



CSC6290: Data Communication and Computer Networks

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Objectives of the course

- *Ultimate goal:*
 - To help students become deep thinkers in computer networking!
- Humble course objectives:
 - To help students understand the three basic building blocks of computer networking, i.e., multiplexing, switching, and routing
 - To help students develop deep insight into computer networking through systematic analysis of networking design and implementation
 - to help students appreciate the basic techniques of designing and analyzing networked systems

Suppose we were in the old days (1900s ...):

How to design solutions to basic networking issues and how to analyze the behaviors of networked systems?

Topics to cover

- *Prelude*: history, current status, future directions of computer networks; examples of network analysis
- Review of math materials
- *Networking*: fundamental elements and current practice
- *Multiplexing*
 - Performance measures and engineering issues
 - Stream sessions: deterministic and stochastic analysis
 - Circuit-multiplexed networks
 - Adaptive bandwidth sharing for elastic traffic
 - Multiple access: wireless networks

Topics (contd.)

- *Switching*

- Performance and architecture issues
- Queueing in packet switches
- Switching fabrics
- Packet processing

- *Routing*

- Engineering issues
- Shortest path routing of elastic aggregates
- Virtual-path routing of elastic aggregates
- Routing of stream-type sessions

Perspectives

- Computer science is more than programming!
- Computer networking as efficient resource sharing
- Deep insight through design and analytical modeling

Textbooks

- Required:
 - **[R0]** Anurag Kumar, D. Manjunath, Joy Kuri, *Communication Networking: An Analytical Approach*, Morgan Kaufmann, 2004. ISBN: 0124287514
- Recommended references:
 - **[R1]** Anurag Kumar, D. Manjunath, Joy Kuri, *Wireless Networking*, Morgan Kaufmann, 2008. ISBN: 978-0-12-374254-4
 - **[R2]** Larry Peterson and Bruce Davie, *Computer Networks: A Systems Approach* (4th edition), Morgan Kaufmann, ISBN: 0123705487
 - **[R3]** Jim Kurose and Keith Ross, *Computer Networking: A Top-Down Approach Featuring the Internet* (4th edition), Addison-Wesley, ISBN: 0321497708.
 - **[R4]** Srinivsan Keshav and S. Keshav, *An Engineering Approach to Computer Networking: ATM Networks, the Internet, and the Telephone Network* (1st edition), Addison-Wesley, ISBN: 0201634422.
 - **[R5]** Mohamed G. Gouda, *Elements of Network Protocol Design* (1st edition), John Wiley & Sons, ISBN: 0471197440.
 - **[R6]** Sheldon M. Ross, *Introduction to Probability Models*, 9th edition, Academic Press, 2006. ISBN: 9780125980623.
 - **[R7]** Robert G. Gallager, *Discrete Stochastic Processes*, Kluwer Academic Publishers, 1996. ISBN: 0792395832.

Logistics

- Class timings
 - MW 1:20pm-2:40pm
- Office hours
 - MW 4:30pm-5:30pm in *454 State Hall*, or by appointment
- Teaching Assistant
 - TBA
 - Office hours
 - TBA
- Mailing list
 - csc6290@lists.wayne.edu

Logistics (contd.)

- Prerequisites
 - Basic knowledge of computer networks (e.g., materials covered in CSC4992 or equivalent), elementary probability theory and statistics. Or consent of instructor
- Course website
 - <http://www.cs.wayne.edu/~hzhang/courses/6290b/6290b.html>
- Affinity study group: up to 3 students per group
 - For homework and project
 - NOT for in-class exam

Logistics (contd.)

- Grading
 - Class participation: 10%
 - Homework assignments: 30%
 - Exam: 30%
 - One midterm, NO final exam
 - Project: 30%

- Letter grades will be assigned based on performance *relative* to other students;
A tentative grading scale:
 - A: 93-100
 - A-: 90-92
 - B+: 85-89
 - B: 80-84
 - B-: 75-79
 - C+: 70-74
 - C: 65-69
 - C-: 60-64
 - F: 0-60

Project

- Survey the design and analysis of selected protocols/systems in the following fields:
 - *Wireless, embedded networking* technologies and applications in
 - vehicles: V2V, V2I, sensing and control, infotainment, etc.
 - industrial control: feedback control, machine health monitoring, etc.
 - Can focus on issues such as *MAC, interference management and control, routing, and transport control.*

Project (contd.)

- *Sensor network* applications and protocol design in
 - Healthcare
 - Engineering: structural health monitoring, factory automation & industrial control, etc.
 - Scientific study: environmental engineering, social sciences, etc.
 - Homeland security and military
 - Daily life: urban sensing, security monitoring

- Can focus on issues such as *MAC, routing, transport control, data storage and querying, and localization.*

Project (contd.)

- *Wireless mobile network* applications and protocol design in
 - traffic control: real-time road traffic condition detection and control
 - Auto safety: DSRC
 - Homeland security
 - Social networks

- *Heterogeneous network* applications and protocol design in
 - integrated wireless networks (sensor networks, WiFi, cellular) and the Internet etc.

- Other topics of your choice (with consent of instructor)

Project (contd.)

■ Rules

- Students are allowed to form groups in doing projects, but the number of students per group should be no more than 3
- First choose one of the above research fields, and then start surveying the literature to understand the state of the art in the field
- *Report the history, development, and open issues of your chosen topic(s)/challenge(s)*
 - It will be great if you can form your own opinions of the research topic you have chosen.
- It is **required** that, in your project report, you present whether and how the basic challenges (such as media access control, routing, and congestion control) in your chosen research field remain the same as or differ from what we have discussed in class

Project (contd.)

- Deliverables
 - Written project report (in the form of a survey paper)
 - In-class presentation
- Timeline
 - Select the topic and form your project group by 09/21/2008
 - Detailed project report outline & list of references are due on 10/31/2008
 - Submit slides for your presentation at least one day before your presentation (date to be decided)
 - Submit your project report electronically by midnight 12/14/2008
- Evaluation criteria
 - Breadth and depth of your understanding of the literature, as evidenced by your project report and presentation
 - Presentation quality (e.g., clarity, readability, and conciseness) of your talk and written report

What is this course NOT for?

- Network programming
- Assemble networks with switches, routers, firewalls, etc.
- Design websites

Policies

- Lecture attendance required
- Homework
 - No late submission without prior permission
- Exam required
- Others
- Frequently check out the course website for updates

How to succeed in this course?

- Attend lectures, and read books after classes
- Work on homework and project
- Ask questions!!!

Questions?

