هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission
اعتماد
NCAAA
2024
TP-153

Course Specification
(Bachelor)

Course Title:	Operating Systems
Course Code:	CS1322
Program:	Bachelor of Computer Science
Department:	Computer Science
College:	College of Computer and Information Sciences
Institution:	Imam Mohammad Ibn Saud Islamic University
Version:	2.0
Last Revision Date:	31 December 2025

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A. General information about the course:

1. Course Identification

1. Credit hours: (4 Hours)					
2. Course type					
A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: (Level 5 /Year 3)					
4. Course General Description:					
Operating systems are an essential part of any computer system. Similarly, a course on operating systems is an essential part of any computer-science education. This course aims to provide a clear description of the theoretical concepts that underlie operating systems. It also aims to familiarize students with the practical side of the OS by programming and simulating different aspects Threading, scheduling, Synchronization, memory management, etc.).					
5. Pre-requirements for this course (if any)**:**					
CS1242-Data Structures **CS1223 - Computer Architecture**					
6. Co-requisites for this course (if any)**:**					
N/A					
7. Course Main Objective(s):					
The main purpose for this course is to introduce students to the operating systems concepts, principles, and design. The focus is on presenting the computing systems layers and explaining different methods of handling problems such as deadlocks through these layers. Another emphasis is on identifying and comparing different communication and synchronization mechanisms that can be employed to realize concurrent systems and shared resources. These mechanisms deal with multi threads systems and include important topics such as critical section problems and semaphore. Also, Processor scheduling algorithms for both preemptive and non-preemptive are introduced. Another emphasis is to introduce to students the main principles of memory and virtual memory management techniques such as segmentation and paging. The goal is to provide the students with a set of important concepts to acquire the ability to handle, design and use operating system-based techniques within the computer science area context.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	100%
2	E-learning	-	-
3	Hybrid • Traditional classroom • E-learning	-	-
4	Distance learning	-	-

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	60
2.	**Laboratory/Studio**	0
3.	**Field**	0
4.	**Tutorial**	0
5.	**Others (specify)**	0
Total		60

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	Define the operating systems concepts, principles, and design.	**K1**	In Class Lectures Class discussions.	Written Exam Quizzes
1.2	Identify techniques and tools used for managing processes and threads, including synchronization mechanisms and deadlock handling.	**K2**	In Class Lectures Class discussions. Examples and Case Studies	Written Exam Assignment Quizzes

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.3	Describe the principles of memory management, including segmentation, paging, and virtual memory management techniques.	**K1**	In Class Lectures Class discussions. Examples and Case Studies	Written Exam Assignment Quizzes
2.0	**Skills**			
2.1	Compare the different communication and synchronization mechanisms that can be employed to realize concurrent systems and shared resources.	**S1**	In Class Lectures Class discussions. Examples and Case Studies Lab programming exercises	Written Exam Assignment Quizzes
2.2	Evaluate different processor scheduling algorithms for both preemptive and non-preemptive.	**S2**	In Class Lectures Class discussions. Examples and Case Studies Lab programming exercises	Written Exam Assignment Quizzes
2.3	Apply different inter-process and multi threads communication and synchronization mechanisms, such as critical section problem and semaphore.	**S4**	In Class Lectures Class discussions. Examples and Case Studies	Written Exam Assignment Quizzes
3.0	**Values, autonomy, and responsibility**			
3.1	Work in teams and learn how to manage the time slot allocated to the project.	**V2**	Class discussions. Examples and Case Studies	Project
3.2	Demonstrate effective collaboration skills and leadership roles within a team while presenting implemented projects.	**V2**	Class discussions. Examples and Case Studies	Project

