EE 449 Computer Communication Networks

**Designation:** Elective  
**Catalog Description:** EE 449 Computer Communication Networks (3) ISO Reference Model, Physical Layer, Data Link Layer protocols, local- and wide-area networks, routing, congestion and flow control, TCP/IP, higher-layer protocols, network design, performance evaluation, high-speed networks. Pre: 315 and one of EE 342, MATH 371, or MATH 471; or consent.  
**Credits:** 3  
**Pre- and Co-requisites:** Prerequisites: EE 315 “Signal and Systems Analysis” and one of EE 342, MATH 371 “Elementary Probability Theory”, or MATH 471 “Probability”.  
**Class/Lab Schedule:** Three 50-minute lectures. Lab is held once per week (3 hours) for roughly 8-10 weeks.  

**Topics Covered:**  
This course explains how modern computer-communication networks work. The emphasis is on Layer 1 (Physical), Layer 2 (Link), Layer 3 (Network) and Layer 4 (Transport) of the 7-Layer ISO Reference Model. The course is systems oriented, as opposed to analytical, and involves some laboratory work.

**LECTURES**
- **Part I: Basics of Data Communications** (14 lectures): Introduction to computer communications, description of the wired and wireless telephone systems, modems, time, frequency, and code-division multiplexing, the plesiochronous digital transmission system, the synchronous digital transmission system (SONET), packet switching, error-control techniques, data-link protocols, HDLC.
- **Part II: Local Area Networks** (14 lectures): Packet networks and the OSI model, the ALOHA System, CSMA LANs and Ethernet, repeaters, bridges, hubs and switches, token-ring LANs, wireless networks including WiFi and WiMax.
- **Part III: Wide Area Networks** (15 lectures): The network layer and the IP protocol, Routing algorithms, Voice over IP, the Transport Layer and the TCP protocol, Virtual-circuit networks-vs-datagram networks, ATM networks and protocols, ATM service classes and quality of service, IP over ATM, IP Label switching (MPLS).

**LABORATORIES**
Each group of two students has a PC, which is connected to the internet. There are 7 experiments each of which takes one or two weeks to complete:
- Lab 1: Introduction to Ethereal  
- Lab 2: Link-layer Protocols  
- Lab 3: Network-layer Protocols  
- Lab 4: Transmission-Control Protocol  
- Lab 5: TCP and UDP  
- Lab 6: Network address translation  
- Lab 7: VoIP
Textbook and Other Required Materials:


Course Objectives and Relationship to Program Objectives:

This course explains how modern computer-communication networks work. The emphasis is on Layer 1 (Physical), Layer 2 (Link), Layer 3 (Network) and Layer 4 (Transport) of the 7-Layer ISO Reference Model. The course is systems oriented, as opposed to analytical, and involves some laboratory work. [Program Objectives addressed by this course: 1,2, and 4.]

Course Outcomes and Their Relationship to Program Outcomes

The following are course outcomes and the Program Outcomes (numbered 1-11 in square braces “[ ]”) they address:

- Students will understand network architectures, primitives, and models.
- Students will be able to use knowledge of linear systems and Fourier analysis to solve problems related to the Physical Layer of computer networks. [1,5,11]
- Students will be able to extract the essential features of problems and to discard irrelevant data. [1, 2]
- Students will be able to set up simple networking systems. [2,4]
- Students will be able to write lab reports and work in lab groups (teams). [4,7]
- Students will understand current network architectures, such as TCP/IP and ATM, and be aware of some of the recent trends in networking. [9,10]

Contribution of Course to Meeting the Professional Component

Engineering topics: 100%

Computer Usage: The laboratories have computer usage primarily through setting up network experiments and demonstrations.

Design Credits and Features: The course is oriented toward understanding networking primitives, models, and architectures. It has only limited design content. There are 0 design credits.

Instructor(s): E. J. Weldon, Jr. and J. Yee.

Person(s) Preparing Syllabus and Date: E. J. Weldon, Jr. March 18, 2009