Computer Networks

Course Overview

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Computer Networks

“Sometimes when my internet is down I forget the rest of my computer still works”.... (Anonymous)

Course Outline

Credit Hours: 4 Prerequisite: Operating Systems, Data Base Systems

Course Objectives:

- The main objective of this course is to introduce the principles and practices of Computer Networking, specifically focusing on the Internet. By the end of the course, students should be able to:

✓ Understand the anatomy of the Internet, (layered structure, services, protocols and algorithms)

✓ Write networking application with Socket programming in C/C++

✓ Design and test networks on network designing tools

✓ Simulate existing protocols along with designing new protocols in network simulators

Text Book:

- Computer Networking: A Top Down approach featuring the Internet, 6th Edition *James F. Kurose and Keith W. Ross*
- Computer Networks, 5th Edition *Andrew Tanenbaum*

Course Outline (1/3)

Lectures (anticipated)	Topics Covered	Reference
5	**Introduction** • Basic Concepts of Networking • Internet Architecture • Protocol Layering • Circuit switching Packet switching • Multiplexing (TDM, FDM) • Throughput and delay	**Chapter 1** 1.1–1.5 **Chapter 1** Tanenbaum 1.4
2	**Application Layer** • Architectures of network applications • HTTP, FTP, Email, DNS • P2P Applications	**Chapter 2** 2.1– 2.3, 2.4.1, 2.5.1, 2.6.1

Course Outline (2/3)

Lectures (anticipated)	Topics Covered	Reference
7	**Transport Layer** • Multiplexing in UDP and TCP • Connectionless Transport: UDP • Reliable data transfer & TCP • Congestion avoidance and control	**Chapter 3** 3.1 – 3.8
8	**Network Layer** • The Internet Protocol • Routing algorithms • Routing protocols • Broadcasting and Multicasting	**Chapter 4** 4.1 – 4.7

Course Outline (3/3)

Lectures (anticipated)	Topics Covered	Reference
6	**Data Link Layer & MAC Layer Functionalities** • Error Detection & Control, ARQ • Link layer addressing • Bridges and Hubs LAN Technologies • Multiple Access	**Chapter 5** 5.1 – 5.6 **Chapter 4** Tanenbaum 4.1 – 4.4 **Chapter 2** Tanenbaum 2.1.3, 2.2, 2.5
	Advanced Topics • Multimedia Networking Applications • Voice and Video over IP • Introduction to Network Security, SDN and IoT	**Chapter 7** 7.1, 7.2, 7.3 **Chapter 8** 8.1, 8.2 Research Papers (provided)

Assessment Distribution

• Mid-I	15%	~5th week, see official schedule!
• Mid-II	15%	~8th week
• Mini-Project	15%	Due: 17/11/2017
• Assignment	5%	Take home assignments ~3
• Quiz	10%	In-class, 3 quizzes
• Final	40%	~15th week

- Details of Mini-Project: See *Slate>Assignments*

Tools of the Trade

Network Monitoring Tools

- ***Intrusive Network Monitoring Methods***
- Ping
- Tracert/traceroute
- Iperf/Jperf
- ***Non-Intrusive Monitoring Methods***
- Tcpdump/windump
- Wireshark
- Cisco NetFlow/NetFlow Analyzer
- **Operating System**
- Ubuntu Linux (preferred) or Windows
- **Programming Languages (Optional)**
- awk/sed, BASH

Lab Software

- ns-2, ns-3 [mainly used for protocol development testing]
- RouterSim [simulator for Cisco devices]
- Python, C/C++ [socket programming]