C. Course Content

No	List of Topics	Contact Hours
1.	**[Chapter 1: Introduction into OS]** Roles and purposes of the operating system. Structuring methods. Abstractions, processes, and resources. The evolution of hardware/software techniques and application needs. Kernel data structures.	4
2.	**[Chapter 3: Processes]** Process concepts and scheduling. Interprocess communication and Communication in client–server systems. fork () system call.	8
3.	**[Chapter 4: Threads]** Identify thread. Multithreading models. Thread libraries. Implicit threading. Threading issues with examples. Pthreads.	4
4.	**[Chapter 5: Synchronization Tools]** The critical-section problem and some hardware and algorithms solution approaches (synchronization hardware, mutex locks, Semaphores). Race condition.	4
5.	**[Chapter 6: Synchronization Examples]** Synchronization examples. Alternative approaches. Test-and-Set- Compare and swap.	2
6.	**[Chapter 7: CPU Scheduling]** CPU scheduling algorithms (Preemptive and non-preemptive). Basic Concepts Scheduling Criteria. Thread Scheduling. Scheduling Algorithm Optimization Criteria. FCFS-SJF-SRTF-RR-Priority scheduling. Multilevel Queue Multilevel Feedback Queue.	8
7.	**[Chapter 8: Deadlock]** Multiple simultaneous computations and system model. Deadlock definition and handling methods: prevention, avoidance, detection, and recovery.	8
8.	**[Chapter 9: Main Memory]** Main Memory. Memory management Unit(MMU) Contiguous Memory Allocation. Paging. Structure of the Page Table. Protection techniques in memory. Address Binding stages. Virtual address vs. Physical address. Variable Partition allocation. Dynamic Storage-Allocation techniques. Swapping.	8
9.	**[Chapter 8: Virtual Memory]** Principles of virtual memory. Demand Paging. Page Fault. Paging and virtual memory. Page Replacement Algorithms-FIFO-LRU-Optimal Page Replacement Algorithm	8
10.	**[Chapter 13: File-Systems Management]** various aspects of files and the major directory structures, semantics of sharing files among multiple processes, users, and computers, and handling files protection.	6
Total		**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quiz 1	4th Week	5%
2.	Midterm Exam	11th Week	25%
3.	Quiz 2	10th Week	5%
4.	Project and presentation	15th Week	15%
5.	Assignments 1&2	5th Week – 12th Week	10%
6.	Final Exam	Final Week	40%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	Understanding Operating Systems. 8th Edition. Ann McHoes and Ida M. Flynn. Cengage Learning. 2017
Supportive References	1. Operating System Concepts, 10th Edition, Abraham Silberschatz, Peter B. Galvin, Greg Gagne, 2021 2. Modern Operating Systems, 4th Edition, Andrew S. Tanenbaum, Herbert Bos, 2014.
Electronic Materials	Blackboard is utilized as the course online learning environment and management system.
Other Learning Materials	UNIX The Textbook, 3rd Edition, Syed Mansoor Sarwar and Robert M. Koretsky, Chapman and Hall/CRC, 2016.

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Lecture room with: • At least 35 seats • A projector connected to a PC preferably with Internet connection Sliding board
Technology equipment (projector, smart board, software)	A lab supported by a sufficient number of computer machines wit pre-installed Unix-based Operating Systems.
Other equipment (depending on the nature of the specialty)	N/A

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students, Instructors, Program Leaders	1. Students feedback (collected through course evaluation surveys) 2. Course report submitted by instructors. 3. Reviewing course reports by the program leaders
Effectiveness of Students assessment	Students, Instructors, Program Leaders	1. Students feedback (collected through course evaluation surveys) 2. Course report submitted by instructors 3. Reviewing course reports by the program leaders
Quality of learning resources	Instructors, Program Leaders	1.Direct assessments for students' grades related to CLOs 2. Reviewing course reports (including CLOs achievement) by instructors and program leaders
The extent to which CLOs have been achieved	Program Leaders	1. Reviewing Course Specification and Reports by program leaders
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewers, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	**COMPUTER SCIENCE DEPARTMENT COUNCIL**
REFERENCE NO.	**18**
DATE	**5-1-2026**