CS 5143
Network Design and Management

Course Description
This course covers basic concepts of designing networks using analytical and modeling techniques, and network management protocols.

Course Focus
This course focuses on the design aspects of computer networks. It will consider the design of network parameters that affect network Quality of Service parameters such as throughput, packet loss, delay and jitter. It emphasizes on individual projects and class presentations.

Prerequisite
CS 4133 or CS 5133, or equivalent.

Texts and References
- Telecommunication Networks: Protocols, modeling and analysis by Mischa Schwartz, Addison Wesley, 1988
- Additional references and handouts as required will be provided by the instructor.

Topics to be covered
- Queuing Theory and applications
  - Poisson Process
  - Various queuing disciplines, e.g. MM/1, M/M/c, FIFO, etc.
  - Queue with discouragement, queues with dependence on state of system,
  - Little’s theorem,
- Markov chains and applications
- Packet switching network and performance analysis: open and closed loop queuing networks, application of product form solution to the analysis of packet switched networks
- Modeling and analysis of circuit switched networks
  - ATM switch performance
  - Analysis of switches with non uniform traffic (hot spots)
- IP Quality of Service
  - Integrated Services,
  - Differentiated Services,
  - TCP/IP over ATM,
  - Scheduling policies
- Buffer Management
  - RED and variants
  - Early Packet Discard
  - Explicit Congestion Notification
- Modeling of computer network protocols
- Simulation Techniques
  - ns-2, loss, delay, throughput
- Network Management
  - SNMP, MIB, RMON
- Advanced Topics
Computer Usage
The course will use Linux OS and C++ programming language. Simulation software may be used. Selected course material will be delivered via D2L at learn.ou.edu. If you have any difficulty in obtaining the course information, contact your instructor immediately.

Student Contributions
Each student is expected to spend at least 6 hours per week preparing for class. Lecture attendance is crucial in this class. Each student will take a midterm exam and a comprehensive final exam, as well as homeworks, projects and presentation. Working together on out-of-class assignments is encouraged, but all submitted work must reflect each student's understanding, and all documents including programs must be developed independently. Assignments are due at the beginning of class.

Course Evaluation
Exams, projects and homeworks will be used to assess each student's progress towards meeting the stated course goals. The following points will result in at least the letter grade specified: A=90 - 100, B=80 - <90, C=70 - <80. The points will be distributed as follows:

<table>
<thead>
<tr>
<th>Component</th>
<th>Points</th>
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<tbody>
<tr>
<td>Midterm Exam</td>
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<td>Projects</td>
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<td>Homeworks</td>
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<td>Final Exam</td>
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Course Schedule
This course meets in Carson 119 on Mondays and Wednesdays from 4:30 – 5:45 pm.

Office Hours
Dr. Atiquzzaman is available for further discussion via email or during office hours:

Mondays and Wednesdays: 9:30 – 10:30 AM
and by appointment

Students with Disabilities
Any student in this course who has a disability that may prevent him or her from fully demonstrating his or her abilities should contact me personally as soon as possible so we can discuss accommodations necessary to ensure full participation and facilitate your educational opportunities.

Religious Holidays
It is the policy of the University to excuse the absences of students that result from religious observances and to provide without penalty for the rescheduling of examinations and additional required class work that may fall on religious holidays. Any student in this course who plans to observe a religious holiday that might conflict with course requirements should contact me personally as soon as possible so we can make appropriate arrangements.

Academic Integrity
The provost’s web pages include information on expectations for academic integrity. Please review the material at http://integrity.ou.edu/
Adjustments for Pregnancy/Childbirth Related Issues: Should you need modifications or adjustments to your course requirements because of documented pregnancy-related or childbirth-related issues, please contact me as soon as possible to discuss. Generally, modifications will be made where medically necessary and similar in scope to accommodations based on temporary disability. Please see [www.ou.edu/content/eoo/pregnancyfaqs.html](http://www.ou.edu/content/eoo/pregnancyfaqs.html) for commonly asked questions.

Title IX Resources: For any concerns regarding gender-based discrimination, sexual harassment, sexual misconduct, stalking, or intimate partner violence, the University offers a variety of resources, including advocates on-call 24/7, counseling services, mutual no contact orders, scheduling adjustments and disciplinary sanctions against the perpetrator. Please contact the Sexual Misconduct Office 405-325-2215 (8-5) or the Sexual Assault Response Team 405-615-0013 (24/7) to learn more or to report an incident.

Student ratings: The College of Engineering utilizes student ratings as one of the bases for evaluating the teaching effectiveness of each of its faculty members. The results of these forms are important data used in the process of awarding tenure, making promotions, and giving salary increases. In addition, the faculty uses these forms to improve their own teaching effectiveness. The original request for the use of these forms came from students, and it is students who eventually benefit most from their use. Please take this task seriously and respond as honestly and precisely as possible, both to the machine-scored items and to the open-ended questions.