

Course Profile

Course Name:-	CEN 321
Course Code:-	Operating System
Academic Year:-	1434-1435(H)
Semester:-	I

Course Overview

This Course is designed to develop knowledge and understanding of the Computer Operating System. This course is an introduction to the theory and practice behind modern computer operating systems. Over all aim of the course is Understand general structure of an operating system and its functions, key concepts such as multiprogramming, understand the role of operating systems in management of computer resources such as processes, memory, CPU, files, disks, input output subsystems and apply important methods and algorithms for scheduling the different activities during the operation of a computer. Topics will include what an operating system does (and doesn't) do, system calls and interfaces, processes, concurrent programming, resource scheduling and management (of the CPU, memory, etc.), virtual memory, security, File System Structure & implementation, Mass-Storage Structure, I/O Systems and Overview of Window, Mac, iOS & Android OS . We will approach the subject from both a theoretical perspective (what are the abstractions and algorithms?) as well as a practical one (what are the mechanisms and how are they built?).

Course Details

Level:-	6
Credit:-	3
Pre-Requisites:-	CS 210
Co- Requisites:-	

Learning Outcomes of Course

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

1. Understand general structure of an operating system and its functions.(Understand issues and problems involved in the design and implementation of operating systems & Identify the abstract services common to all operating systems)
2. Understand processes and their different states during execution of programs, describe states diagrams of processes(Understand and analyze theory and implementation of: processes, threads,CPU Scheduling,)
3. Describe how important mechanisms such as synchronizations and implemented to support multiprogramming (Understand and analyze theory and implementation of synchronization, Memory Management)
4. Describe major scheduling techniques & how they are applied to real situations and management of the CPU & Memory.
5. Understand the File System Structure & implementation, Mass-Storage Structure, I/O Systems (Understand OS support for I/O, file systems, Mass-Storage Structure)
6. Understand the Concept of different OS i.e., Window, Mac, iOS & Android OS (Understand OS for PC & Smart Phone)

In addition, during the practical exercise and associated self-study, you will:

- become familiar (if not already) with the C language, gcc compiler, and Make files
- understand the high-level structure of the Linux kernel both in concept and source code
- acquire a detailed understanding of one aspect (the scheduler) of the Linux kernel

Course Assessment

Name of Assessment Task	Weight of Assessment	Week Due
1. Midterm Exam-1	15%	6
2. Midterm Exam-2	15%	12
3. Quizzes	5%	4,7,11
4. Assignments/Report/Seminar	5%	3,5,8,10,14
5. Lab Exam	20%	15
6. Final Exam	40%	16

Assessment Task and Learning Outcomes Alignment

Assessment Task Name	Course Learning Outcomes					
	1	2	3	4	5	6
1. Midterm Exam-1	√	√				
2. Midterm Exam-2			√	√	√	
3. Quizzes	√	√	√	√	√	
4. Assignments/Report/Seminar	√	√	√	√	√	√
5. Final Exam	√	√	√	√	√	√

Teaching Contact Details

Course Coordinator:	Shailendra Mishra, Ph.D
Lab/Tutorial Instructor:	Mohammed AbdulKhader, M.S
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Details of Required Text Book

Book Name	Authors Name	Publisher	Year	Edition
1. Operating System Concepts	Silberschatz, Galvin, and Greg Gagne	WILEY	2010	8 th

Details of Required Reference Books

Book Name	Authors Name	Publisher	Year	Edition
1. Modern Operating Systems	Tanenbaum	Prentice Hall	2007	3rd
2. Operating Systems: Design and Implementation	Tanenbaum and Woodhull	Prentice Hall	2007	3rd

IT Resources

The following IT Resources will require to access-

- <http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-828-operating-system-engineering-fall-2006/lecture-notes/>
- **Understanding Operating System Resources - Oracle Documentation**
(docs.oracle.com/cd/B19306_01/server.102/b14211/ch23_os.htm)

Course Schedule

Module/Topic	Chapter	Event and submission	Week
Introduction : <ul style="list-style-type: none"> • Different OSs (Mainframe, Desktop, Multiprocessor, Distributed, Clustered, Real-Time, Handheld). • Computer-System Structures (I/O, Storage, Storage Hierarchy, Hardware Protection, Network). 	Chapter 1, Operating System Concepts , 8th edition International Student Version Silberschatz, Galvin, and Gagne, 8th edition, Wiley, 2010.	Brain storming and review of previous knowledge.	Week-1
OS-Structures (Components, Services, System Calls, System structure, Virtual Machines, System Design & Implementation).	Chapter 2 Operating System Concepts , 8th edition International Student Version Silberschatz, Galvin, and Gagne, 8th edition, Wiley, 2010.		Week-2
Processes <ul style="list-style-type: none"> • Process Concept • Process Scheduling • Operations on Processes • Cooperating Processes • Inter-process Communication 	Chapter 3, Operating System Concepts , 8th edition International Student Version Silberschatz, Galvin, and Gagne, 8th edition, Wiley, 2010.	Assignment I	Week-3

