Computer Networks

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Lecture 0

Course Information

Title: Computer Networks

Course Information

- **Description:** This course focuses on the principles of computer networking protocols and architectures with emphasis of the Internet. Students will learn about the technologies and protocols used in local and wide area networks. Special emphasis will be given to study the TCP/IP protocol suite and its underlying protocols and concepts including: HTTP, SMTP, POP, IMAP, DNS, P2P, UDP, TCP, error control, flow control, congestion control, network routing (static and dynamic), packet delays, Local Area Networks (Ethernet, Wi-Fi).

Course Information

- **TextBook:**

James F. Kurose and Keith W. Ross, Computer Networking: A Top-Down Approach Featuring the Internet, 4th edition, Addison-Wesley (ISBN: 0-321-22735-2).

Course Objectives:

1. Students will understand the basics of computer networks and the OSI reference model.
2. Students will describe and distinguish basic networking protocols and understand where each is useful and why.
3. Students will understand the operation of multi-access and point-to-point link layer technologies.
4. Students will understand the basics of the TCP/IP protocol suite and its widely used protocols.
5. Students will experiment with protocol analyzers (packet sniffers) to understand and analyze the operation of the different TCP/IP protocols.
6. Students will experiment with network routing (static and dynamic) and understand the process of implementing simple routed inter-networks.

Course Outcomes:

1. Introduction to Networking (packet switching vs. circuit switching), the structure of the Internet, network performance, packet delays and losses, and the OSI reference model.
2. Application Protocols: DNS, SMTP, POP, IMAP, HTTP, P2P.
3. Transport Protocols: UDP, Internet Checksum algorithm, Principles of reliable data transfer, TCP, Flow Control and Congestion Control, Pipelined Protocols (Go-Back-N, Selective Repeat), TCP and UDP sockets.
4. Network Protocols: Internet Protocol (IPv4 and IPv6), static and dynamic routing.
5. Data Link Protocols: Ethernet and CSMA/CD, Wi-Fi and CSMA/CA.

Instructor Information

- **Instructor**: Dr. Abdel Ilah Alshbatat
- **Office**:
- **Office Hours**:
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Grading Policy

- First Exam 20%
- Second Exam 20%
- HW 5%
- Quizzes 5%
- Final Exam 50%

Learning Material

- Lecture slides
- Textbook

Course Outline

Chapter1: **Computer Networks and the Internet**

1. What is the Internet?
2 .Network edge
3. Network core
4. Network access and physical media
5. Internet structure and ISPs
6. Delay & loss in packet-switched networks
7. Protocol layers, service models
8. History

Chapter2: **Application Layer**

1. Principles of Application-Layer Protocols
2. The World Wide Web: HTTP
3. Cookies Overview
4. File Transfer: FTP
5. Electronic Mail in the Internet
6. Domain Name System: DNS
7. P2P File Sharing
8. Socket Programming with TCP
9. Socket Programming with UDP

Chapter3: **Transport Layer**

1. Transport-layer services
2. Multiplexing and Demultiplexing
3. Connectionless transport: UDP
4. Principles of reliable data transfer
5. Connection-oriented transport: TCP
6. Principles of congestion control
7. TCP congestion control

Chapter4: **Network Layer and Routing**

1. Introduction and Network Service Model
2. Routing Principles
3. Hierarchical Routing
4. Internet Protocol (IP)
5. Routing in the Internet
6. What is Inside a Router?

Chapter5: **Link Layer and Local Area Networks**

1. The Data Link Layer: Introduction, Services
2. Error Detection and Correction
3. Multiple Acces Protocols and LANs
4. LAN Addresses and ARP
5. Ethernet , CSMA/CD
6. Hubs, Bridges and Switches
7. Wireless LANs: IEEE 802.11
8. The Point-to-Point Protocol