



Ministry of Higher Education and Scientific Research  
Lebanese French University – Erbil  
College of Engineering and Computer Science  
Department of Information Technology



# Operating System

**Fourth Year – First Semester**

**Dr. Teeba Ismail Kh.**

**Academic Year: 2022-2023**

**Course Book**



S. No.	Information	Details
1.	Course Name	Operating System
2.	Course Code	IT401OS
3.	Lecturer In-charge	Teeba Ismail Kh.
4.	College/Department	Information Technology
5.	Contact Information	<a href="mailto:Teeba.ismail84@gmail.com">Teeba.ismail84@gmail.com</a> , Teeba.ismail@lfu.edu.krd
6.	Time (in hours) per Week	Theoretical (2) \ Practice (2)
7.	Office Hours	Sunday to Thursday 8:30 am -3:00 pm Or by appointment, also you can send an email at any time to book for a consultation hour.
8.	Teacher's Academic Profile	She received the B.S. degree in optical electronics engineering from Al-Nahrain University, Baghdad, Iraq, in 2004, and the M.S. degree in Laser and optoelectronics engineering from Al-Nahrain University, Baghdad, Iraq, in 2007. She got Ph.D. degree in computer and control engineering from Salahaldine University, Erbil, Iraq. She is Lecturer with the Lebanese French University Faculty of Engineering Erbil, Iraq. Her research interest includes model-based testing area and quality assurance for the IoT software systems.
9.	Academic Title	Lecturer
10.	Keywords	Processes and threads, Deadlocks, Memory management, System calls, I/O, File systems, Unix and Linux.
11.	<p><b>Course Overview:</b>            The purpose of this course is to provide an overview of computer operating systems. Topics to be discussed include a brief history of OS's and their design and development. The course will cover major components and the algorithms and implementation techniques used to create them. The class will presented using a both a mix of theory and hands-on exercises. Some/most of the programming assignments will be done on Linux machines.</p>	



<b>12.</b>	<p><b>Aims &amp; Objective:</b> A successful student will be able to understand the basic components of a computer operating system, and the interactions among the various components. The course will cover an introduction on the policies for scheduling, deadlocks, memory management, synchronization, system calls, and file systems.</p>
<b>13.</b>	<p><b>Course Requirement:</b> Non</p>
<b>14.</b>	<p><b>Teaching and Learning Method:</b></p> <ul style="list-style-type: none"> <li>• Lecture</li> <li>• Assignment</li> </ul> <p><b>Learning Activities:</b></p> <ol style="list-style-type: none"> <li>1. Student will be taking a short-sided assessment consisting of 3-4 questions from the week worth of lessons. They will be given the first 15 minutes of class every week.</li> <li>2. Interactive class discussion.</li> <li>3. Hands-on exercises.</li> <li>4. All students will be given the opportunity to earn extra credit points throughout the semester. However, the extra credit offered will not exceed one full letter grade of the student's total grade for the quarter.</li> </ol>
<b>15.</b>	<p><b>Assessment Scheme:</b></p> <ul style="list-style-type: none"> <li>▪ 25 % Mid-term Examination</li> <li>▪ 15 % Assignments and Quizzes</li> <li>▪ 60 % Final Examination</li> </ul>
<b>16.</b>	<p><b>Students Learning Outcome:</b> <b>At the end of this course the student will be able to:</b></p> <ol style="list-style-type: none"> <li>1. Describe and explain the fundamental components of a computer operating system.</li> <li>2. Define, restate, discuss, and explain the policies for scheduling, deadlocks, memory management, synchronization, system calls, and file systems.</li> <li>3. Describe and extrapolate the interactions among the various components of computing systems.</li> <li>4. Design and construct the following OS components: System calls, Schedulers, Memory management systems, Virtual Memory and Paging systems.</li> </ol>
<b>17.</b>	<p><b>Course Reading List and References</b> Operating Systems Concepts, Fifth Edition; Silberschatz and Galvin</p>
<b>18.</b>	<p><b>Course Content</b></p>



