Course Description

Communication networks form the core of today’s internet. This introductory, first-year graduate course on computer networks covers protocol design principles, performance considerations, and networking technologies, with a particular focus on the Internet. A top-down approach is followed towards understanding the Internet’s five-layer architecture including application, transport, network, link and physical layers. Particular emphasis is given towards both the fundamental concepts and principles, and on practical considerations. Both analytical and programming based approaches are followed to gain a better understanding of networking fundamentals and applications. Programming assignments may involve –

(a) Introductory-level network application programming in Java or C/C++,
(b) Wireshark labs at the end of chapters in textbook, and
(c) C programming on Unix based systems.

Overall, this course will equip you with a deep knowledge of protocols that make today’s Internet work, help you develop critical insights into their design, and obtain a first-hand feel for implementation through lab exercises. This course is also intended to help you prepare for doing research in the field of computer networking.

Required or Elective

Elective for BS in CS and BS in CE.

Catalog Description

Presents a quantitative performance evaluation of telecommunication networks and systems. Includes fundamental digital communications system review; packet communications; queuing theory; OSI, s.25, and SNA layered architectures; stop-and-wait protocol, go-back-N-protocol, and high-level data link layer; network layer flow and congestion control; routing; polling and random access; local area networks (LAN); integrated services digital networks (ISDN); and broadband networks.
Prerequisites

CS 300 Data Structures and Algorithms
IME 254 Engineering Probability and Statistics

Prerequisite Expectations by Topic

**Required**
- ‘C’ programming language and programming skills
- Data Structures – Arrays, Linked Lists, Queues and Trees
- Algorithms – Space and Time Complexity
- Basic Probability

**Desirable**
- Knowledge of C++ and/or Java
- Socket Programming
- Wireshark and/or Ethereal

Instructor

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Textbook


Course Objectives

- Identify the objectives of various Internet Protocols and associate them with respective layers (application, transport, network and link layers) in internet architecture
- Analyze the design and performance considerations in various networking concepts and protocols both qualitatively and quantitatively
- Analyze the advantages and disadvantages of various approaches towards providing reliability, congestion control, shortest-cost routing, and multiple access
- Discuss latest research papers and formulate open research problems
- Appropriately interpret the results of network programming and other lab exercises
Format and Grading Percentages

Primarily lecture based class (2 lectures each week). There will be 4 – 5 home works (or reading assignments), 2 – 3 programming assignments (or lab exercises), and three exams.

Exams 60%
- Exam 1: 15 points;
- Exam 2: 15 points;
- Exam 3 (COMPREHENSIVE): 30 points;

Home Works 15%
- One homework per major topic
- Each submission has equal weight

Programming Assignments 25%

Exam Schedule

Since the exams will be held during class hours, you should not have any conflicts. However, if you do have a scheduled conflict for the exam period, see the instructor. There will be NO make-up exams. All exams will be closed book/notes (no laptops allowed), and will be time constrained. Exams will typically consist of quantitative problems, modeling and design questions, multiple choice (true-false) questions and short answer questions and will focus on concepts. Tests 1 and 2 will cover the material covered until the previous lecture before the test. Test 3 will be comprehensive, but it will place extra emphasis on incremental material covered since the previous exam.

EXAM DATES:
- Exam 1: September 23rd, 2010 (15%)
- Exam 2: October 28th, 2010 (15%)
- Exam 3: December 9th, 2010 (30%, comprehensive)

Tentative List of Topics

- Computer Networks and the Internet : Chapter 1
- Application Layer : Chapter 2
- Transport Layer : Chapter 3
- The Network Layer : Chapter 4
- The Link Layer and Local Area Networks : Chapter 5

Optional Topics (time permitting)
- Wireless and Mobile Networks basics : Chapter 6
- Security in Computer Networks : Chapter 8
General Policies

- The exams and home works will be based upon lectures and required reading.
- Our policy will be to return graded material within one week of handing it in. All issues regarding graded material should be resolved within one week of the date graded material is returned. Any graded material that is not picked up within two weeks will be discarded.
- All home works and other submissions must be submitted by the indicated deadline. Submissions after the deadline will not be graded. Exceptions will require a valid and documented reason. There will be no make-ups for home works.
- Blackboard would be used extensively for posting lecture slides, assignments and grades.
- Late submission of programming assignments may be allowed with 25% penalty, until the next class meeting after the submission deadline. You need to inform the instructor if you plan to submit the programming assignment late.
- Home works and other assignments will clearly state where, how and when to submit your assignment. Late submissions are not accepted (except for programming assignments, as mentioned above). Submissions over email are not accepted, and would be discarded.
- Exam dates will not be changed (including final exam).
- Academic Honesty: Please refer to the university’s academic honesty statements. While it is encouraged to interact with your colleagues, your submissions must be only your own work. Issues of academic dishonesty will be dealt with severely.