

0306-694/794 Intro to Data & Communication Networks

Instructor and office hours

- Shanchieh Jay Yang, jay.yang@rit.edu, <http://www.ce.rit.edu/~sjyeec>
- Office Hours: (09-3425) see the schedule in instructor's homepage.
- Slides & homework will be posted at <http://www.ce.rit.edu/~sjyeec/0306-694>
- Lectures: MW 1000-1150am, 09-1129
- Announcements will be sent via the <http://www.mycourses.rit.edu> system.

Description

This course will give an overview of the technologies, architectures and protocols used to build various types of computer and communication networks – wired or wireless. The emphasis will be placed on discussions of various network design problems and solution principles. Specific issues covered in this course include:

- Overview: network services / requirements: telephone, Internet, ATM & cable networks
- Network design problems and principles
 - Encoding, framing, error detection, and reliable transmission
 - Multiple access control
 - Naming & addressing
 - Routing
 - Flow / congestion control
 - Switching and scheduling

Prerequisite: 1016-351 Probability and Statistics.

Recommended Textbook

- *Computer Networks: A systems approach*, L. Peterson and B. Davie. Morgan Kaufman, 4th edition, 2007.
- *Computer Networking: A top down approach featuring the Internet*, James F. Kurose and Keith W. Ross. Addison Wesley, 4th Edition, 2007.
- *Data and Computer Communications*, William Stallings. Prentice Hall, 8th Edition, 2007.

(Other references:)

- *High Performance Communication Networks*, J. Walrand and P. Varaiya. Morgan Kaufman, 1996.
- *An Engineering Approach to Computer Networking - ATM Networks, the Internet, and the Telephone Network*, S. Keshav, Addison Wesley, 1997.

Evaluation / Grading Policy

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| • Assignments: | 20% |
| • Quizzes: | 20% |
| • Midterm: | 25% |
| • Final exam: | 30% |
| • Wildcard (best of the above four): | 5% |
| • 794 assignment (794 student only): | 10% |

Each 794 student will have a quarter-long assignment: an RIT Wiki site that introduces an instructor approved networking topic. The sites will need to have thorough and well organized explanations with credible references, examples, mathematical definitions, etc. All 694/794 students will evaluate each site at the end of Week 5 and at the end of Week 10 through RIT's Clipboard. The 794 students will have their overall grades normalized by 110% instead of 100%.

No late homework or make-up quizzes/exams will be accepted without prior arrangement with the instructor. All special arrangements need to be made with at least 24-hour advance notice to the instructor.

Tentative Schedule

Week	Topics
1	<ul style="list-style-type: none">• Overview of networking problems<ul style="list-style-type: none">○ Modulation, digitization, and coding○ MAC, Routing and addressing○ Congestion and flow control○ Switching and scheduling○ Security• Network types: packet vs. circuit switching• Performance metrics: delay, throughput, loss, BW-delay product, RTT
2	<ul style="list-style-type: none">• Modulation, digitization and coding<ul style="list-style-type: none">○ Quantization and sampling (Nyquist theorem)○ SNR and Shannon's theorem○ Compression and error correction○ Packetization
3	<ul style="list-style-type: none">• Medium Access Control / Multiple Access Control (MAC)<ul style="list-style-type: none">○ FDMA, TDMA, CDMA○ Parameter 'a'○ ALOHA
4	<ul style="list-style-type: none">• Medium Access Control / Multiple Access Control (MAC) (cont')<ul style="list-style-type: none">○ CSMA/CD○ Token Ring○ CSMA/CA (MACAW)
5	<ul style="list-style-type: none">• Addressing<ul style="list-style-type: none">○ IP vs. MAC addresses○ Subnetting and supernetting (CIDR)○ DNS, ARP, ipconfig (or ifconfig), nslookup• Midterm
6	<ul style="list-style-type: none">• Addressing (cont')• Routing<ul style="list-style-type: none">○ Link-state (Dijkstra) algorithm○ Distance-vector (Bellman-Ford) algorithm
7	<ul style="list-style-type: none">• Routing (cont')<ul style="list-style-type: none">○ Assessments of Link-state and Distance-vector algorithms○ Repeater, bridge, switch and router○ Spanning tree algorithm
8	<ul style="list-style-type: none">• Flow and congestion control<ul style="list-style-type: none">○ Stop-and-wait and sliding window○ TCP header and 3-way hand-shake○ TCP flow control
9	<ul style="list-style-type: none">• Flow and congestion control (cont')<ul style="list-style-type: none">○ RTT estimation○ TCP congestion control (AIMD)○ TCP Tahoe, Reno, and Vegas
10	<ul style="list-style-type: none">• Switching and scheduling• Other selected topics (e.g., security)• Review