1. TITLE OF COURSE AND COURSE NUMBER: Data Communications and Computer Networks, CS430 Credits: 3

2. DESCRIPTION OF THE COURSE: Topics include basic concepts, principles, design procedures, and applications of data communication systems. ISO reference model for open system interconnection is used as the basis to discuss the functions and protocols of layered network structures. Also introduced are the evolutions trends of networking technologies, various types of networks from LAN to WAN, internetworking architectures, network security, management, and applications.

3. COURSE PREREQUISITES: CS 341 and CS345 with grades of C- or better

4. COURSE OBJECTIVES:

   To learn the principles of data communications, computer networks, and inter-networking.

   To understand the functions and design principles of different types of computer networks from LANs to WANs.

   To understand the concepts of the OSI 7-layer reference model and the functions assigned to each layer.

   To learn the TCP/IP protocol stack, the de-facto internetworking standard.

   To become familiar with the services provided by major communication carriers and the trends.

   To learn other aspects of data communication and networking including security and network administration.

   To understand the trends of the rapidly evolving communication and networking technologies.

   To appreciate the impact of data communication and networking technologies on society.

5. STUDENT LEARNING OUTCOMES:

   Upon completion of the course, students will be able to:

   a) Understand the advantages and specific uses of a network.
b) Recognize data communications and networking standards and the standard organizations.
c) Identify basic communication hardware and software components of a computer network.
d) Recognize the infrastructures of the networking industry and identify the services provided by the major data communications carriers.
e) Understand the design principles of LANs and WANs.
f) Design and implement a simple LAN and a WAN that meet a specific set of criteria.
g) Understand the general functions of network administration.
h) Identify the new trends and technologies, their potential applications.
i) Articulate the social impact of the networking technology particularly on issues related to security and privacy.

The above outcomes will be assessed via: exams, surveys, homework and projects.

Through classroom participation and discussions, and various homework, term papers, team lab projects, and other assignments, the course also reinforce the following students learning outcomes of the university:

a) Effectively express themselves in written and oral form. Measure: exams, homework and projects.
b) Demonstrate ability to think critically. Measure: exams, homework and projects.
c) Locate and use information. Measure: projects.
d) Demonstrate ability to integrate knowledge and idea in a coherent and meaningful manner. Measure: exams, homework and projects.
e) Work effectively with others. Measure: projects.

6. **TOPICAL OUTLINE OF THE COURSE CONTENT:**

**Topic 1: Introduction to Data Communications and computer networks**
   a) Use of data communications 
   b) Basic components of communication network 
   c) Evolution of systems form 1950s till today 
   d) Types of networks 
   e) Current and future networks 

**Topic 2: OSI 7-layer reference model and concepts of open standards**
   a) Motivations for standards 
   b) ISO reference model 
   c) Open standard 

**Topic 3: The Communication Hardware**
   a) Transmission media and signal types 
   b) Terminals and Computers 
   c) Modems and telephone networks
d) Multiplexers and line controllers

Topic 4: Data Transmission Basics
a) Asynchronous transmission
b) Synchronous transmission
c) Error detection methods
d) Data compression

Topic 5: Protocol Basics
a) Error control
b) Idle and continuous RQ
c) Link management
d) Data link control protocols

Topic 6: Network Configurations
a) Topology: ring, bus, star, and mesh
b) Configurations: LAN, MAN, and WAN

Topic 7: Local Area Networks
a) Types
b) Protocols
c) Performance

Topic 8: Wide Area Networks
a) Packet-switched data networks
b) Circuit-switched data networks
c) ISDN
d) Private networks

Topic 9: Internetworking
a) Architectures
b) Protocol standards
c) Internet IP
d) The ISO protocols

Topic 10: Network Design Fundamentals
a) System approach
b) Steps
c) A survey of design tools

Topic 11: Introduction to Network Administration
a) Personnel organization
b) Basic functions
c) Managing day-to-day operations
d) Test equipment
Topic 12: Network Security and Control
   a) Error control
   b) Evaluation of Security problems
   c) Risk Assessment
   d) Basic control principles of a secure network

7. GUIDELINES/SUGGESTIONS FOR TEACHING METHODS AND STUDENT LEARNING ACTIVITIES:

   a) Lectures and classroom discussions emphasizing active learning.
   b) Term papers and reports emphasizing to achieve breadth and depth. These assignments also aim to develop critical thinking and the ability to effectively utilize library and the Internet resources.
   c) Lab sessions: design and set up a internet with multi-segment LANs to gain hands-on experience.
   d) Problem-solving sessions and pre-exam reviews.

8. GUIDELINES/SUGGESTIONS FOR METHODS OF STUDENT ASSESSMENT
   (STUDENT LEARNING OUTCOMES):

   a) Attendance and classroom participation.
   b) Examinations, quizzes, and final examination.
   c) Various homework assignments including term papers and reports.
   d) Programming and lab projects.

9. SUGGESTED READINGS, TEXTS, OBJECTS OF STUDY:


10. BIBLIOGRAPHY OF SUPPORTIVE TEXTS AND OTHER MATERIALS:


Stallings, W., 2004; Computer Networking with Internet Protocols, Prentice Hall, Upper Saddle River, NJ


Dean, T., 2000, Network+ Guide to Networks, Course Technology, Cambridge, MA


Umar, A., 1997; Object-Oriented Client/Server Internet Environments, Prentice Hall, Upper Saddle River, NJ

Halsall, F., 1996; Data Communications, Computer Networks and Open Systems, 4th edition, Addison-Wesley Publishing Company


Periodicals and journals:
- Communications, a monthly journal published by ACM
- Computer, a monthly journal published by IEEE Computer Society
- IEEE/ACM Transactions on Networking

Web sites of networking organizations:
- http://www.npa.org Network Professional Organization
- http://www.acm.org Association of Computing Machinery
- http://www.computer.org IEEE Computer Society
- http://www.enanet.org Enterprise Networking Association
- http://www.netproguild.org Network Professional Guild

Web sites Networking standard organizations:
- http://www.ansi.org American National Standards Institute
- http://www.eia.org Electronic Industry Alliance
- http://www.ieee.org IEEE web site
- http://www.itc.ch International Telecommunication Union
- http://www.iso.ch International Organization for Standardization

11. PREPARERE’S NAME AND DATE: Dr. E. Hu; Fall 1996
12. **ORIGINAL DEPARTMENTAL APPROVAL DATE:** Spring, 1997

13. **REVISORS'S NAME AND DATE:** Drs. E. Hu and B. Su; Spring, 2005 and previously Spring, 2000

14. **DEPARTMENTAL REVISION APPROVAL DATE:** Spring, 2005