UNIVERSITY OF NEBRASKA AT OMAHA
COURSE SYLLABUS/DESCRIPTION

Department and Course Number	CSCI 3550
Course Title	Communication Networks
Course Coordinator	Azad Azadmaneh
Total Credits	3
Date of Last Revision	Feb 3, 2015

1.0 Course Description Information:

1.1 Catalog description:

This course introduces the students to the important topics concerning the technology and architecture of data communication and computer networks. Through TCP/IP and Ethernet protocols, the course covers the principles of networking with an emphasis on protocols, implementations and design issues.

1.2 Prerequisites of the course (Courses).

Data Structures (CSCI3320), Introduction to C Programming (CSCI1840)

1.3 Overview of content and purpose of the course:

This course is primarily for senior-level undergraduate students. The course is designed for students with little or no background in network communication. The coverage of the course is based on the Internet protocol layers (TCP/IP, Ethernet). A top-down study of the layers introduces the students to the major principles of network technologies, protocols, and implementation. The course includes multiple exams, in addition to homework and programming assignments.

1.4 Unusual circumstances of the course.

None

2.0 Course Justification Information

2.1 Anticipated audience/demand:
The course is required for computer science students. The course can also be taken by other non-CS students. Although the course is inherently an undergraduate course, some non-CS units may require their students to take the course as a graduate level course. The course content for such students is the same.

2.2 Indicate how often this course will be offered and the anticipated enrollment:
The course is offered Fall and Spring semesters. The course may also be offered during the summer time, depending on enrollment size. The average size of a class during the Fall and Springs semesters is 25 – 30 students.

2.3 If it is a significant change to an existing course, please explain why it is added:

N/A

3.0 List of performance objectives stated in learning outcomes in a student's perspective:

3.1 Students will learn about traditional and modern network technologies.
3.2 Students will learn about details of common network protocols.
3.3 Students will have a better understanding Internet implementation.
3.4 Students will have the basic ability to write application programs.
3.5 Students will learn how to compare different network protocols.
3.6 Students will have the ability to configure and debug their computers in case of network difficulties.
3.7 Students will be able to work-out and explain the important networking performance parameters.
3.8 Students will have a good understanding of various addressing types and the reasons behind them.
3.9 The students will have the ability to clearly distinguish between TCP/IP vs. Ethernet; and when they are applied.
3.10 The students will have the basic understanding of how the impaired communicated messages get corrected.
3.11 The amount of knowledge on TCP/IP, Ethernet is overwhelming. Through discussions, homework, and programming assignments, the students will have a good understanding on how the major components of the entire protocol suite fit together.
3.12 The students will have the basic understanding of various protocols in each layer.
3.13 The students will have a better appreciation for the unique characteristics of wireless communication in comparison to wired technologies.

4.0 Content and Organization Information

4.1 List the major topics central to this course:

4.1.1 Introduction (4 hours)

- Internet and its history
- Concept of switching
- Protocol Layering (TCP/IP, OSI)
- Types of addresses (Name, Port, IP, Hardware)

4.1.2 Application Layer (5 hours)

- Purpose of application layer
- Application layer paradigms (Client/server, P2P)
- Client/server applications
- Some standard client/server applications (HTTP, FTP, Email, SSH, DNS)
- P2P applications
- Some P2P applications (Skype, BitTorrent, Ad Hoc)
- Socket interface programming (UDP, TCP)

4.1.3 Transport Layer (10 hours)

- Purpose of transport layer
- User datagram protocol (UDP)
- Principles of reliable data transfer

- Transmission control protocol (TCP)
- Congestion control
- Flow control (stop-and-wait, Selective repeat, Go-back-N)

4.1.4 Network Layer (10 hours)

- Network layer services and routing principles
- Packet switching
- Structure of routers
- IPv4 datagram format and addressing
- IPv6 datagram format and addressing
- Routing (unicast, multicasting)
- Internet control message protocol (ICMP)
- Dynamic host configuration protocol (DHCP)
- Network address translation (NAT)

4.1.5 Data-link Layer (12 hours)

- Data-link sublayers & services
- Framing
- Error detection/correction (Parity, Checksum, CRC, Hamming)
- Multiple access protocols (Random, Controlled, Channelization)
- IEEE Project 802 (Wired & Wireless)
- Interconnecting devices (Hubs, Bridges, Switches, Routers, Gateways)
- Data link control protocols (HDLC, PPP)
- WiFi, Bluetooth, WiMAX
- Ethernet (Principle, addressing, technologies)
- Cellular technologies

4.1.6 Physical layer (4 hours)

- Digital/analog
- Transmission media
- Transmission impairment
- Data rate/bandwidth
- Analog to digital conversion
- Digital to analog transmission
- Multiplexing (FDM, DTM, WDM)

5 Teaching Methodology Information:

5.1 Methods to be used.

The course will be presented primarily in lecture form. A top-down approach is presented for the coverage of the Internet layers, which begin by introducing the highest layer, to make it easier for students to understand how the major network components work together before discussing the layers in more detail. Students are expected to participate in discussions of the various topics as they are studied.

