وزارة التعليم العالي والبحث العلمي

Ministry of Higher Education and Scientific Research

SH. A.

أكاديميــة الشــروق

المعهد العالى للحاسبات وتكنولوجيا المعلومات
مدينة الشروق ـ القاهرة
شعبة علوم الحاسب

Course specification

Course Code: CS 331

Course Title: Theory of Operating Systems

Academic Year: 2025/2026

Course specification
(CS 331 - Theory of Operating Systems)

Course Outline	
Faculty:	*HICIT- (Higher Institute for Computers & Information Technology-El Shorouk Academy)*
Programme(s) on which the course is given:	Undergraduate program in Computer Science
Major or minor element of programme:	Compulsory
Department offering the program	Department of Computer Science
Department offering the course:	Department of Computer Science
Level	Third Level
Date of specification approval	22/7/2023

Basic Information				
Code:	CS 331	*Title:*	Theory of Operating Systems	
Prerequisites:	CS 220 Computer Organization			
Weekly Hours:				
Lecture: 2	**Exercise:** 1	**Practical :** 1	**Total: 3** credit hours	

Professional Information

Course Aims:

CS331 theory of operating system course aims at introducing the Basic concepts related to operating systems and systems programming. The course introduces process, threads, and processor scheduling. Memory management for single user & multi-user systems. Virtual storage organization & management. Race condition/concurrent update problem with mutual exclusives and synchronization means. Deadlocks conditions and remedy actions. The course introduces selected advanced topics operating systems related such as OS extension techniques, parallel and distributed systems, and security. Laboratory work on more than one OS platform as well as practice on a single & multi-user system. The lab work includes: multi-threading, synchronization, deadlocks, and OS problems demonstration and practice.

Program ILOs Covered by Course			
Knowledge and understanding	**Intellectual Skills**	**Professional and practical skills**	**General and Transferable skills**

A8,A10 ,A13,A15,A18,A19	B1, B3, B4,B7, B14	C5,C6	D5,D7
A8 -- Understanding fundamental topics of computer systems especially hardware architectures. A10- acquired deeper understanding of H/W ….. A13-Demonstrated strong .. programming and construct of computer based systems **A15**—Select advanced topics to provide deeper understanding of operating systems, parallel processing A18 – Identify the methods used in defining and assessing criteria for measuring the extent to which a computer system is appropriate for its current deployment and future evolution. **A19** -- Recognize the current and underlying technologies that support computer processing and inter-computer communication.	**B1** -- Define traditional and non-traditional problems, set goals towards solving them, and observe results. B3- Perform classifications of (data, results, methods, techniques, algorithms, etc.). **B4**-- Identify attributes, components, relationships, patterns, main ideas, and errors. **B7**-- Establish criteria and verify solutions. B14- Perform problem analysis from written descriptions; derive requirements specifications from an understanding of problems (analysis, synthesis).	**C5 - Specify, design, and implement and manage computer-based systems.** **C6 - Evaluate systems in terms of general quality attributes and possible trade-offs presented within the given problem.**	**D5** -- Demonstrate efficient IT capabilities. D7 - Manage tasks and resources.

Intended learning outcomes of course (ILOs)

a. <u>Knowledge and Under-Standing:</u>

a1. Bases and concepts of the operating systems. [A8, A10]
a2. Process concept, process states, threading and time sharing. [A15, A19]
a3. Pulling and interrupts processing [A15, A13, A19]
a4. Memory partitioning and management. [A8, A15]
a5. Virtual memory. [A15, A13]
a6. Job and processor Scheduling. [A18, A15]
a7. Deadlocks and Concurrent Update problems. [A13]
a8. Selected topics [A15]

b. <u>Intellectual Skills:</u>
b1**.** Resources sharing concepts in time and space analysis, synthesis. [B1, B7]

b2. Modes of operations and alternating modes to deal with problems. [B1,B3, B4]

b3. Use of diagrams in problems representations, formulation, and search for solutions. [B1,B4,B14]

c. <mark>**Professional and practical skills**</mark>
c1 – Deal with different OS platforms with command lines. [C6]
c2 - Build programs that include threads, API's and synchronization. [C5]

d. <mark>**General and transferable skills**</mark>
d1 – Virtualization concept to satisfy utilization optimization. [D5]
d2 – Use of operating modes for sharing critical resources. [D7]

