

# ECE 7353 – Network Modeling and Analysis

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## Syllabus

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### Course Information

- Spring 2021
- Classroom: TBA
- Time: 2 pm ~ 4:30 pm, Wednesdays

### Instructor

- Professor Shivendra S. Panwar
- Office Hours: TBA or by email appointment.
- Office: 2 MetroTech Center, 9th Floor, 9.105
- Contact: 732-547-8906, [panwar@nyu.edu](mailto:panwar@nyu.edu)

### Instructor for experimental methods

- Dr. Fraida Fund
- Office: 2 MetroTech Center, 10th floor, 10.065
- Contact: [ffund@nyu.edu](mailto:ffund@nyu.edu)

### Course Prerequisites

- ECE 6303, ECE 5373/6353 or ECE 3613 or equivalent

### Course Outline (ordering subject to change)

- Poisson process, Markov chains
- M/M/1 Queue
- M/G/1 queue
- Other queues, queuing networks
- Feedback Congestion analysis: TCP Analysis
- Random access networks; Aloha, CSMA
- Random access networks, IEEE 802.11 WiFi analysis
- Performance analysis of switches: Output queuing, VOQ, Load balancing
- Source traffic modeling –Equivalent bandwidth approach/admission control
- Long range dependence
- Capacity of ad hoc networks, connectivity, mobility, new topics
- Markov Decision Processes and Reinforcement Learning
- Project Presentations

## Experimental Methods: Outline

We will have several short lab lectures in class on topics related to experimenting with computer networks:

- How analytical, simulation, and testbed results support and validate one another, and what potential pitfalls exist in each approach.
- Asking a meaningful research question and designing an experiment to answer that question.
- Interpreting experimental results and communicating them a way that convinces the reader that your results are valid.
- Implementing experiments and describing your implementation so that they can be easily replicated by yourself and others.

We will apply the lessons from these lab lectures to some small experiments on queueing systems, which you will implement on the GENI networking testbed. Next, you will apply these principles to an independent project.

## Text Books

- Data networks, Second Edition, D. Bertsekas and R. Gallager PDF version available for free via author's website: <http://web.mit.edu/dimitrib/www/datanets.html>

## Other References

- Lecture notes (will be posted on NYU Classes)
- Communication Networking: An analytical approach, A. Kumar et al. Available as ebook via NYU Libraries when you are on NYU network:  
<http://ebookcentral.proquest.com/lib/hyulibrary-ebooks/detail.action?docID=333974>
- Papers (will be posted on NYU Classes)

## Grading Policy

- Quizzes (on lecture, lab, and homework material) 50%
- Projects (one on analytical techniques, one on experimental techniques) 50%
  1. On analytical techniques: you will study or extend an existing analytical model.
  2. On experimental techniques: you will implement an experiment to try and reproduce a published result from networking research, and possibly extend it.

## Homework

- Lab assignments, reading assignments, homework problems and solutions will be posted on NYU Classes. Please check **Homework** for assignments after each lecture. Strongly recommend that you attempt all homework problems. Homework and lab assignments will not be graded, but in-class quizzes will draw on this material.