Goals:
This course provides a broad background in queuing theory fundamentals and their application to the performance analysis of computer networks and network protocols. A student completing this course should have a working knowledge of basic queuing theory concepts and be able to apply this knowledge to model the class of systems encountered in computer hardware, software, and networking applications.

Required Background:
CISC 650 or ELEG 651 (Computer Networks II) or equivalent, or instructor permission. Some background in probability theory is required. Good calculus skills are assumed. This is an advanced graduate course that requires commensurate mathematical ability and aptitude.

Textbook:

The text may be supplemented by material from other books, from the web, and by readings from journal and conference papers.

Course Contents:

1. Introduction to modeling techniques.

2. Review Topics - Probability theory, use of transforms.


4. Markovian queues in equilibrium - The M/M/1 queue and variations, Erlangian arrivals and service times.
5. The M/G/1 queue - Distributions of number in system and waiting time, Priority Queuing.

6. Open and closed queuing networks.

7. Multiaccess Communication: ALOHA Protocol, Carrier Sensing (CSMA), CSMA/CD.

8. Advanced Topics and Applications: Some applications to networking such as Flow and Congestion Control, Analysis of ARQ Protocols, Multipath Routing, etc. will be integrated with the study of queuing theory topics above.

Course Structure:

The course grade will have two components:

- **Homeworks (70%)**: There will be 6-8 homeworks distributed throughout the semester. The homeworks will involve queueing theory concepts and networking applications. Each homework will be due on the assigned date; late submissions will be accepted up to a maximum of one week late and will be penalized 10% for each day late (not counting weekends and holidays). **All homeworks will be individual assignments.**

- **Final Exam (30%)**: The Final Exam will be held during the Finals week and the exact date and time will be announced later. The Final Exam will cover the whole semester’s syllabus and will be open-book open-notes.

Grades will be assigned on a relative basis based on the weights listed above. Subjective factors that may also affect your grade include class attendance and participation in discussions.

This course will use the University of Delaware’s Canvas Course Management System. This course syllabus, weekly reading assignments, and the homework assignments will be posted on Canvas. That site also contains pointers to textbooks and online material that will be helpful. In addition, course grades will be posted on this site. However, homeworks should be submitted to me in class in hard copy. The Canvas site is: [http://www.udel.edu/canvas](http://www.udel.edu/canvas) You can log in to the site using your UDEL login id and password.