1 Course Description Information

1.1 Catalog description

This course is designed to bring students up to the state of the art in networking technologies with a focus on Internet. It will cover the principles of networking with an emphasis on protocols, implementations and design issues.

1.2 Prerequisites of the course

CSCI 3320/8325 Data structures and algorithms. Java or C++ programming.

1.3 Overview of content and purpose of the course

This course is for a first course on computer networking, and it will cover a blend of theoretical topics and practical examples as well as the state of the art in networking research with a focus on Internet technologies. This course will focus on core concepts that are essential for current network practitioners who want to understand the 'whys' behind the protocols they work with every day and to see the big pictures of networks. The course topic also includes network application development in which students get hand-on experience with basic network programming and development of simple network applications on top of TCP/IP.

1.4 Unusual circumstances of the course

None.

2 Course Justification Information

2.1 Anticipated audience / demand

This course is intended for junior/senior students in computer science and related disciplines interested in studying the state of the art in networking research with a focus on Internet technologies.

2.2 Indicate how often this course will be offered and the anticipated enrollment

This course will be offered every semester. The anticipated enrollment is 30 students per semester.

2.3 If it is a significant change to an existing course please explain why it is needed

The prerequisite of the course was changed. There is no significant change.
3 Objective Information

Is this course part of the General Education curriculum?
No

3.1 List of performance objectives stated in learning outcomes in a student’s perspective

- To learn about traditional and modern network technologies.
- To learn about details of common network protocols.
- To better understand Internet implementation.
- To learn how Internet works and how to design/implement Internet applications.
- To learn about performance issues in network communication, so that different network protocols can be compared.

3.2 General Education Standard Learning Objectives

Does not apply.

4 Content and Organization Information

4.1 List the major topics central to this course

1. Computer Networks and the Internet (4 hours)
   (a) What is the Internet?
   (b) The Network Edge
   (c) The Network Core
   (d) Delay, Loss, and Throughput in Packet-Switched Networks
   (e) Protocol Layers and Their Service Models

2. Application Layer (5 hours)
   (a) Principles of Network Applications
   (b) The Web and HTTP
   (c) File Transfer: FTP
   (d) Electronic Mail in the Internet
   (e) DNS—The Internet’s Directory Service
   (f) Peer-to-Peer Applications
   (g) Socket Programming with TCP
   (h) Socket Programming with UDP

3. Transport Layer (10 Hours)
   (a) Introduction and Transport-Layer Services
   (b) Multiplexing and Demultiplexing
(c) Connectionless Transport: UDP
(d) Principles of Reliable Data Transfer
(e) Connection-Oriented Transport: TCP
(f) Principles of Congestion Control
(g) TCP Congestion Control

4. The Network Layer (10 Hours)
   (a) Introduction
   (b) Virtual Circuit and Datagram Networks
   (c) The Internet Protocol (IP): Forwarding and Addressing in the Internet
   (d) Routing Algorithms
   (e) Routing in the Internet
   (f) Broadcast and Multicast Routing

5. The Link Layer and Local Area Networks (10 Hours)
   (a) Link Layer: Introduction and Services
   (b) Error-Detection and -Correction Techniques
   (c) Multiple Access Protocols
   (d) Link-Layer Addressing
   (e) Ethernet
   (f) Link-Layer Switches
   (g) Link Virtualization: A Network as a Link Layer

6. Wireless and Mobile Networks (3 Hours)
   (a) Introduction
   (b) Wireless Links and Network Characteristics
   (c) WiFi: 802.11 Wireless LANs
   (d) Mobility Management: Principles
   (e) Mobile IP

5  Teaching Methodology Information

5.1 Methods

The principal method for teaching this course is the lecture/discussion format, along with small-group exercises and individual presentations when appropriate.

5.2 Student Role

Students will be actively involved in the course through general discussion, in-class and outside-of-class writing assignment, small-group exercises, and individual presentations of student research.
6 Evaluation Information

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

Evaluation of student performance will be based on two exams (with short answer and essay elements), written assignments, programming assignments, a group project presentation/report, and class participation.

Group Project: Students can work on either a research-oriented project or an implementation-oriented project. Students may work individually or in a team of three to four students. The objective of a group project is to study and digest advanced technical literature, and report on it in a form that is easy to understand for other students in the class.

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

Weighting of projects will be determined by the instructor and communicated to students at the start of the term. What follows is one possible example.

25% Exam 1
25% Exam 2
20% Written Assignments
15% Programming Assignments
10% Project
5% Class Participation

6.3 Grading type

The final letter grade for a numeric grade of \( g \) will be assigned using the following table, or one that is slightly more generous, as the numeric break points between the different letter grades may be lowered (based largely on overall class performance), but they will never be increased.

| \( 97 \leq g \leq 100 \) percent | A+ | \( 77 \leq g < 80 \) percent | C+ |
| \( 93 \leq g < 97 \) percent | A | \( 73 \leq g < 77 \) percent | C |
| \( 90 \leq g < 93 \) percent | A- | \( 70 \leq g < 73 \) percent | C- |
| \( 87 \leq g < 90 \) percent | B+ | \( 67 \leq g < 70 \) percent | D+ |
| \( 83 \leq g < 87 \) percent | B | \( 63 \leq g < 67 \) percent | D |
| \( 80 \leq g < 83 \) percent | B- | \( 60 \leq g < 63 \) percent | D- |
| \( g < 60 \) percent | F |

7 Resource Material Information

7.1 Textbook(s) or other required readings used in course


7.2 Other student suggested reading materials

To be provided.

7.3 Current bibliography and other resources


8 Other Information

8.1 Accommodations statement

Accommodations are provided for students who are registered with UNO Disability Services and make their requests sufficiently in advance. For more information, contact Disability Services (EAB 117, Phone: 402.554.2872, TTY: 402.554.3799) or visit the web at http://www.unomaha.edu/disability.

8.2 Other

None.

8.3 Author(s)