

CMPE445 - Internet Architecture and Protocols		
Department: Computer Engineering		
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Assistant Information		
Program Name: Computer Engineering		Program Code: 25
Course Number: CMPE445	Credits: 4 Cr	Year/Semester: 2019-2020 Spring
<input type="checkbox"/> Required Course <input checked="" type="checkbox"/> Elective Course (click on and check the appropriate box)		
Prerequisite(s): CMPE344 Computer Networks		
Catalog Description: An overview of the Internet architecture and its TCP/IP reference model. Protocols of the network layer. Addressing and routing datagrams in the Internet. Internet Control Message Protocol (ICMP) for dissemination of error and control messages. Transport layer, UDP and TCP protocols. Flow control and congestion control in TCP. Stream Control Transport Protocol (SCTP) for new applications. Routing protocols and communication between routers. Multicasting in the Internet and creation of multicast trees. Multicast routing protocols. Protocols for real-time applications. Voice and video over IP. Resource reservation and quality of service. IPv6 protocol and trends in the evolution of the Internet. Monitoring and managing IP networks with Simple Network Management Protocol (SNMP). Securing TCP/IP environments. Diagnostic tools and protocol analyzers for the Internet.		
Course Web Page: https://staff.emu.edu.tr/gurcuoz/en/teaching/cmpe445		
Textbook(s): *D.E. Comer, Internetworking with TCP/IP: Principles, Protocols, and Architecture, 6 th ed., Pearson Prentice-Hall, 2014, ISBN 10: 1292040815. **B.A. Forouzan, TCP/IP Protocol Suite, 4th ed., McGraw-Hill, 2010, ISBN 9780070166783		
Indicative Basic Reading List : See below		
Topics Covered and Class Schedule: (4 hours of lectures per week)		
Week 1	Course overview and introduction. Layered architecture of the Internet, with a summary of its protocols. The general concept of a protocol. **Chs1,2,5,6,7	
Week 2	Internet addresses and their mapping to physical addresses. The details of the address resolution protocol (ARP). IP protocol and its operation (with a flowchart of the related algorithm). **Ch8	
Week 3	Dissemination of error and control messages with the use of the Internet Control Message Protocol (ICMP). Characteristics, services and interfaces of the transport layer. **Ch9	
Week 4	Details of the UDP protocol. The TCP protocol, its features and state diagram. **Ch13, Ch14	
Week 5	Details of the flow and congestion control in TCP. The algorithm of a TCP process. SCTP - A new reliable transport protocol and its operation. **Ch15, Ch16	
Week 6	Routing in the Internet. Two main activities of a router. A forwarding algorithm. Intradomain and interdomain routing protocols of the Internet. **Ch6, Ch11	
Week 7	Review.	
Weeks 8-9	Midterm Examination	
Week 10	Multicasting and its use in the Internet. Multicasting in a local area network The Internet Group Management protocol (IGMP). Approaches to the creation of multicast routing trees. **Ch12	
Week 11	Multicast routing protocols of the Internet. The MBone multicast system. Voice over IP.	

	Effects of delay, jitter and loss of voice packets on voice perception. The Session Initiation Protocol (SIP). **Ch12
Week 12	Multimedia via the Internet. Digitizing and compression of video information. Streaming stored and live video/audio. Real-time interactive video/audio with the use of protocols RTP and RTCP. **Ch25
Week 13	Concepts of the quality of service (QoS) in the Internet. Resource Reservation Protocol (RSVP). Differential and Integrated services. Monitoring and management of IP networks. Simple Network Management Protocol (SNMP). The protocol IPv6 and trends in the evolution of the Internet. Diagnostic tools and protocol analyzers for the Internet (optional).**Ch25, Ch26, Ch24
Week 14	Presentations
Weeks 15-17	Final Examination

Laboratory Schedule:

(2 hours of laboratory per week)

Week 3	Lab 1: Ping and Traceroute programs usage in the Internet
Week 4	Lab 2: Description of the term projects.
Weeks 5-6	Lab 3: Preparation of materials for the term project
Week 7	Lab 4: Submission of the intermediate report with outline, introduction and references
Weeks 11-12	Lab 5: Writing of the report for the term project
Week 13	Lab 6: Submission of the report for the term project
Week 14	The oral presentation of the term project

Course Learning Outcomes:

At the end of the course, student must be able to

- (1) Describe layered architecture of the Internet with its protocols.
- (2) Describe the basic protocols at the network layer of the Internet.
- (3) Explain characteristics, services, protocols and state diagrams of the transport layer.
- (4) Explain routing and routing protocols of the Internet.
- (5) Describe multicasting and multicast routing protocols in the Internet.
- (6) Describe transmission of multimedia information via the Internet and related protocols.
- (7) Explain quality of service in the Internet and related protocols.
- (8) Explain network monitoring and management in the Internet.
- (9) Understand IPv6 and the evolution of the Internet.

	Method	No	Percentage
Assessment	Midterm Exam(s)	1	40%
	Assignment (or Term Project)	1	15 %
	Final Examination	1	45%
	Attendance		-

Contribution of Course to Criterion 5

Credit Hours for:

Mathematics & Basic Science : 0

Engineering Sciences and Design : 4

General Education : 0

Relationship of Course to Program Outcomes

The course has been designed to contribute to the following program outcomes:

- (c) design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- (e) identify, formulate, and solve engineering problems
- (k) use the techniques, skills, and modern engineering tools necessary for engineering practice

Prepared by: Assoc. Prof. Dr. Gürcü Öz

Date Prepared: 17 February 2020

Notes:

- **Attendance and Participation:** Attendance to every lecture and laboratory is mandatory.
- **Make-Up Policy:** Only one comprehensive make-up examination will be given to those who miss any of the exams. The make-up exam will be given to only those who provide a medical report (doctor's report approved by the Student Health Center) within 3 days after the examination.