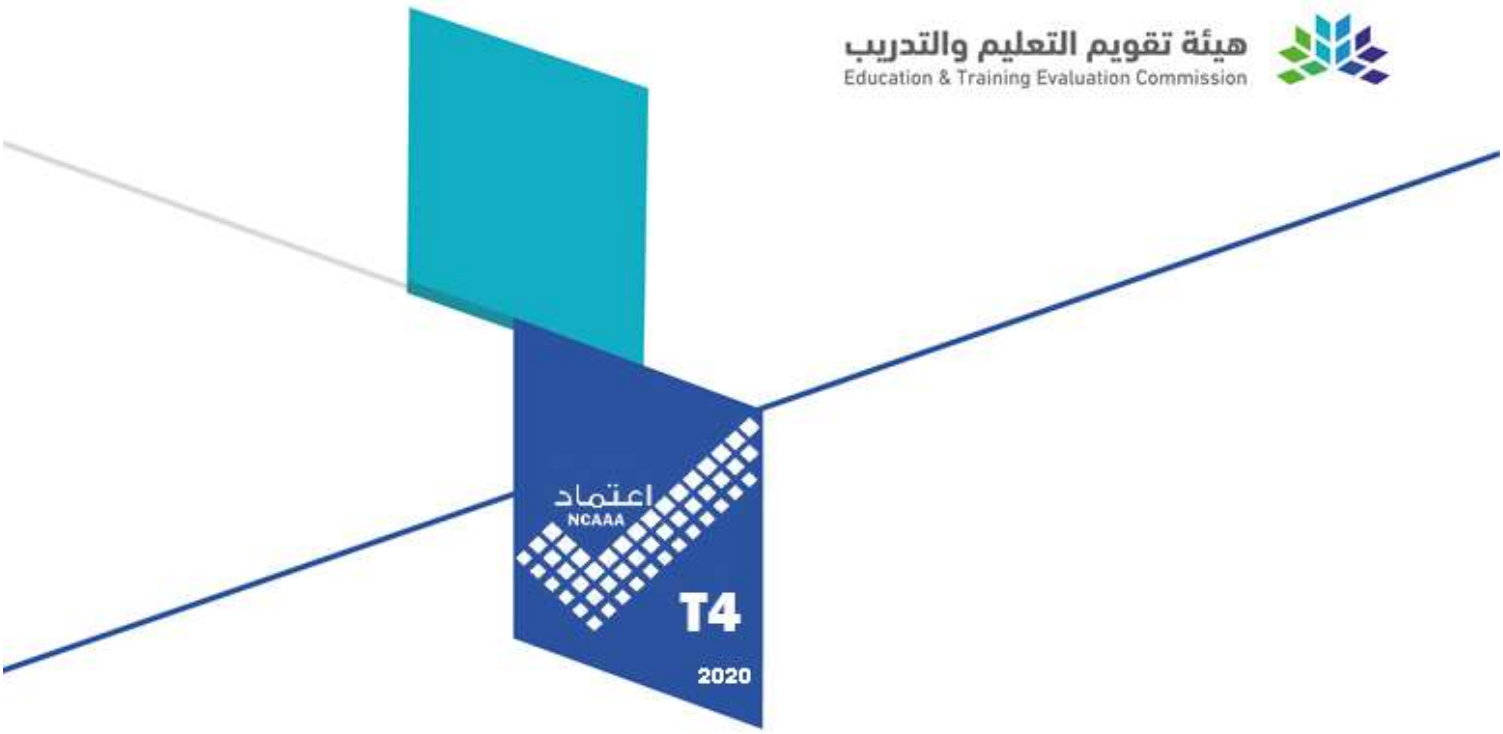

Course Specifications

Course Title:	Operating System
Course Code:	CS 311
Program:	Computer Science
Department:	Computer Science
College:	College of Computer and Information Sciences
Institution:	Majmaah University

Table of Contents

A. Course Identification

1. Credit hours: 3(3,0,1)
2. Course type **a.** University ☐ College ☑ Department ☐ Others ☐ **b.** Required ☑ Elective ☐
3. Level/year at which this course is offered: Level 7
4. Pre-requisites for this course (if any)**:** Data Structure (CS 231)
5. Co-requisites for this course (if any)**:**

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	55	100%
2	Blended		
3	E-learning		
4	Distance learning		
5	Other		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	44
2	Laboratory/Studio	
3	Tutorial	11
4	Others (specify)	
	Total	

B. Course Objectives and Learning Outcomes

1. Course Description

This course is an introduction to the theory and practice behind modern computer operating systems. This course aims to provide a theoretical as well as experimental background of operating system. Topics include OS Component, OS structure, System calls and interfaces, Process management, Resource scheduling and management (of the CPU, memory, etc.), Synchronization of concurrent processes, Deadlocks, Memory management, Virtual memory, File System Structure & implementation, Mass-storage structure and I/O Systems.

