University/Academy: Arab Academy for Science and Technology & Maritime Transport
Faculty/Institute: College of Computing and Information Technology
Program: Computer Science / Information Systems / Software Engineering

Form No. (12)
Course Specification

1- Course Data

Course Code:	Course Title:	Academic Year/Level:
CS322	Operating Systems	Year 3 / Semester 6
Specialization:	**No. of Instructional Units:**	**Lecture:**
Computer Science	2 hrs lecture 2 hrs lab 2 hrs section	

2- Course Aim	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 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; and on operating system support for distributed systems.
3- Intended Learning Outcome:	
a- Knowledge and Understanding	**Students will be able to demonstrate knowledge of:** **K5.** The extent to which a computer-based system meets the criteria defined for its current use and future development. **K6.** The current and underlying technologies that support computer processing and inter-computer communication. **K10.** Current developments in computing and information research. • Define the computer System and describe computer system components.(k6) • Describe the memory hierarchy and how it is being accessed by the Operating System. (K6) • Describe operating systems evolution (K6) • Understand the process, and how is it being controlled by the operating system. (K5,K6) • Demonstrate the problems with processes interaction. (K5)

	• Illustrate the difference between the Threads and processes, using diagrams and contents. (K6) • Define mutual exclusion, and trying synchronization. (K5,K6) • Explain the deadlock occurs because of mutual exclusion. (K5,K6) • Define theories of the deadlock solutions. (K5,K6,K10) • Define the concept of memory management.(K5,K6,K10) • Define dealing with the two levels memory. (K5,K6) • Define the concept of scheduling and its usage. (K5,K6,K10) • Define dealing with files. (K5,K6) Define how the computer systems are being secured. (K10)
b- Intellectual Skills	**By the end of the course, the student acquires high skills and an ability to understand:** **I3.** Identify criteria to measure and interpret the appropriateness of a computer system for its current deployment and future evolution. **I7.** Achieve judgments considering balanced costs, benefits, safety, quality, reliability, and environmental impact. I9. Evaluate research papers in a range of knowledge areas **I11.** Perform comparisons between (algorithms, methods, techniques...etc). • Relate the computer system structure to the Linux environment. (I3) • Calculate the average access time for different memory hierarchies.(I3,I7) • Differentiate between operating systems environments.(I11) • Differentiate between multiprogramming and time-sharing operating systems(I3,I11) • Discover the process interaction, and how it can communicate with each others. (I3) • Construct the different types of processes interaction. (I3) • Analyze a multithreaded system with its usage.(I3) • Apply mutual exclusion to a multithreaded system .(I9,I11) • Apply selected solutions for deadlock prevention, avoidance, and detection(I3,I9,I11) • Solve the deadlock problems (I3,I11) • Demonstrate different types of memory management (I3,I11) • Relate accessing one level in the memory with the new topic of accessing the two levels. (I9,I11) • Show different scheduling techniques and compare between them. (I7,I9,I11) Differentiate between different ways of securing a computer system (I9,I7,I11)

c- Professional Skills	**By the end of the course the student will have the ability to:** **P5.** Develop a range of fundamental research skills, through the use of online resources, technical repositories and library-based material **P7.** Assess the implications, risks or safety aspects involved in the operation of computing equipment within a specific context. • Use Linux operating system • Experiment the process interaction under Linux environment. • Implement the analyzed multithreaded model to a running code under Linux. • Design codes for the deadlock avoidance and detection • Implement the codes designed in the previous part. • Explain dealing with paging and segmentation Design diagrams of dealing with virtual memory through the main memory.
d- General Skills	**Students will be able to:** **G1.** Demonstrate the ability to make use of a range of learning resources and to manage one's own learning. **G2.** Demonstrate skills in group working, team management, time management and organizational skills. **G3.** Show the use of information-retrieval.

	G7. Show the use of general computing facilities. • Verify theory with practice Verify with practice the implementation of deadlock avoidance, detection, and the scheduling techniques
4- Course Content	

1	Operating Systems overview
2	Process Description & Control
3	Threads
4	Concurrency
5	Deadlocks
6	Memory Management
7	Virtual Memory Management
8	Uniprocessor, multiprocessor, and Real-time scheduling
9	I/O management and Disk scheduling

5- Teaching and Learning Methods	Lectures, Labs, Projects, Individual study & self-learning.
6- Teaching and Learning Methods for Students with Special Needs	• Students with special needs are requested to contact the college representative for special needs (currently Dr Hoda Mamdouh in room C504) • Consulting with lecturer during office hours. • Consulting with teaching assistant during office hours. • Private Sessions for redelivering the lecture contents. • For handicapped accessibility, please refer to program specification.
7- Student Assessment:	
a- Procedures used:	Exams, lab work, and Individual Projects
b- Schedule:	Week 7 exam Week 12 exam Week 16 Final exam
c- Weighing of Assessment:	7th Week Exam 30% 12th week Exam: 10% Lab work 10% Section work 10% Final exam 40%
8- List of References:	
a- Course Notes	From the Moodle on www.aast.edu
b- Required Books (Textbooks)	William Stallings, "Operating Systems: Internals and Design Principles", 7th edition, 2009

c- Recommended Books	• Harvey M. Deitel, *An introduction to Operating Systems*, Addison Wesley, 1990 • Andrew S Tanenbaum and Albert S Woodhull, *Operating Systems Design and Implementation*, 3rd Edition, Prentice Hall, 2006 • Abraham Silberschatz, Peter Baer Galvin, and Greg Gagne, *Operating Systems Concepts*, 9th Edition, Wiley, 2013 Andrew S. Tanenbaum, *Modern Operating Systems*, 3rd Edition, Prentice Hall, 2008
d- Periodicals, Web Sites, …, etc.	

Course Instructor: **Head of Department:**

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