Arab Academy for Science and Technology & Maritime Transport

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

Form No. (12)
Course Specification

1- Course Data

Course Code: CS331	Course Title: **Network Protocols & Programming**	Academic Year/Level: Year 4 / Semester 7
Specialization: Computer Science	No. of Instructional Units: 2 hrs lecture 2 hrs lab	Lecture:

2- Course Aim	The course is an introduction to network programming using the application programming interface known as sockets. In addition, several design alternatives for client/server applications will be presented along with tradeoffs. Upon successful completion of the course, the student should be able to develop network-aware applications that involve unicast and multicast communications from the grounds up. Hands-on experience will be gained through several programming assignments, which require knowledge of the C and/or Java programming language.
3- Intended Learning Outcome:	
a- Knowledge and Understanding	**Students will be able to demonstrate knowledge of:** .K13.Use high-level programming languages. K19. Select advanced topics to provide a deeper understanding of some aspects of the subject, such as hardware systems design, object-oriented analysis and design, and artificial intelligence, and parallel and concurrent computing. • Define TCP/IP Layers • Describe functions provided by TCP/IP layers • Explain IP addressing • Demonstrate TCP reliability features • Define interface Maximum Transfer Unit (MTU) • Illustrate TCP state transition diagram using diagrams • Explain basic UDP functionality • Define socket address structures • Demonstrate basic client and server • Demonstrate basic TCP socket API functions • Demonstrate TCP client/server example • Define I/O multiplexing • Define IPv4 socket options • Demonstrate name and address conversions API functions

	• Demonstrate basic UDP socket API functions • Explain multicast operation on a LAN • Explain multicast operation on a WAN Discuss TCP client/server design alternatives
b- Intellectual Skills	**By the end of the course, the student acquires high skills and an ability to understand:** I11. Define traditional and nontraditional problems, set goals towards solving them, and. observe results. I13. Identify attributes, components, relationships, patterns, main ideas, and errors. I17. Identify a range of solutions and critically evaluate and justify proposed design solutions. • Calculate TCP acknowledgment number • Reason about a TCP connection state • Differentiate between link MTU and path MTU • Extract network and subnet address from an IP address • Analyze TCP connection establishment and termination • Apply the use of socket address structures • Analyze use of TCP as a transport layer protocol • Analyze use of UDP as a transport layer protocol • Reason about the need for I/O multiplexing • Apply IPv4 socket options • Apply name and address conversions through DNS resolution • Apply network-layer multicast on a LAN • Differentiate between multicast on a LAN and on a WAN • Differentiate between application-layer and network-layer multicast • Compare between different client/server design alternatives Evaluate client/server design alternatives

c- Professional Skills	**By the end of the course the student will have the ability to:** P11. Perform independent information acquisition and management, using the scientific literature and Web sources. P13. Prepare technical reports, and a dissertation, to a professional standard; use IT skills and display mature computer literacy. P14. Specify, design, and implement computer-based systems. P15. Evaluate systems in terms of general quality attributes and possible tradeoffs presented within the given problem. • Use Linux operating system • Use network tools to discover IP address • Use network tools to discover TCP connection state • Design and implement a simple client/server application • Design and implement TCP client/server • Design and implement UDP application • Design and implement I/O multiplexing application • Implement name and address conversions functions • Design and Implement an application to demonstrate socket options • Design and implement a multicast network application Design an implement TCP client/server with different design alternatives

d- General Skills	**Students will be able to:** G1.Demonstrate skills in group working, team management, time management and organizational skills. G2.Show the use of general computing facilities. G7.Demonstrate the ability to make use of a range of learning resources and to manage one's own learning.
4- Course Content	1. Apply network protocols operation and design methodology 2. Use application programming interface known as sockets for implementing a network applications. 3. Programming of unicast and multicast network applications 4. Be involved in a project for designing Client/server design alternatives along with their tradeoffs.
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 and Individual Projects
b- Schedule:	Week 7 exam Projects through the semester Week 16Final exam
c- Weighing of Assessment:	7th week exam 30% Project 20% Lab work 10% Final exam 40%
8- List of References:	
a- Course Notes	From the Moodle on www.aast.edu

b- Required Books (Textbooks)	W. Richard Stevens, Bill Fenner, and Andrew Rudoff, *Unix Network Programming, The Sockets Networking API*, Volume 1, 3rd Edition, Addison-Wesley, 2004
c- Recommended Books	
d- Periodicals, Web Sites, ..., etc.	

Course Instructor:

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Head of Department:

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