Course Code & No	Comp225	225 حاسب	رقم المقرر ورمزه
Course Name	Operating Systems	نظم التشغيل	اسم المقرر
Credit Hours	3 (3 + 0 + 0)	3 (3 + 0 + 0	عدد الساعات المعتمدة
Pre-requisite	COMP 211 and COMP 221	211 حاسب، 221 حاسب	المتطلب السابق

General Description	توصيف عام
This course examines the important problems in operating system design and implementation. The operating system provides an established, convenient, and efficient interface between user programs and the bare hardware of the computer on which they run. The operating system is responsible for sharing resources (e.g., disks, networks, and processors), providing common services needed by many different programs (e.g., file service, the ability to start or stop processes, and access to the printer), and protecting individual programs from interfering with one another. The course will start with a brief historical perspective of the evolution of operating systems over the last fifty years and then cover the major components of most operating systems. This discussion will cover the tradeoffs that can be made between performance and functionality during the design and implementation of an operating system. Particular emphasis will be given to three major OS subsystems: process management (processes, threads, CPU scheduling, synchronization, and deadlock), memory management (segmentation, paging, swapping), and file systems	

Course Objectives	أهداف المقرر

• Have practical information about how programming languages, operating systems, and architectures interact. • More effectively use and manipulate computers and computer programs. • Provide an introduction to the internal operation of modern operating systems. • Know basic concepts in processes and threads, CPU scheduling, deadlock, memory management, and file systems. • Know operating system structure including: System Components, Operating-System Services, System Calls, System Programs, System Structure, Virtual Machines, System Design and Implementation, System Generation. • Understand Process Concept and Scheduling, Operations on Processes, Cooperating Processes, Inter-process Communication, and Communication in Client-Server Systems • Understand concepts of Threads including: Multithreading Models, Threading Issues. • Understand the basic concepts of CPU Scheduling, Scheduling Criteria, Scheduling Algorithms, Multiple-Processor Scheduling, Real-Time Scheduling, Algorithm Evaluation, and Process Scheduling Models. • Understand Process Synchronization, Critical-Section Problem, Synchronization Hardware, Semaphores, and Classic Problems of Synchronization, Critical Regions OS Synchronization, And Atomic Transactions. • Become familiar with Deadlocks: Deadlock Characterization, Methods for Handling, Deadlocks Prevention,	•

Deadlock Avoidance, and Deadlock Detection. • Know Memory Management: Swapping, Contiguous Memory Allocation, Paging, Segmentation. • Become familiar with Virtual Memory: Demand Paging, Process Creation, Page Replacement, Allocation of Frames, and Thrashing. • Know File-System Interface including: Access Methods, Directory Structure, File-system Mounting, File Sharing, and Protection. • Understand File-System Implementation, Directory Implementation, Allocation Methods, Free-Space Management, Efficiency and Performance. • Know Disk Scheduling, Disk Management, Swap-Space Management, RAID Structure, Disk Attachment, And Stable-Storage Implementation.	

Course Outlines	**مفردات المقرر**
Introduction • What Is an Operating System? • Mainframe Systems • Desktop Systems • Multiprocessor Systems • Distributed Systems • Clustered Systems • Real-Time Systems **Operating-System Structures** • System Components	

• Operating-System Services • System Calls • System Programs • System Structure • Virtual Machines • System Design and Implementation • System Generation **Processes** • Process Concept • Process Scheduling • Operations on Processes • Cooperating Processes • Inter-process Communication • Communication in Client -Server Systems **Threads** • Overview • Multithreading Models • Threading Issues • P-threads • Solaris 2 Threads • Window 2000 Threads • Linux Threads • Java Threads **CPU Scheduling** • Basic Concepts • Scheduling Criteria • Scheduling Algorithms • Multiple-Processor Scheduling • Real-Time Scheduling • Algorithm Evaluation • Process Scheduling Models	

Process Synchronization • Background • The Critical-Section Problem • Synchronization Hardware • Semaphores • Classic Problems of Synchronization • Critical Regions • OS Synchronization • Atomic Transactions **Deadlocks** • System Model • Deadlock Characterization • Methods for Handling • Deadlocks • Deadlock Prevention • Deadlock Avoidance • Deadlock Detection **Memory Management** • Background • Swapping • Contiguous Memory Allocation • Paging • Segmentation • Segmentation with Paging **Virtual Memory** • Background • Demand Paging • Process Creation • Page Replacement • Allocation of Frames • Thrashing	

File-System Interface • File Concept • Access Methods • Directory Structure • File-System Mounting • File Sharing • Protection **File-System Implementation** • File-System Structure • File-System Implementation • Directory Implementation • Allocation Methods • Free-Space Management • Efficiency and Performance • Recovery • Log-Structured File System • NFS 441 **I/O Systems** • Overview • I/O Hardware • Application I/O Interface • Kernel I/O Subsystem • Transforming I/O to Hardware Operations • STREAMS • Performance **Mass-Storage Structure** • Disk Structure • Disk Scheduling • Disk Management • Swap-Space Management • RAID Structure	

• Disk Attachment • Stable-Storage Implementation • Tertiary-Storage Structure	

References	المراجع
• Abraham Silberschatz, Peter B. Galvin, Greg Gagne, ***Operating System Concepts.*** 8th edition. 2008., Addison-Wesley **Additional References:** • Andrew Tanenbaum, ***Modern Operating Systems***, Prentice Hall.	•