# EE 449 Computer Communication Networks

**Credits**: 3

**Categorization of credits:**    engineering topic

**Instructors:**  E. J. Weldon,  Jr. and J. Yee.

**Textbook and Other Required Materials**: *Computer Networks*, Fundamental Concepts and Key Architectures, 2nd edition, by A. Leon- Garcia and I. Widjaja, McGraw-Hill, 2004.

**Designation:**  Elective

**Catalog Description: EE 449 Computer Communication Networks (3)** ISO Reference Model, Physical Layer, Data Link Layer, Network Layer and Transport Layer protocols.  Wired and wireless local area networks, routing, congestion and flow control, TCP/IP, higher-layer protocols, network design, performance evaluation, high-speed networks.

**Pre-and Co-requisites**: Prerequisites: EE 315 "Signal and Systems Analysis" and one of EE 342 "Probability and Statistics" or Math 371 "Elementary Probability Theory" or Math 471 "Probability".

**Class/Lab Schedule:**  3 lecture hours per week.  Some lectures are used to discuss labs or get started together.

**Topics Covered:**

- Computer Networks and the Internet, ISO Reference Model (3 hours)
- TCP/IP Architecture, Internet Protocol, Transmission Control Protocol (5 hours)
- Routing in Computer Networks, shortest path algorithms (Bellman-Ford, Dijkstra), distance vector protocols (RIP, IGRP), link state (OSPF, IS-IS) (6 hours)
- Setting up real networks, configuring routers and the protocols (6 hours)
- Medium Access Control Protocols (4 hours)
- Local Area Networks (6 hours)
- Setting up networks of routers and Ethernet switches and their configuration (3 hours)
- Data Link Layer, ARQ and Reliable Data Transfer Service (3 hours)
- Performance evaluation and network design (3 hours)
- Digital Transmission Fundamentals (4 hours)

**Course Objectives and Their Relationship to Program Objectives:**

The student learns the basic concepts of networking and develops an understanding of how the Internet works.  The student is usually aware of the vast number of applications of the Internet. The student develops an understanding of how the subsystems of the very complex system, the Internet, interact to provide these services.  The student develops an understanding of the layered organization of the protocols used in the Internet.

**Course Outcomes and Their Relationship to Program Outcomes:**

The following are the course outcomes and the subset of Program Outcomes (numbered 1-7 in square brackets '[ ]") they address:

- Understand networking architectures and protocols [2]
- Understand distributed algorithms and their application in the design of routing protocols [1, 2]
- Understand the advantage and disadvantages of distance vector and link state routing protocols [1, 2]
- Understand IP addressing, subnetting, VLSM/supernetting and effectively applying these to improve to performance of a network [2]
- Understand basic network security via access control lists [2]
- Understand the relationship between wildcard masks and set theory and their application in access control lists/security [1, 2]
- Be able to do basic configuration of routers and switches [5]
- Understand the basic application of probability and queueing theory in computer network design [1]
- Understand the application of Fourier analysis to address Physical Layer issues [1]
- Understand current networking technologies and be aware of trends [7]

**Contribution of Course to Meeting the Professional Component**

Engineering Topics: 100%

**Computer Usage**

The student uses a PC to configure routers and switches which are computers.

**Deign Credits and Features**

There are 0 design credits. The student learns to consider various performance measures in evaluating various design alternatives. The student learns ways of improving performance by optimizing the address design.

**Person(s) Preparing Syllabus and Date:** James Yee, October 12, 2014. Y. Dong, June 14, 2021.