<p>Threads</p> <ul style="list-style-type: none"> • Multithreading models • Threading Issues • Pthreads, Solaris 2 threads, Windows 2000 threads, Linux Threads, Java Threads 	<p>Chapter 4, Operating System Concepts , 8th edition International Student Version Silberschatz, Galvin, and Gagne, 8th edition, Wiley, 2010.</p>	<p>Quiz 1</p>	<p>Week-4</p>
<p>Scheduling</p> <ul style="list-style-type: none"> • CPU Scheduling • Scheduling Criteria • Scheduling Algorithms, • Algorithm Evaluation • Process Scheduling Models 	<p>Chapter 5, Operating System Concepts , 8th edition International Student Version Silberschatz, Galvin, and Gagne, 8th edition, Wiley, 2010.</p>	<p>Assignment II</p>	<p>Week-5</p>
		<p>Written Assessment Due</p>	<p>Week-6</p>
<p>Synchronization</p> <ul style="list-style-type: none"> • Process Synchronization • Critical-Section Problem • Synchronization Hardware • Semaphores • Critical Regions • Monitors 	<p>Chapter 6, Operating System Concepts , 8th edition International Student Version Silberschatz, Galvin, and Gagne, 8th edition, Wiley, 2010.</p>	<p>Quiz II</p>	<p>Week-7</p>
<p>Memory Management</p> <p>Swapping</p> <ul style="list-style-type: none"> • Contiguous Memory Allocation • Paging • Segmentation with Paging • Page Replacement 	<p>Chapter8, Operating System Concepts , 8th edition International Student Version Silberschatz, Galvin, and Gagne, 8th edition, Wiley, 2010.</p>	<p>Assignment III</p>	<p>Week-8</p>
<ul style="list-style-type: none"> • Virtual Memory • Allocation of frames • Thrashing 	<p>Chapter 9, Operating System Concepts , 8th edition International</p>		<p>Week-9</p>

	Student Version Silberschatz, Galvin, and Gagne, 8th edition, Wiley, 2010.		
File System <ul style="list-style-type: none"> • File-System Interface • File-System Structure • File-System Implementation 	Chapter10,11 Operating System Concepts , 8th edition International Student Version Silberschatz, Galvin, and Gagne, 8th edition, Wiley, 2010.	Assignment IV	Week-10
Mass-Storage Structure <ul style="list-style-type: none"> • Disk Structure • Disk Scheduling • Disk Management • Swap-Space Management • RAID Structure 	Chapter12, Operating System Concepts , 8th edition International Student Version Silberschatz, Galvin, and Gagne, 8th edition, Wiley, 2010	Quiz III	Week-11
		Written Assessment Due Sunday	Week-12
I/O Systems <ul style="list-style-type: none"> • Kernel I/O Subsystem • Transforming I/O to Hardware • Protection & Security 	Chapter13,14,15 Operating System Concepts , 8th edition International Student Version Silberschatz, Galvin, and Gagne, 8th edition, Wiley, 2010		Week-13
Overview of Window,Mac,iOS & Andriod	Chapter22,23,Operating System Concepts , 8th edition International Student Version Silberschatz, Galvin, and Gagne, 8th edition, Wiley, 2010	Assignment V	Week-14
			Exam Week

The **American Psychological Association (APA)** referencing style must be used for all submissions of this course.

Course Assessment Task

WRITTEN ASSESMENT (Mid Term I Exam)

Assessment Title	Written Assessment
Task Description	<p>This assignment is aligned to learning outcomes 1, 2 In that regard, the assignment contains questions that assess:</p> <ol style="list-style-type: none"> 1) Understand general structure of an operating system and its functions.(Understand issues and problems involved in the design and implementation of operating systems & Identify the abstract services common to all operating systems) 2) Understand processes and their different states during execution of programs, describe states diagrams of processes(Understand and analyze theory and implementation of: processes, threads, CPU Scheduling.)
Assessment Due Date	Week 6
Return Date to Students	Week 7
Weighting	15%
Assessment Criteria	The assessment criteria for this task are under continuous revision.
Referencing Style	American Psychological Association (APA)
Submission	
Learning Outcomes Assessed	<ol style="list-style-type: none"> 1) Understand issues and problems involved in the design and implementation of operating systems & Identify the abstract services common to all operating systems 2) Understand and analyze theory and implementation of: processes, threads, CPU Scheduling.

WRITTEN ASSESMENT (Mid Term IIExam)

Assessment Title	Written Assessment
Task Description	<p>This assignment is aligned to learning outcomes 3,4,5 In that regard, the assignment contains questions that assess:</p> <ul style="list-style-type: none">• Describe how important mechanisms such as synchronizations and implemented to support multiprogramming (Understand and analyze theory and implementation of synchronization, Memory Management)• Describe major scheduling techniques & how they are applied to real situations and management of the CPU & Memory.• Understand the File System Structure & implementation, Mass-Storage Structure, I/O Systems (Understand OS support for I/O, file systems, Mass-Storage Structure)
Assessment Due Date	Week 12
Return Date to Students	Week 13
Weighting	15%
Assessment Criteria	The assessment criteria for this task are under continuous revision.
Referencing Style	American Psychological Association (APA)
Submission	
Learning Outcomes Assessed	<ul style="list-style-type: none">• Understand and analyze theory and implementation of synchronization, Memory Management• Describe major scheduling techniques & how they are applied to real situations and management of the CPU & Memory.• Understand OS support for I/O, file systems, Mass-Storage Structure

FINAL EXAMINATION

Outline	Complete an examination
Date	During University examination period
Weighting	40%
Length	180 Minutes
Details	Dictionary - non-electronic, concise, direct translation only (dictionary must not contain any notes or comments) No Calculator Permitted Closed Books
Learning Assessed	Outcomes
	<ol style="list-style-type: none">1. Understand issues and problems involved in the design and implementation of operating systems & Identify the abstract services common to all operating systems2. Understand and analyze theory and implementation of: processes, threads,CPU Scheduling,.)3. Understand and analyze theory and implementation of synchronization, Memory Management4. Describe major scheduling techniques & how they are applied to real situations and management of the CPU & Memory.5. Understand OS support for I/O, file systems, Mass-Storage Structure6. Understand OS for PC & Smart Phone