



**Course Description:**

Operating systems course is oriented towards exposing students to the essential concepts and issues in operating systems and their design. In general terms, the course covers the basic concepts of OS, process management, deadlock, CPU scheduling, memory management, files and disk management.

**Aims and Objectives:**

*Students are expected to:*

1. Understand how processes compete for resources
2. Know the process life cycle using a state diagram
3. Understand how processes are loaded and swapped
4. Use of semaphores (and others) for mutual exclusion
5. Understand deadlock and indefinite postponement
6. Use of paging and segmentation
7. Understand different approaches in disk management

**Intended Learning Outcomes of Course (ILOs):**

*Upon successful completion of this course, students will be able to:*

<b>A. Knowledge and Understanding</b>	
<b>A1</b>	<b>Concepts and Theories:</b> <ul style="list-style-type: none"> <li>• Describe the structure of an operating system and know the major parts of an OS</li> <li>• Describe most important hardware structures upon which an OS is based.</li> <li>• Differentiate between processes and threads.</li> <li>• Explain the operations of memory management and virtual memory</li> <li>• Demonstrate various scheduling algorithms and OS schedules tasks</li> <li>• Gain knowledge and understanding of the underlying architecture and organization of the operating system and the different designs used.</li> </ul>
<b>A2</b>	<b>Contemporary Trends, Problems and Research:</b> compare and contrast between different operating systems.
<b>A3</b>	<b>Professional Responsibility:</b> Abide by laws and regulations of software development and design

<b>B. Subject-specific skills</b>	
<b>B1</b>	<b>Problem Solving Skills:</b> Use analytic skills to analyze problems at hand and determine the appropriate solution(s).
<b>B2</b>	<b>Modeling and Design:</b> Understand current computer operating systems and introduce new design ideas
<b>B3</b>	<b>Application of Methods and Tools:</b> work with different operating systems

<b>C. Critical-Thinking Skills</b>	
<b>C1</b>	<b>Analytic skills:</b> Use analytic skills to analyze problems at hand and determine the appropriate solutions



<b>C2</b>	<b>Strategic Thinking:</b> Use strategic thinking to propose efficient solutions for complex problems
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<b>D. General and Transferable Skills (other skills relevant to employability and personal development)</b>	
<b>D1</b>	<b>Communication:</b> Express and communicate ideas in written and oral forms.
<b>D2</b>	<b>Teamwork and Leadership:</b> Be cooperative members of a team
<b>D3</b>	<b>Organizational and Developmental Skills:</b> plan, prioritize, and achieve defined goals
<b>D4</b>	<b>Ethical and Social Responsibility:</b> Understand that they are accountable for their actions and there must be a balance between economic growth and the welfare of the society and environment.

### Course Structure:

Week	Hours	ILOs	Topics	Teaching Procedure	Assessment methods
2	3	A1,A2,A3	<ul style="list-style-type: none"> <li>Introduction: History, generations of Operating Systems, multi-user OS, time sharing, future trends.</li> <li>Basic Concepts: Hardware, software, firmware.</li> </ul>	Presentation	Quizzes, Exams, Class Participation and Activity file
3	3	A1,A2,A2	<ul style="list-style-type: none"> <li>Process Concepts: What is a process? process states, operation on processes, interrupt processing.</li> </ul>	=	=
4	3	A1,A2,A3,B1	<ul style="list-style-type: none"> <li>Asynchronous Concurrent Processes: Parallel processing, mutual exclusion, critical section, Dekker's algorithm, hardware solution, semaphores, counting semaphores, case studies.</li> </ul>	=	=
5	3	A1,A2,A3,B1, C1,C2,D1	<ul style="list-style-type: none"> <li>Deadlock: Deadlock concepts, indefinite postponement, prevention, avoidance, detection, recovery.</li> </ul>	=	=
6+7	6	A1,A2,A3,B1, C1,C2,D1,D2, D3,D4	<ul style="list-style-type: none"> <li>Job and Processor Scheduling: Scheduling levels, objectives, criteria, scheduling algorithms, multilevel feedback queue.</li> </ul>	=	=
8	3	A1,A2,A3,B1, C1,C2,D1,D2, D3,D4	<ul style="list-style-type: none"> <li>Real Storage: Storage organization, storage hierarchy, storage management strategies, contiguous vs. noncontiguous storage allocation, fixed and variable partition multiprogramming, storage swapping.</li> </ul>	=	=
9+10	6	A1,A2,A3,B1, C1,C2,D1,D2, D3,D4	<ul style="list-style-type: none"> <li>Virtual Storage Organization: Basic concepts block mapping, paging, segmentation.</li> </ul>	=	=
11	3	A1,A2,A3,B1, C1,C2,D1,D2, D3, D4	<ul style="list-style-type: none"> <li>Virtual Storage Management: Basic concepts, page replacement strategies.</li> </ul>	=	=
12	3	A1,A2,A3,B1, C1,C2,C3,D1, D2,D3,D4	<ul style="list-style-type: none"> <li>Disk Scheduling: Basic concepts, why scheduling? Desirable characteristics, scheduling algorithms.</li> </ul>	=	=

Week	Hours	ILOs	Topics	Teaching Procedure	Assessment methods
13+14	6	A1,A2,A3,B1, C1,C2,D1,D2, D3,D4	<ul style="list-style-type: none"> <li>Case studies</li> </ul>	=	=

### References:

#### A. Main Textbook:

- 1) H.M. Deitel, An Introduction to Operating Systems, 3rd Edition, Addison-Wesley, Reading, MA 2003.

#### B. Supplementary Textbook(s):

- 1) Abraham Silberschatz, Operating Systems Concepts, 9th edition, Addison Wesley, 2013.
- 2) W. S. Davis and T. M. Rajkumar, Operating Systems A Systematic View, 5th Edition, Addison Wesley, 2001.
- 3) S. Tanenbaum, Modern Operating Systems, 2nd Edition, Prentice Hall, 2001.
- 4) Gary Nutt, Kernel Projects for Linux, Addison Wesley, 2000.
- 5) Steven V. Earhart (Editor), UNIX Programmer's Manual, Holt, Rinehart, and Winston, New York, NY 1986.

### Assessment Methods:

Methods	Grade	Date
First Exam	20%	
Second Exam	20%	
Assignments (Reports /Quizzes/ Seminar / Tutorials ....)	10%	
Final Examination	50%	