



**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**

<b>Course Code:</b> CE 231	<b>Course Title:</b> Introduction to Networks	<b>Academic Year/Level:</b> Year 2 / Semester 4
<b>Specialization:</b> Computer Science	<b>No. of Instructional Units:</b> 2 hrs lecture 2 hrs lab 2 hrs section	<b>Lecture:</b>

<b>2- Course Aim</b>	The course is an introduction to computer networks architecture and protocols with special emphasis on the Internet. The course will present the IP protocol stack including application, transport, network, and link layers. Such presentation will illustrate the main concepts, protocols, and services provided by each layer. Hands-on experience will be provided through the use of a packet sniffing and protocol analysis tool.
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**3- Intended Learning Outcome:**

<b>a- Knowledge and Understanding</b>	<b>Students will be able to demonstrate knowledge of:</b> K4. Criteria and specifications appropriate to specific problems, and plan strategies for their solution. 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. K11. Requirements, practical constraints and computer-based systems. <ul style="list-style-type: none"><li>• Define Computer Network (K5)</li><li>• Define Network Protocol(K5)</li><li>• Define Computer Network Motivation.(K5)</li><li>• Discuss the layered architecture. (K6,K11)</li><li>• Discuss OSI reference Model (Theoretical Model) (K6,K11)</li><li>• Discuss the TCP/IP model(K6,K11)</li><li>• Illustrate the packet transmission through circuit switching and packet switching.(K6,K11)</li><li>• Define the delay, loss and throughput in packet-switching networks(K6,K11)</li><li>• Discuss the protocol layers and their service models. (K6,K11)</li><li>• Discuss the DNS(K6,K11)</li><li>• Illustrate how DNS works(K6,K11)</li><li>• Discuss the DNS records and messages(K6,K11)</li></ul>
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	<ul style="list-style-type: none"> <li>• Demonstrate what is emailing and how SMTP works(K6,K11)</li> <li>• Illustrate an overview of the HTTP(K6,K11)</li> <li>• Define persistent and non-persistent connections(K6,K11)</li> <li>• Define Web caching(K6,K11)</li> <li>• Define FTP(K6,K11)</li> <li>• Illustrate how FTP works(K6,K11)</li> <li>• Illustrate how SMTP works(K6,K11)</li> <li>• Discuss the Transport Layer services(K6,K11)</li> <li>• Discuss the Connection-less Transport: UDP(K6,K11)</li> <li>• Discuss the Connection-oriented Transport: TCP(K6,K11)</li> <li>• Discuss the network layer (K6,K11)</li> <li>• Illustrate how the Internet protocol (IP) work(K6,K11)</li> <li>• Discuss the Routing algorithms(K6,K11)</li> <li>• Illustrate how routing in the internet works(K6,K11)</li> <li>• Discuss Multicast routing(K6,K11)</li> <li>• Illustrate what is the link layer and its services(K6,K11)</li> <li>• Discuss what is multimedia networking and its applications (K4)</li> <li>• Demonstrate the streaming of audio and video(K4)</li> </ul>
<b>b- Intellectual Skills</b>	<p><b><u>By the end of the course, the student acquires high skills and an ability to understand:</u></b></p> <p>I4. Analyze, propose and evaluate alternative computer systems and processes taking into account limitations, and quality constraints.</p> <p>I7. Achieve judgments considering balanced costs, benefits, safety, quality, reliability, and environmental impact.</p> <p>I11. Perform comparisons between (algorithms, methods, techniques...etc).</p> <p>I13. Identify attributes, components, relationships, patterns, main ideas, and errors.</p> <p>(Equivalent to I12 in the IS and SE departments)</p> <ul style="list-style-type: none"> <li>• Compare between OSI and TCP/IP model (I4)</li> <li>• Differentiate between the services offered by each layer (I4,I11)</li> <li>• Analyze different delays and throughput in packet-switched networks(I4,I11)</li> <li>• Compare between packet switching and circuit switching (I4,I11)</li> <li>• Differentiate between the different internet applications and their underlying transport protocols(I4,I11)</li> <li>• Differentiate between iterative and recursive resolution(I4,I11)</li> <li>• Compare between persistent and non-persistent connections(I4,I11)</li> <li>• Distinguish between the connection-oriented and connectionless transport layer protocols(I4,I11)</li> <li>• Compare between and TCP and UDP(I4,I11)</li> <li>• Compute TCP acknowledgement number (I13)</li> <li>• extract network address and subnet address (I13)</li> <li>• Analyze how different routing algorithms work(I13)</li> <li>• Compare between broadcasting and multicasting routing(I4,I11)</li> <li>• Differentiate between multiple access protocols(I4,I11)</li> <li>• Compare between the different audio and video compression techniques (I7)</li> </ul>