Contents		
Topic	**Contact Hours**	
	lecture	**Lab/Ex.**
Introduction, major OS functions, base concepts	2	2
Process concept, process states	2	2
Process threading and time sharing	2	2
OS Bootstrap, Interrupts, interrupt classes, API's	3	3
Memory partitioning and management	3	3
Virtual memory concept	2	2
Virtual memory methodologies and management	3	3
Job and processor Scheduling concepts and objectives	2	2
Job and processor Scheduling realization	2	2
Deadlocks conditions and remedy actions	3	3
Concurrent Update problem & process/threads synchronization	2	2
Selected advanced Topics	2	2

Teaching and learning methods	
Teaching and learning methods	**Used**
Lectures	√
Tutorial Exercises	√
Lab works and practical assignments	√
Discussions.	√
Self – Learning (Reading material, Websites search,)	√
Self-studies	-
Group work	√
Presentation	-
Problem solving/problem solving learning based	√

Synchronous E-Learning	-
Video lectures	√
Asynchronous E-Learning	√

Student assessment methods & Schedule		
Methods	**Used**	**Week#**
Midterm Exam	√	**8**
Final Exam	√	**16**
Course Work & Quizzes	√	**2-14**
Practical Exam	√	**15**

Assessment Weight	
Assessment	Weight %
Mid Term Exam	15
Practical Exam	15
Final Exam	60%
Course Work & Quizzes	10%
Total	100

Course Work &Quizzes
Short Exams, Assignments, Research, Reports, Presentations
Class discussion

List of references	
Essential books (textbooks)	- Operating System Concepts, 10th Edition by: (Abraham Silberschatz, Greg Gagne and Peter B. Galvin), Wiley May 4, 2018. - Understanding operating systems 008 edition, by (Ann McIver, McHoes Ida, M. Flynn), Cengage Learning (March 15, 2017)
Course notes	E-Learning Portal
Periodicals, website	
Videos link	

Required Facilities		
Tools & SW (Technology facilities):	– VM, Linux, python	
Teaching facilities:	Whiteboard	√
	Computer Lab	√
	Data show	√
	E-Learning	√
	Videos	√
	Website	√

Course Content/ILO Matrix															
Course Contents	Knowledge & understanding								Intellectual skills			Professional and practical skills		General	
	a1	a2	a3	a4	a5	a6	a7	a8	b1	b2	b3	c1	c2	d1	d2
Introduction, major OS functions, base concepts	x														
Process concept, process states		x							x	x		x	x		x
Process threading and time sharing		x							x	x			x		x
OS Bootstrap, Interrupts, interrupt classes, API's	x		x									x		x	
Memory partitioning and management				x								x			
Virtual memory concept					x									x	
Virtual memory methodologies and management				x	x									x	
Job and processor Scheduling concepts and objectives						x						x			
Job and processor Scheduling realization						x									
Deadlocks conditions and remedy actions							x				x	x			
Concurrent Update problem & process/threads							x					x	x		
Selected Advanced Topics								x							x

Learning Method /ILOs Matrix

Learning Methods/ILOs Matrix	Knowledge & understanding								Intellectual skills			Professional and practical skills		General	
Learning Methods	a1	a2	a3	a4	a5	a6	a7	a8	b1	b2	b3	c1	c2	d1	d2
Lectures	X	X	X	X	X	X	X	X	X	X	X			X	X
Tutorial Exercise	X	X	X	X	X	X	X	X	X	X	X	X		X	X
LAB WORK												X	X	X	X
Discussions		X						X				X		X	X

Assessment Methods /ILOs Matrix

ASSESMENT METHODS	Knowledge & understanding								Intellectual skills			Professional & practical skills		General	
Assessment Methods	a1	a2	a3	a4	a5	a6	a7	a8	b1	b2	b3	c1	c2	d1	d2
Midterm Exam	X	X	X	X											
Practical Exam		X	X		X		X	X	X		X	X	X		
Final Exam	X	X	X	X	X	X	X	X	X	X	X				
Course work									X			X		X	X

Course ILOs Vs Program ILOs																
Prog ILOs / Course ILOs		Knowledge & understanding						Intellectual skills					Professional and practical skills		General	
		A8	A10	A13	A15	A18	A19	B1	B3	B4	B7	B14	C5	C6	D5	D7
Knowledge and understanding	a1	√	√													
	a2				√		√									
	a3			√	√	√										
	a4	√			√											
	a5			√	√											
	a6				√	√										
	a7			√												
	a8				√											
Intellectual skills	b1							√			√					
	b2							√	√	√						
	b3							√		√		√				
Professional and practical skills	c1													√		
	c2												√			
General skills	d1														√	
	d2															√

Course Coordinator   : Dr. **Abdellatief Hussien Abouali (   )**
Head of Department : Dr. Ahmed El-Abbassy   **(   )**
Date: 01/05/2023

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