

UNIVERSITY OF DELAWARE
DEPARTMENT OF COMPUTER & INFORMATION SCIENCES

CISC 453/653: Simulation of Computer Networks

Fall Semester, 2008

Tuesdays 12:30 – 1:45 pm, 051 McKinly Lab

Thursdays 12:30 – 1:45 pm, 238 Purnell

Professor: Adarsh Sethi (sethi@cis.udel.edu)

Office Hours: Mondays 1 – 3 pm, 422 Smith

Course Description:

Modeling and computer simulation of discrete systems using discrete event simulation techniques. Application to the performance evaluation and modeling of computer networks and networking protocols. Study and use of the OPNET simulation system.

Prerequisites: CISC 450 or CISC 650.

Desired Background: Programming proficiency in C/C++, knowledge of probability theory and statistics.

Goals: The aim of this course is to provide the student with a good understanding of the fundamental concepts and principles of discrete event simulation as applied to the simulation of computer networks and protocols. The students will learn how to use the OPNET IT Guru and Modeler software for such simulations. The course will rely heavily on labs and practical simulation exercises involving a variety of networking technologies and protocols.

Learn how to use the OPNET software for network simulation and add to your marketable skills. OPNET is widely used in industry, government, and defense enterprises.

Contents:

1. Introduction to simulation principles and to OPNET IT Guru and Modeler.
2. Principles of discrete event simulation.
3. Simulation of routing protocols: Distance-vector (RIP) and Link state (OSPF).
4. Simulation of transport protocols: TCP and UDP, reliable data transfer, flow control and error control, congestion avoidance.
5. Simulation of LAN protocols: Ethernet, wireless LAN (802.11).
6. Simulation of Wireless networks: Mobile ad-hoc networks (MANET), mobility models.
7. Simulation of applications and modeling of various traffic types.
8. Design of new simulation models with OPNET Modeler: Node and Process models.
9. Introduction to and familiarity with basic queuing models.
10. Analysis of simulation results: basic statistical analysis.
11. Comparison with other simulation platforms: Qualnet, ns-2.

Textbook: There is no prescribed textbook for the course. Instead, we will use online material. Selected course notes will also be provided.

You may find it useful to have a networking textbook to use for reference. Any of the following will suffice:

1. "Computer Networking: A Top-Down Approach Featuring the Internet" by James F. Kurose and Keith W. Ross. Boston, MA: Addison-Wesley. Either the Third Edition (2005) or the Fourth Edition (2008).
2. "Computer Networks" by Andrew S. Tanenbaum. Upper Saddle River, NJ: Prentice Hall, 2003. Fourth Edition.
3. "Data and Computer Communications" by William Stallings. Upper Saddle River, NJ: Prentice Hall, 2004. Seventh Edition.

Course Policies:

1. Thursday classes will be lectures in 238 Purnell while Tuesday classes will be mixed lectures/demos/labs in 051 McKinly. The course will be heavily based on lab work. There will be a new lab each week that we will start in class but which you will have to finish later on your own. There will be one final exam, which will be a mixture of written exam and lab problems. Students registered for CISC 653 will be assigned extra problems, work, homeworks, or labs, and may be given a different exam.
2. Late Policy: Each Homework Assignment and Lab is due at the beginning of class on the date specified for it. Any assignment submitted after this time will lose 10% credit for each working day that it is late (not counting weekend days); an assignment which is more than 5 working days late will not get any credit. Example: a homework/lab that is due on Thursday October 16 must be handed in by 12:30 pm (beginning of class) on that date. If it is turned in later that day or before 4:30 pm on Friday October 17, it will be counted as 1 day late and will lose 10%. If it is turned in after that but before 4:30 pm on Monday October 20, it will be deemed to be 2 days late and will lose 20%. The last date it will be accepted is Thursday October 23 at 12:30 pm when it will lose 50%.
3. All assignments should be submitted to me in class. Alternatively, they may be left in my mailbox in Smith 101 (main CIS office) after noting down the date and time of submission on the top page. This is an honor system. Your word is good enough for me. Please do not ask the secretaries or anyone else to sign the submission or to verify the time as they are busy people and should not be burdened with this task.
4. Grading Policy: The weight assigned to each component of the course is

Lab Assignments (including homeworks)	70%
Final Exam	30%

Your performance in each of these categories will be averaged using the above weights to arrive at your overall score. Your grade will be given using this score on a relative basis (i.e., will be curved). Grades for CISC 453 and 653 will be assigned separately and independently of each other.

5. You are expected to know and abide by the University's policy on Academic Dishonesty found in the Official Student Handbook and also available on the Web at

<http://www.udel.edu/stuguide/08-09/code.html#honesty>

The Code of Conduct listed therein applies to this course. Additionally, the following specific requirements will be expected in this class. All homeworks and lab work (unless specified otherwise) are individual assignments, and group work is not permitted. General discussion on course material and conceptual ideas are acceptable (and even encouraged), and it is expected that we will cooperate with each other and help each other out during the lab sessions when some of us have difficulty. **However, all homeworks and labs must be completed on your own and the work that is submitted should be work that is done by you. For all such work, students are not permitted to access or compare any answers, code, or models with those of any other person. Looking at another person's work, comparing answers or code before submitting one's work, and copying another person's work in whole or in part is considered plagiarism. If any students are suspected of violating this policy, they will be prosecuted according to University guidelines. This applies to both the student who gets answers and the student who gives answers.** If you have any questions about the policy as it applies to this course or to any specific situation in the course, I encourage you to come and talk to me.

6. This course will use the University of Delaware's new Sakai Course Management System. The course outline, policies, homework assignments and labs, and other reference material will be made available to the extent possible on Sakai. The web site is

<http://www.udel.edu/sakai>

This course will use the 051 McKinly lab for which you will need ECE/CIS Academic accounts. If you do not currently have such an account, you can apply online at

<http://www.eecis.udel.edu/NewAccount/>

If you do not know whether or not you have such an account, try logging in to *hplab.acad.cis.udel.edu*. If you are successful, then you have an academic account. **You must have an active academic account before you show up for the first class in 051 McKinly Lab.** If you have any problems with your account or with computer system access, then you should post a request for help on the online service/help request system at

<https://www.eecis.udel.edu/service/>

7. The Teaching Assistant for this course is Peng Wu. He can be reached at pwu@cis.udel.edu. His office hours will be announced later.
8. I encourage you to interact with me through electronic mail. Send mail to sethi@cis.udel.edu. In case you want to meet me outside class, my office hours are Mondays 1-3 pm in Smith 422. I can also be available at other times by appointment. Send me email or call me at 831-1945 to get an appointment.