

## Data Networks

Classes held at Jeffrey 102, Mon 14:30-15:20, Tue 16:30-17:20, Thu 15:30-16:20

### Course Information

Design of communication networks involve many theoretical and practical challenges. This course will present a number of mathematical tools to develop approaches and algorithms for optimization of communication networks, and networks in general.

- Instructor: Serdar Yüksel, Jeffrey Hall 415, Phone: 533-2429, E-mail: [yuksel@mast.queensu.ca](mailto:yuksel@mast.queensu.ca)
- Office Hour: Tuesday 14:00-15:00
- Recommended Text: *Control Techniques for Complex Networks*, by Sean P. Meyn,  
(Copies of this book are available at the Queen's Bookstore -book is also available online-)  
Supplemental Notes will be posted on the course web site
- References: *Markov Chains and Stochastic Stability*, by S. P. Meyn, R. L. Tweedie  
*Communication Network Analysis*, Lecture Notes by Bruce Hajek (available online)  
*Data Networks*, by D. Bertsekas and R. Gallager  
*Dynamic Programming and Optimal Control*, by D. Bertsekas  
*Mathematics of Internet Congestion Control*, by R. Srikant
- Announcements: Visit <http://www.mast.queensu.ca/~math484> for announcements, homeworks etc.
- Grading: Assignments 10%; Midterm 25% , Project/Presentation 30%, Final 35%

### Topics

- Mathematical Models for Communication Networks and the Single Queue
- Review of Markov Chains, Martingales and Stochastic Stability
- Single Queue as a Sampled Process, Poisson and General Distributions, Little's Theorem
- Controlled Random Walk Model and the Fluid Model
- Workload and Stability
- Dynamic Programming and the Linear Programming Approach to Markov Decision Processes
- Scheduling, Routing and Flow Control
- Graph and Decentralized Algorithms
- Multiple Access Channels
- ...Project Presentations