related concepts** | **3** | **c** | **3** | **S** |
| **B3** | | | | | |
| **C** | **Subject specific skills:** | | | | |
| **C1** | **Solve different deadlock problems, CPU Scheduling Algorithms, comment on results and evaluate alternatives** | **4** | **d** | | **C** |
| **C2** | | | | | |
| **C3** | | | | | |
| **D** | **Transferable skills:** | | | | |
| **D1** | | | | | |
| **D2** | | | | | |
| **D3** | | | | | |

***Bloom Taxonomy Levels**

| **Level #** | **1** | **2** | **3** | **4** | **5** | **6** |
|---|---|---|---|---|---|---|
| **Level Name** | **Knowledge** | **Comprehension** | **Application** | **Analysis** | **Evaluation** | **Synthesis** |

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

## Program Learning Outcome (PLOs):

| **Program Learning Outcomes describe what students are expected to know and be able to do by the time of graduation. These relate to the knowledge, skills, and behaviours that students acquire as they progress through the program. A graduate of the (_____) program will demonstrate:** | **Descriptors**** | | |
|---|---|---|---|
| | **K** | **S** | **C** |

| | | | | |
|---|---|---|---|---|
| **a.** | **Analyse a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.** | √ | | |
| **b.** | **Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.** | | √ | |
| **c.** | Communicate effectively in a variety of professional contexts. | | | √ |
| **d.** | Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles. | | | √ |
| **e.** | Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline. | | | √ |
| **f.** | Apply computer science theory and software development fundamentals to produce computing-based solutions [CS} | | √ | |

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

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

### ■ Face to Face

| Week | First Hour | Second Hour | Third Hour | Ach. ILOs | Ach. PLOs | Descriptors** |
|---|---|---|---|---|---|---|
| 1 | **Introduction**<br>What OS Do<br>Computer-System Organization<br>Computer-System Architecture<br>Operating-System Structure<br>Operating-System Operations<br>Process Management<br>Memory Management<br>Storage Management<br>Protection and Security<br>Kernel Data Structures<br>Computing Environments<br>Open-Source OSs | Discussion | Discussion | A1 | a | K |
| 2 | **OS structure**<br>Operating System Services<br>User OS Interface<br>System Calls<br>Operating System Design and Implementation<br>System Boot | Examples | Examples | A2 | a | K |
| 3 | **Processes**<br>Process Concept<br>operations;<br>co-operating,<br>models, hierarchies,<br>Threads & Multithreading Models<br>inter-process Communication.<br>**Process Synchronization:**<br>Race Conditions,<br>Critical Sections | Examples | Problem Solving | A2 | a | K |
| 4 | **CPU Scheduling:**<br>concepts, criteria, scheduling algorithms,<br>Multiple-processor scheduling. | Examples | Problem Solving | B1 | b | S |
| 5 | **CPU Scheduling:**<br>concepts, criteria, scheduling algorithms, | | | B1 | b | S |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Multiple-processor scheduling. | | | | | |
| 6 | **Threads**<br>Thread concepts, Basic Communication processes, structure of threads, examples | Discussion | Examples | A1 | a | K |
| 7 | **Threads**<br>Thread concepts, Basic Communication processes, structure of threads, examples | Discussion | Examples | A1 | a | K |
| 8 | **Threads**<br>Thread concepts, Basic Communication processes, structure of threads, examples | Examples | Discussion | A1 | a | K |
| 9 | **Process Synchronization**<br>Mutual Exclusion with Busy Waiting, Sleep and Wakeup, Semaphores, Monitors, Message Passing. | Written Report | Written Report | A2 | b | K |
| 10 | **Process Synchronization (Cont.)**<br>Mutual Exclusion with Busy Waiting, Sleep and Wakeup, Semaphores, Monitors, Message Passing. | Written Report | Written Report | A2 | b | K |
| 11 | **Deadlock**<br>Concepts, definitions, Examples | Examples | Problem Solving | A1 | c | K |
| 12 | **Deadlock**<br>Algorithms Bankers Algorithms<br>Case Studies | Examples | Problem Solving | C1 | d | C |
| 13 | Memory Management<br>Paging , Techniques, processes and types of management | Examples | Problem Solving | A2 | b | K |
| 14 | **Case studies** | **Case studies** | **Case studies** | C1 | c | C |
| 15 | **Report Discussion** | **Report Discussion** | **Report Discussion** | C1 | c | C |

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

## Teaching Methods and Assignments:

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

- **Interactive videos**
- **Practice Labs**
- **Discussion Forums**
- **Quizzes**
- **Other Interactive online activities**
- **Reports**

## 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.
- Activities (Course Videos, homework , Discussion Forums, Quizzes) **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 IU E-Learning Platform at: https://elearn.iu.edu.jo/**
- **E-learning plan**
- 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
- Practice Labs
- Discussion Forums
- Periodic reports for learning assessment
- Improvement plans for online or face-to-face teaching
- Others:…….

## Responsible Persons and their Signatures:

| | | | |
|---|---|---|---|
| **Course Coordinator** | **Dr. Faiz Al-Shrouf** | **Completed Date** | 15 / 2 / 2022 |
| | | **Signature** | |

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|---|---|---|---|
| **Received by** (Department Head) | **Dr. Faiz Al Shrouf** | **Received Date** | 15 / 2 / 2022 |
| | | **Signature** | |