To: new or prospective students entering our PhD or MS program who are interested in computer networking.

So you want to study networking….congratulations!! In this memo, I identify two sets of courses that represent two tracks: one research oriented (for PhDs and highly motivated MS students) and one for MS students who are preparing for a job in industry. For either track, my approach to teaching/mentoring students is best summarized as helping to create “well trained minds”. My objective is not to teach you how to program in C/C++, Java, Java#, PHP, or the latest programming language of the day. Instead we teach you how to analyze and model complex systems. These are necessary skills for most areas of Computer Science research. For those that are industry bound, I claim that these skills are necessary to ensure success at the top tech companies.

Funding: If you are an MS student, you should not expect an assistantship. For PhD students, if you have an area of interest you probably already have an idea of our faculty in this area. You should contact them.

Please refer to the latest PhD and MS program requirements as this provides the correct details you must meet to get your degree. The courses listed below represent my suggestions for classes that will provide you a foundation for the study of or a career in networking systems.

Industry path
Systems: 822 Linux Operating Systems
Languages: 827 Programming Languages
Theory: 838 Algorithms

Networking:
624: Linux Sys Admin and Security
851: Computer Networks
852: TCP/IP Protocols
853 Linux TCP
854: Internet Performance
Research path
Systems: 822 Linux Operating Systems
Languages: 827 Programming Languages
Theory: 838 Algorithms

Networking:
851: Computer Networks
852: TCP/IP Protocols
853 Linux TCP
854: Internet Performance

ECE
ECE 638 (Computer Communications)
ECE 640 (Perf analysis of Networks)
ECE 819 (Detection and Estimation Theory)
ECE 822 (Information Theory)
ECE 848 (telecommunications analysis)

MathScience (highly recommend 811, 812, 814)
  800 Probability (for review purposes)
  803 Stochastic Processes
  805 Data Analysis
  809 Time Series Analysis
  810 Mathematical Programming
  811 Nonlinear Programming
  812 Discrete Optimization
  814 Network Flow Programming
Prospective Networking Students who want to do research in networking:

If you are interested in joining my research group you must take CPSC 852 and CPSC 854 to obtain the necessary background and skills. By the time you complete 854 you will have started your research project. Before taking CPSC 852, if you are not comfortable with sockets, "C" programming, and Linux, you should consider taking CPSC 360 and/or 624. Other classes of interest for networking students are the 822/853 series. I expect PhD students that are funded by my research to take Math Science optimization courses: 8110 and 8120.

If you do plan on working on research under my guidance please make sure that you have a light course load during your last two semesters so that you can focus on your research.

Funding: only students that demonstrate an aptitude for networking research (the usual method is by earning an “A” in CPSC852 and CPSC854) will be considered for an assistantship. RA positions are given only to PhD students.

Courses

CPSC 852: Internet Issues and Performance: This course deals with the principles and issues underlying the provision of wide area connectivity through the interconnection of autonomous networks. Emphasis will be placed on Internet architecture and protocols as they are today and as they are likely to evolve in the future. Case studies of particular protocols will demonstrate how fundamental principles are applied in practice. They will also provide the opportunity to practice a critical skill: shifting through details for the key idea. The functional requirements of internetworking will be motivated by selected examples of networked client/server applications.

At the conclusion of the course you should be able to:

1. Demonstrate an understanding of the fundamental problems, tradeoffs, and design issues that arise in internetworking, as well as identify and critically evaluate internet technologies and solution approaches.

2. Understand the details of several particular protocols, as example implementations of fundamental principles, and digest descriptions of specific protocols, extracting the fundamental concepts.
3. Implement complex networked applications using the BSD sockets interface.
4. Identify and employ appropriate tools for evaluating protocol performance.
5. Apply basic concepts to new networking environments.
6. Engage in original research in the area of internetworking.

**CPSC 854: Internet Issues and Performance:** This course is intended for PhD students (or MS Thesis students) with an interest in network performance analysis and Internet protocols and issues. The course will provide a foundation for research in network analysis focusing on current Internet protocols and issues. At the end of the course, you will have the background necessary to conduct measurement and simulation based research in the area of computer networking.

In the first half of the course you will learn how to use the 'ns' simulation tool. In addition to 'ns' discussions, the lecture and homework assignments will focus on the foundations of simulation analysis beginning with a review of probability, stochastic systems, probability models, experimental statistics, and time series analysis. These topics provide a framework that is used to learn about discrete-event simulation. Simulation specific topics include topics such as different types of simulation (discrete-event, monte carlo), dealing with randomness (generating random numbers and random variates, techniques to assess the quality of the random number generator), traffic generators (i.e., generators that produce aggregate traffic that exhibits desired properties such as periodic behavior, Poisson behavior, or long-range dependent behavior). In the second half of the semester you will apply the "theory" by working on a research project of your own choosing. I provide a list of projects that you can chose. Or, if you already have a research topic, you will be encouraged to extend the scope to include a networking component. At the end of the semester you will have completed a research paper that describes and documents your project. The goal is for this paper to be publishable in a student oriented conference such as ACM SouthEast conference or sent in an online magazine such as http://www.acm.org/crossroads/.

Prerequisite: CPSC 852/permission of instructor. You must have had a basic course in probability and statistics (e.g., MATHSC 301/302). Finally, you must be proficient in the "C" or "C++" programming language and have basic Unix programming skills.