### Course Content

Week	Lecture Date	No. of Hours	Topics
1.	Week 1	4	Overview of Operating Systems: <ul style="list-style-type: none"> <li>• What is an OS</li> <li>• Brief history</li> </ul>
2.	Week 2	4	Background and Basics: <ul style="list-style-type: none"> <li>• Computer System review</li> <li>• Architecture</li> <li>• Instruction cycle</li> <li>• Process Control Block</li> <li>• Basic OSs</li> <li>• Batch</li> <li>• Multi-programmed batch</li> <li>• Timesharing</li> <li>• Computer System Structures</li> <li>• Operating System Structures</li> </ul>
3.	Week 3	4	Processes: <ul style="list-style-type: none"> <li>• Definition</li> <li>• Process States</li> <li>• 5 state model</li> <li>• Process structure</li> <li>• PCB and components</li> <li>• Operations on Processes</li> <li>• Threads</li> </ul>
4.	Week 4	4	CPU Scheduling: <ul style="list-style-type: none"> <li>• I/O burst cycle</li> <li>• Context Switching</li> <li>• Scheduling               <ul style="list-style-type: none"> <li>○ Short Term</li> <li>○ Long Term</li> </ul> </li> <li>• Scheduling Criteria</li> </ul>

5.	Week 5	4	<ul style="list-style-type: none"> <li>• Algorithms               <ul style="list-style-type: none"> <li>○ First Come First Serve</li> <li>○ Shortest Job First</li> </ul> </li> </ul>
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6.	Week 6	4	<ul style="list-style-type: none"> <li>○ Priority Scheduling</li> <li>○ Round Robin</li> </ul>
7.	Week 7	4	MIDTERM WEEK
8.	Week 8	4	Process Synchronization <ul style="list-style-type: none"> <li>• Critical Section Problem             <ul style="list-style-type: none"> <li>○ Mutual Exclusion</li> <li>○ Races</li> </ul> </li> <li>• Two Process Solutions             <ul style="list-style-type: none"> <li>○ Algorithm 1</li> <li>○ Algorithm 2</li> </ul> </li> </ul>
9.	Week 9	4	<ul style="list-style-type: none"> <li>▪ Prevention</li> <li>▪ Avoidance</li> </ul>
10.	Week 10	4	Deadlocks <ul style="list-style-type: none"> <li>• System Model</li> <li>• Necessary Conditions for a deadlock             <ul style="list-style-type: none"> <li>○ Mutual Exclusion</li> <li>○ Hold and Wait</li> <li>○ No Preemption</li> <li>○ Circular wait</li> </ul> </li> <li>• Resource Allocation Graphs</li> <li>• Handling Deadlocks</li> </ul>
11.	Week 11	4	Memory Management <ul style="list-style-type: none"> <li>• Address Binding</li> <li>• Compile time</li> <li>• Load time</li> <li>• Execution time</li> <li>• Logical versus Physical Address Space</li> </ul>
12.	Week 12	4	<ul style="list-style-type: none"> <li>• Paging and Virtual Memory</li> <li>• Basics</li> </ul>



			<ul style="list-style-type: none"> <li>• Demand Paging</li> <li>• Page Replacement</li> </ul>
13.	Week 13	4	<p>Storage</p> <ul style="list-style-type: none"> <li>○ Files           <ul style="list-style-type: none"> <li>▪ Attributes</li> <li>▪ Operations</li> <li>▪ File types</li> <li>▪ Structure</li> <li>▪ Access methods</li> </ul> </li> <li>○ Directory Structure</li> <li>○ Protection</li> </ul> <p>Study Week (Review)</p>
14.	Week 14	4	HOLIDAY
15.	Week 15	Final Examination	

19.	<p><b>Examinations:</b> Exams are all comprehensive in nature, (there are two exams, which are Mid-Term &amp; Final Exam).</p> <p><b>Class participation:</b> Class participation is encouraged and will enhance your knowledge and influence positively on your grade, board demonstrations and inquiry-oriented discussions and in-class calculations;</p> <p><b>Homework's:</b> All homeworks are to be HANDED IN a week after they are assigned. Homeworks may be used as a source for exams. Students must be prepared in case to present homework problems on the board the next day. Copying of homework will result in an automatic 0.</p> <p><b>Quizzes:</b> There are some announced quizzes (almost four).</p> <p><b>Feedback:</b> Feedback on student progress will be given throughout the course.</p>
20.	<p><b>Course Policy:</b> <b>Be Responsible</b></p>



	<ol style="list-style-type: none"><li>1. Be on time and be prepared with daily material, completed assignments and prepared questions</li><li>2. Electronics should be stowed and in the off position during class</li></ol> <p><b>Be Respectful</b></p> <ol style="list-style-type: none"><li>1. Speak kindly to others</li><li>2. Listen quietly to others</li><li>3. Understand that others may have different opinions</li></ol> <p><b>Be Ready to Learn</b></p> <ol style="list-style-type: none"><li>1. Try to understand not memorizing</li><li>2. Ask for help from your lecturer during the class and during the announced office hours and don't feel shy for acquire of knowledge and understanding of subject matter.</li></ol>
21.	<b>Note:</b> your suggestions are welcome for the improvement of this course.