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<b>Course:</b>	Communication Networks – 0903426 (3 Cr. – Core Course)
<b>Instructor:</b>	Dr. Mohammed Hawa Office: E306, Telephone: 5355000 ext 22857, Email: hawa@ju.edu.jo Office Hours: will be posted soon
<b>Course Website:</b>	<a href="http://www.hawa.work/courses/426">http://www.hawa.work/courses/426</a>
<b>Catalog Data:</b>	Introduction to communication networks and the OSI model. Circuit switching and packet switching. Physical layer and transmission media. Asynchronous and synchronous transmission. Local loop access technologies. Data Link Layer Principles. IEEE 802.x Medium Access Control (MAC) protocols: LANs, MANs, WANs and PANs. The concept of internetworking and the Internet Protocol (IP), IP Specifications and supporting protocols (ARP, DHCP, ICMP, etc), Routing and switching in IP networks. Repeaters, Switches, Hubs, Bridges, Routers and Gateways. UDP and TCP transport layers. Internet applications.
<b>Prerequisites by Course:</b>	EE 0903421 – Communications I (pre-requisit).
<b>Prerequisites By Topic:</b>	Students are assumed to have a background in the following topics: <ul style="list-style-type: none"><li>• Digital coding and modulation.</li><li>• C++ programming.</li></ul>
<b>Textbook:</b>	<ul style="list-style-type: none"><li>• <b>Computer Networks by Andrew S. Tanenbaum and David J. Wetherall, Prentice Hall, 5th Edition, 2010, ISBN-10: 0132126958.</b></li></ul>
<b>References:</b>	<ul style="list-style-type: none"><li>• <i>Computer Networks: A Systems Approach</i> by Larry L. Peterson and Bruce S. Davie, Morgan Kaufmann, 5th Edition, 2011.</li><li>• <i>Internetworking with TCP/IP Vol.1: Principles, Protocols, and Architecture</i> by Douglas E. Comer, Prentice Hall, 6th Edition, 2013.</li><li>• <i>Computer Networking: A Top-Down Approach</i> by James F. Kurose and Keith W. Ross, Addison Wesley, 6th Edition, 2012.</li><li>• <i>Data and Computer Communications</i> by William Stallings, Prentice Hall, 9th Edition, 2010.</li><li>• <b>OPNET</b> network simulation program.</li></ul>
<b>Schedule &amp; Duration:</b>	16 Weeks, 41 lectures (50 minutes each) plus exams.
<b>Minimum Student</b>	Textbook, class handouts, scientific calculator, and an access to a personal computer.
<b>Material:</b>	
<b>Minimum College</b>	Classroom with whiteboard and projection display facilities, library, computational facilities with MATLAB and C++ IDE.
<b>Facilities:</b>	
<b>Course Objectives:</b>	The overall objective is to introduce the student to the basics of computer networks and the OSI model. This course emphasizes: <ul style="list-style-type: none"><li>• The concepts and design guidelines of computer networks.</li><li>• The framework for implementing network protocols (Layering and the OSI model).</li><li>• The current trends and latest implementations of network and internetwork protocols.</li></ul>

## Course Learning Outcomes and Relation to ABET Student Outcomes:

Upon successful completion of this course, a student should:

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|---|-----------|
| 1. Explain the concepts of circuit, packet and message-switching.                     | [a, e]    |
| 2. Describe the fundamental OSI and Internet protocol stacks.                         | [a]       |
| 3. Identify, formulate and solve error control methods at the link layer such as CRC. | [a, e]    |
| 4. Use IP addressing and apply sub-netting techniques.                                | [e, j]    |
| 5. Describe and compare data link layer services and multiple access techniques.      | [i, j]    |
| 6. Use networking tools to observe and analyze behaviors of networking protocols.     | [b, j, k] |

## Course Topics:

Topic Description	Contact Hours
1. Introduction to Communication Networks.	1
2. Network Protocols and Layering: OSI Model, Protocols, Encapsulation, TCP/IP Protocol Stack.	3
3. The Physical Layer and Transmission Media. FLAG Network. Asynchronous and Synchronous Transmission.	1
4. Local Loop, Internet Access and Leased Lines: Dial-up Modems, DSL, Cable Modems, Broadband Wireless Access (BWA), Power Line Communications, PDH, SDH/SONET.	5
5. Data Link Layer Basics: Framing and Error Detection.	2
6. Local Area Networks (LANs): Ethernet and Ethernet MAC Protocol (CSMA/CD).	1
7. Ethernet Addressing and Frame Formats.	2
8. <b>First Exam</b>	1
9. Switched Ethernet and Collision Domains.	2
10. Self-Learning Bridges and the Spanning Tree Protocol (STP). VLANs.	2
11. Ethernet Wiring and Ethernet Standards (Fast Ethernet, 1 GbE and 10 GbE).	3
12. Concept of Internetworking and the Internet Protocol (IP).	1
13. IP Packet Format and IP Packet Fragmentation. IP Addressing (Classful and Classless) and Subnetting.	4
14. IP Datagram Forwarding and ICMP Protocol.	2
15. <b>Midterm Exam.</b>	1
16. Address Resolution and ARP. DHCP, Private IP Addresses and NAT.	3
17. Introduction to Internet Routing: OSPF, RIP and BGP.	1
18. UDP and TCP Transport Layers: Automatic Repeat Request (ARQ) and the TCP Sliding Window Algorithm. Introduction to Congestion Control in TCP.	4
19. Wireless LANs: IEEE 802.11 Wi-Fi.	3
20. Metropolitan Area Networks (MANs): DOCSIS and IEEE 802.16 (Wi-MAX).	4
21. Personal Area Networks (PANs): Bluetooth, Wireless USB and UWB.	1
22. Wide Area Networks (WANs): ATM and Frame Relay.	1
23. Introduction to Security Design in Computer Networks.	1

**Ground Rules:** **Attendance is required** and highly encouraged. To that end, attendance will be taken every lecture. All exams (including the final exam) should be considered **cumulative**. Exams are closed book. No scratch paper is allowed. You will be held responsible for all reading material assigned, even if it is not explicitly covered in lecture notes.

**Assessments:** Exams, Quizzes, Projects, and Assignments.

<b>Grading policy:</b>	First Exam	<b>20%</b>
	Midterm Exam	<b>30%</b>
	<u>Final Exam</u>	<b>50%</b>
	Total	<b>100%</b>

**Last Updated:** January 2016