5.2 Student role:

The students are often reminded to participate in discussion and encouraged to ask questions. The students are continuously reminded not to miss classes or assignments, as their impacts will be highly noticeable toward the end of the semester. They are also involved through exams, homework, and programming assignments.

6.0 Evaluation Information:

6.1 Describe the typical types of student projects that will be the basis for evaluating student performance.

- Students will be evaluated based on homework and programming assignments, and exams. There will be around 10 homework and programming assignments. There are three exams for the course; approximately one exam every five weeks.

6.2 Describe the typical basis for determining the final grade (e.g. weighting of various student projects):

- Three exams will be given during the course:
  25% Exam 1
  25% Exam 2
  25% Exam 3
  25% Homework & Programming assignments

  Tentatively, exams are scheduled every 5 weeks.

6.3 Grading type:

$90 \leq A- < 92 \leq A < 97 \leq A+ \leq 100$
$80 \leq B- < 82 \leq B < 86 \leq B+ \leq 89$
$70 \leq C- < 72 \leq C < 76 \leq C+ \leq 79$
$60 \leq D- < 62 \leq D < 66 \leq D+ \leq 69$
$F \leq 59$

7.0 Resource Material Information

7.1 Textbooks and/or other required readings used in course.

B.A. Forouzan, F. Mosharraf, *Computer Networks: A Top-Down Approach*, MCGraw Hill, 2012.

7.2 Other suggested reading materials, if any.

7.2.1 Andrew S. Tanenbaum, *Computer Networks* (*5th Edition*), Prentice Hall, 2010.

7.2.2 J. F. Kurose and K. W. Ross, *Computer Networking: A Top-Down Approach* (6th edition), Pearson, 1013.

7.3 Current bibliography and other resources:

7.3.1 The author of the text book contains numerous resources for students such as links, exams, practice tests, simulations, etc:

http://highered.mheducation.com/sites/0073523267/information_center_view0/index.html

8.0 Other Information:

8.1 Accommodations statement:

Empty

8.2 Other:

Empty

8.3 Author(s):

Azad Azadmanesh, Computer Science Department

9.0 Computer Science Accreditation Board (CSAB) Category Content (class time in hours):

CSAB Category	*Core*	*Advanced*
Data structures	3	0
Computer organization and architecture	4	0
Algorithms and software design	6	2
Concepts of programming languages	2	0

10.0 Oral and Written Communications:

Every student is required to submit at least __0__ written reports (not including exams, tests, quizzes, or commented programs) to typically __0__ pages and to make __0__ oral presentations of typically __0__ minutes duration. Include only material that is graded for grammar, spelling, style, and so forth, as well as for technical content, completeness, and accuracy.

11.0 Social and Ethical Issues:

No coverage

12.0 Theoretical content

	Contact hours
• Protocol layers and their service models	1.0
• Principles of application layer protocols	1.0
• Principles of reliable data transfer	3.0
• Principle of flow control and congestion control	2.0
• Routing principles	2.0
• Principle of digital/analog communication	1.0
• Multiple access protocol	3.0
• Error detection/correction	3.0

13.0 Problem analysis:

Students experience analysis of problems through class examples and assignments. Analysis and development of existing network protocols are presented in class and are required for some programming assignments.

14.0 Solution design:

A sequence of assignments provides the students with experience in understanding the design requirements and implementation issues of a real communication system. Students are expected to apply their understanding based on lectures and class examples to solve various network communication problems

CHANGE HISTORY

Date	***Change***	***By whom***	***Comments***
11/19/2002	Initial ABET version	Youn	
06/13/2003	Cleanup	Wileman	
09/15/2008	Update resource materials	Youn	Update of textbook and reading materials
09/18/2008	Update Course objectives to improve wording		
09/23/2008	Insertion of table mapping course objectives to program outcomes	Youn	
02/03/2015	Updating course materials and textbook	Azad Azadmanesh	