

## **EECE 261 & 262 Introduction to Local Area Networks, Internetworking, and Wireless Network Services and Applications**

**Textbook:** *Data and Computer Communications, 8<sup>th</sup> Edition* – William Stallings (Prentice Hall, 2007: ISBN 0-13-243310-9)

**Course Objectives:** This course provides an overview of the field of voice/data local- and wide-area networks (LANs and WANs), as well as next-generation converged networking techniques. The proliferation of distributed computing applications through networking services (such as cable modems, xDSL, WIFI/WiMAX, and ad hoc mobile networks) makes knowledge of the underlying protocols and theories of these networking technologies essential. Moreover, by developing a concrete understanding of networking architectures, protocol design, and converged networks, students will have the requisite background to make critical design and implementation decisions for hardware and software communication through LANs and WANs.

The EECE 261 course will focus on the key concepts associated with LANs and WANs. It will first introduce students to transmission fundamentals and protocol architectures associated with LAN and WAN technology, such as techniques for flow control, time synchronization, multiplexing, and congestion control. This subject matter will be followed by a study of widely used asynchronous and synchronous networking architectures, such as ATM, SONET, and MPLS/IP. The course will cover material on cellular, wireless, and converged networking protocols and mechanisms, such as GSM, VOIP, and location-aware services. The emphasis of the course will be on ISO OSI reference model and its relationship to traditional and next-generation convergent LAN/WAN technologies and applications.

The EECE 262 course will be a projects course that will provide students with in-depth opportunities to implement applications and services based upon the concepts covered in EECE 261. Course assignments will involve network configuration of LANs/WANs, as well as smartphone programming using donated Google Android and Apple iPhone handsets, open source software-based PBXs (asterisk), and other convergent infrastructure provided by Vanderbilt ITS.

**Class Schedule:** 2 classes per week of 1hr 15m each

### **Overview of Topics:**

- Transmission Concepts
- Protocol Architectures
- Encoding and Modulation
- Asynchronous and Synchronous Transmission
- Wide Area Interface Architectures
- Analog and Circuit Digital Switching
- Wireless Transmission
- Cellular Telephony
- Synchronous, Time, and Frequency Division Multiplexing
- Wide Area Network Protocols
- Static and Dynamic Routing with IPv4 and IPv6

- Session Management and Initiation Protocols, such as SIP
- Address Resolution Protocol (ARP)
- Internet Control Message Protocol (ICMP)
- Converged Networks
- Open-source platforms for next-generation network and mobile devices.
- VOIP Software Architectures
- P2P Network Message Routing
- Quality of Service Management for Packet-based Networks
- Software switching for VOIP
- Softphones
- Virtual Private Networks
- Open-source platforms for software PBXs
- Router and PBX Virtualization
- Open-source platforms for streaming media
- IP Multimedia Subsystem (IMS)
- Multiprotocol Label Switching

### **Grading:**

There will be a short graded quiz at the end of class each Thursday, starting on August 28th. The exam and the quizzes will largely be based on material presented in class. It is therefore essential that you attend class in order to prepare for the quizzes and final exam. There will be no "makeup" quizzes unless you ask permission from me before the quiz. The relative weighting of each portion of the course is presented below:

- 20% Assignments, 20% In-class Design Problems
- 40% Quizzes
- 20% Final Exam

Note that I reserve the right to change the weights during the course of the semester.

### **EECE 261 Schedule of Course Topics:**

The general outline of the course is below. Adjustments to the topics and scheduling may be made depending on class interest and time. Reading assignments for each week are listed and should be completed before class on Thursday (except the week of Aug 27).

August 27:

Course overview and Introduction to Network Convergence

Quiz 0

September 1-3

Stallings, Chapters 1-2

Quiz 1

September 8-10

Stallings, Chapters 10-11 + Chapter 8 pages 240, 241, 248 (8.2) up to TDM Link Control

Topics: Packet Switching, Circuit Switching, Frame Relay, X.25, Synchronous Time Division Multiplexing

Quiz 2

September 15-22

Stallings, Chapter 7

Topics: Flow Control, Error Detection, Error Control, HDLC

Quiz 3

September 29-October 1

Stallings, Chapter 12

Packet Routing

Quiz 4

October 6-8

Stallings, Chapter 13

Congestion control in data networks.

Quiz 5

October 13-15

Stallings, Chapter 15

Local area networks

Midterm

October 20

Stallings, Chapter 18

Internet protocols

Quiz 6

October 22-23, Fall Break