2. Course Main Objective

Aim of the course is to 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.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	CLO 1- Identify and Discuss the issues and problems involved in the design of operating systems.	K1
1.2	CLO 2- Identify issues of process Management including Process Structure, Scheduling, Synchronization and Deadlock.	K1
1.3	CLO 5. Identify and Discuss the issues related to File System Structure, Mass-Storage Structure, I/O Systems I/O Sub-systems	K1
2	**Skills :**	
2.1	CLO 3. Demonstrate scheduling algorithms, synchronization techniques and Deadlock recovery and avoidance algorithms.	S2
2.2	CLO4. Demonstrate memory management issues including advance techniques of paging, segmentation and virtual memory.	S2
3	**Values:**	
3.1		
3.2		
3.3		
3...		

C. Course Content

No	List of Topics	Contact Hours
1	Introduction & OS-Structures • Introduction • Different OSs (Mainframe, Desktop, Multiprocessor, Distributed, Clustered, Real-Time, Handheld). • Computer-System Structures (I/O, Storage, Storage Hierarchy, Hardware Protection, Network). • OS-Structures (Components, Services, System Calls, System structure, Virtual Machines, System Design & Implementation).	6
2	Process Management • Processes • Process Concept • Process Scheduling • Operations on Processes • Cooperating Processes • Inter-process Communication • Communication in Client-Server	4

3	Threads • Threads • Multithreading models • Threading Issues • Pthreads, Solaris 2 threads, Windows 2000 threads, Linux Threads, Java Threads	4
4	Scheduling • CPU Scheduling • Scheduling Criteria • Scheduling Algorithms, • Algorithm Evaluation • Process Scheduling Models	4
5	Process Synchronization • Process Synchronization • Critical-Section Problem • Synchronization Hardware • Semaphores • Critical Regions • Monitors • Classical Problems	6
6	Deadlocks • Deadlocks • Deadlock Characterization • Methods for Handling Deadlocks (Prevention, Avoidance, Detection) • Recovery from Deadlock	4
7	Memory Management • Address Binding Concept • Swapping • Contiguous Memory Allocation • Paging • Segmentation • Segmentation with Paging Virtual Memory • Demand Paging • Page Replacement • Allocation of frames • Thrashing	7
8	Storage Management • File-System Interface • File Concept	4

	• Access Methods • Directory Structure • File-System Mounting • File Sharing • Protection	
9	File-System Implementation • File-System Structure • File-System Implementation • Directory Implementation • Allocation Methods • Free-Space management • Efficiency and Performance • Recovery	4
.10	I/O Systems • I/O Hardware • Application I/O Interface • Kernel I/O Subsystem • Transforming I/O to Hardware Operations • Streams • Performance	4
11	Mass-Storage Structure • Disk Structure • Disk Scheduling • Disk Management • Swap-Space Management • RAID Structure	4
	Review	4
Total		**55**

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	CLO 1- Identify and Discuss the issues and problems involved in the design of operating systems.	Classroom Teaching	Test, Mid Exam, Final Exam, Assignments
1.2	CLO 2- Identify issues of process Management including Process Structure, Scheduling, Synchronization and Deadlock.	Classroom Teaching	Test, Mid Exam, Final Exam, Assignments

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.3	CLO 5. Identify and Discuss the issues related to File System Structure, Mass-Storage Structure, I/O Systems I/O Sub-systems	Classroom Teaching	Test, Mid Exam, Final Exam, Assignments
2.0	**Skills**		
2.1	CLO 3. Demonstrate scheduling algorithms, synchronization techniques and Deadlock recovery and avoidance algorithms.	Exercise/ Teaching in Lab	Lab Based Assignments, Lab Test, Mid Exam, Final Exam
2.2	CLO4. Demonstrate memory management issues including advance techniques of paging, segmentation and virtual memory.	Exercise/ Teaching in Lab	Lab Based Assignments, Lab Test, Mid Exam, Final Exam
…			
3.0	**Values**		
3.1			
3.2			
3.3			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Quiz 1	Week 3	10%
2	Assignment 1	Week 3	10%
3	Midterm	Week 6	20%
4	Assignment 2	Week 7	10%
5	Quiz 2	Week 9	10%
6	Final Exam	Week 11	40%
7			
8			

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :
Each student is allotted to an academic advisor for guidance and counselling

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	• **Operating System Concepts, Silberschatz, Galvin, and Gagne, 10th edition, Wiley, 2018.**
Essential References Materials	• **Charles Crowley, "Operating Systems: A Design Oriented Approach", Tata McGraw Hill 1999.** • **Modern Operating Systems, Tanenbaum, 3rd edition, Prentice Hall, 2007.**

	• **Operating Systems: Design and Implementation, Tanenbaum and Woodhull, Prentice**
Electronic Materials	
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classroom
Technology Resources (AV, data show, Smart Board, software, etc.)	PC or Laptop with Windows/Linux, Smart Board, Projector
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	Internet Connection

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Test/Quiz/Mid Term/ Final Exam assessment (Extent of achievement of course learning outcomes)	Course instructor	Direct
Course Survey in the middle of the semester and at the end of the semester (Effectiveness of teaching and assessment)	Students	Indirect
Extent of achievement of course learning outcomes	Students	Indirect
Final Exam Answer Scripts Verification	Peer faculty members	Review (Direct)

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	CS Council
Reference No.	
Date	