<b>c- Professional Skills</b>	<p><b><u>By the end of the course the student will have the ability to:</u></b></p> <p>P3. Deploy the equipment and tools used for the construction, maintenance and documentation of computer applications.</p> <p>P7. Assess the implications, risks or safety aspects involved in the operation of computing equipment within a specific context.</p> <ul style="list-style-type: none"> <li>• Use ipconfig to determine the IP and network connection information (P3,P7)</li> <li>• Experiment with wireshark (packet sniffer) (P3,P7)</li> <li>• Use wireshark packet sniffer to view DNS traffic(P3,P7)</li> <li>• Use nslookup to query DNS(P3,P7)</li> <li>• Use wireshark packet sniffer to view HTTP traffic(P3,P7)</li> <li>• Use wireshark packet sniffer to view UDP traffic(P3,P7)</li> <li>• Use wireshark packet sniffer to view TCP traffic(P3,P7)</li> <li>• Use wireshark packet sniffer to view ICMP traffic(P3,P7)</li> <li>• Design and Implement a TCP/UDP network application(P3,P7)</li> <li>• Use wireshark packet sniffer to view ARP traffic(P3,P7)</li> <li>• Design and Implement a multimedia networking application(P3,P7)</li> </ul>																				
<b>d- General Skills</b>	<p><b>Students will be able to:</b></p> <p>G1. Demonstrate the ability to make use of a range of learning resources and to manage one's own learning.</p> <p>G3. Show the use of information-retrieval.</p> <p>G7. Show the use of general computing facilities.</p> <ul style="list-style-type: none"> <li>• Verify Theory with Practice</li> </ul>																				
<b>4- Course Content</b>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 5%;">#</th> <th style="width: 95%;">CLO</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1</td> <td>Understanding the motivation that derived the research work in computer networks and over-viewing the different contributions, and early research efforts that shaped the evolution of the Internet e research work in computer networks and over-viewing the different contributions, and early research efforts that shaped the evolution of the Internet</td> </tr> <tr> <td style="text-align: center;">2</td> <td>Introducing link multiplexing techniques (TDM, FDM, Statistical Multiplexing)</td> </tr> <tr> <td style="text-align: center;">3</td> <td>Understanding the different Network Service Models (Packet switching vs Circuit switching)</td> </tr> <tr> <td style="text-align: center;">4</td> <td>Introducing network delays and their effect on the network performance</td> </tr> <tr> <td style="text-align: center;">5</td> <td>Understanding Network layer services and differentiating between the network core and edge</td> </tr> <tr> <td style="text-align: center;">6</td> <td>Understanding routing and forwarding in the light of the two main classes of routing algorithms used over the Internet; Link State and Distance Vector routing protocols</td> </tr> <tr> <td style="text-align: center;">7</td> <td>Introducing the Internet Protocol (IP), IP subnetting and Internet Control Message protocol (ICMP)</td> </tr> <tr> <td style="text-align: center;">8</td> <td>Understanding the ISP tier structure and hierarchical addressing</td> </tr> <tr> <td style="text-align: center;">9</td> <td>Understanding and differentiating between Flow control and congestion control and studying their implementation in the TCP/IP stack</td> </tr> </tbody> </table>	#	CLO	1	Understanding the motivation that derived the research work in computer networks and over-viewing the different contributions, and early research efforts that shaped the evolution of the Internet e research work in computer networks and over-viewing the different contributions, and early research efforts that shaped the evolution of the Internet	2	Introducing link multiplexing techniques (TDM, FDM, Statistical Multiplexing)	3	Understanding the different Network Service Models (Packet switching vs Circuit switching)	4	Introducing network delays and their effect on the network performance	5	Understanding Network layer services and differentiating between the network core and edge	6	Understanding routing and forwarding in the light of the two main classes of routing algorithms used over the Internet; Link State and Distance Vector routing protocols	7	Introducing the Internet Protocol (IP), IP subnetting and Internet Control Message protocol (ICMP)	8	Understanding the ISP tier structure and hierarchical addressing	9	Understanding and differentiating between Flow control and congestion control and studying their implementation in the TCP/IP stack
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<b>5- Teaching and Learning Methods</b>	<p>Lectures, Labs, Projects, Individual study &amp; self-learning.</p>																				

<b>6- Teaching and Learning Methods for Students with Special Needs</b>	<ul style="list-style-type: none"> <li>• Students with special needs are requested to contact the college representative for special needs ( currently Dr Hoda Mamdouh in room C504)</li> <li>• Consulting with lecturer during office hours.</li> <li>• Consulting with teaching assistant during office hours.</li> <li>• Private Sessions for redelivering the lecture contents.</li> <li>• For handicapped accessibility, please refer to program specification.</li> </ul>
<b>7- Student Assessment:</b>	
<b>a- Procedures used:</b>	Exams, coursework, and Individual Projects
<b>b- Schedule:</b>	7 <sup>th</sup> week exam 30% 12 <sup>th</sup> week exam 20% Lab Quiz 10 % Final exam 40%
<b>c- Weighing of Assessment:</b>	<hr/> <b>Week 7 Grades – 30%</b> <b>Week 12 -Grades – 20%</b> Lab 10 % <hr/> <b>Week 16 - Final Exam – 40%</b>
<b>8- List of References:</b>	
<b>a- Course Notes</b>	From the Moodle on <a href="http://www.aast.edu">www.aast.edu</a>
<b>b- Required Books (Textbooks)</b>	James Kurose and Keith Ross, <i>Computer Networking: A Top-Down Approach Featuring the Internet</i> , 6 <sup>th</sup> Edition, Addison-Wesley
<b>c- Recommended Books</b>	1- Andrew Tanenbaum, <i>Computer Networks</i> , 4 <sup>th</sup> Edition, Prentice Hall, 2003. 2- Douglas E. Comer, <i>Internetworking with TCP/IP Volume I: Principles, Protocols, and Architecture</i> , 5th edition, Prentice Hall, 2005.
<b>d- Periodicals, Web Sites, ..., etc.</b>	

**Course Instructor: Dr Waleed Fakh**

**Head of Department: Dr Samah Senbel**

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