Advanced Computer Communication

Course Information

Hung-Yun Hsieh
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Course Information

- Registration
  - Title: Advanced Computer Communication (高等電腦通信)
  - Code number: 921EU3460
  - Credit: 3 points
  - Time: Thursday 2:20pm ~ 5:20pm
  - Place: Room 144, EE-II Building
- Instructor
  - Prof. Hung-Yun Hsieh <hyhsieh@cc.ee.ntu.edu.tw>
  - Office: Room 409, EE-II Building
  - Office hours: By appointment

Goal and Scope

- Goal
  - This is course is intended for students with background in computer communication networks who would like to
    - Know more about some fundamental theories in computer communication networks
    - Expose themselves to analytical and mathematical tools for advanced research in computer networking
- ☞ What should be covered?
- Scope of this course
  - Fundamental principles and theories of computer networking, including packet scheduling, routing, flow control, and network optimization

Course Plan

- Introduction
- Multiplexing (switching)
  - Deterministic and stochastic network analysis, and packet scheduling
- Routing
  - Shortest path routing and optimal routing
- Flow (congestion) control
  - Analysis of TCP and TCP-friendly congestion control, and active queue management
- Network optimization
  - Network design problem formulation and linear programming

Course Plan – Caveats

- Coverage
  - The topics selected cover important and fundamental building blocks in computer networking
    - Layer 2, layer 3, and layer 4
    - Network design
    - ☞ No established paradigm for writing the syllabus
    - ☞ Course plan may be biased by the interests of the lecturer
  - The context of this course is set in wired networks, but the fundamental principles and theories also find important applications in wireless networks
    - ☞ Stepping stone to understanding and analyzing many problems in wireless networks

Course Plan – Caveats (Cont.)

- Depth
  - The scope of this course prevents in-depth treatment of all topics
  - Several topics deserve a one or two semester courses by themselves
    - Network calculus
    - Queueing theory and/or Queueing networks
    - Graph theory
    - Network optimization

☞ Course plan is subject to change depending on class progress

Prerequisites

- Background knowledge
  - Computer communication networks, or
  - Introduction to computer networks
    - ☞ This course covers selected topics which are very focused, and hence you need to have at least the "big picture" of what computer networking is
    - ☞ It is possible to acquire the required background knowledge through self-learning
  - Engineering mathematics
    - Probability, in particular
    - Elementary linear algebra
    - Discrete mathematics (a plus)

Course Materials

- Course materials are taken mainly from three reference books
  - (B&G) D. Bertsekas and R. Gallager, Data Networks, Prentice-Hall, 1992
  - (KMK) A. Kumar, D. Manjunath, and J. Kuri, Communication Networking – An Analytical Approach, Elsevier, 2004
  - (AMO) R. Ahuja, T. Magnanti, and J. Orlin, Network Flows, Prentice-Hall, 1993

- ☞ Other supplementary materials
  - Selected book chapters, journal or conference papers

Three Textbooks?

- The decision as to where you should buy all three books is totally up to you
  - Lecture slides will be prepared as self-contained as possible
  - ☞ Homework assignments too
- You can wait until we go into each topic and then decide whether you want to buy the concerned book for reference
- The NTU library can always help

Grading

- Class participation (10%)
  - Questions and discussions
  - Student presentations (TBA)
- Homework assignments (30%)
  - Exercises
  - Paper reviews
  - ☞ It is okay to discuss homework with other students, but you have to write your homework
- Midterm exam (30%)
- Final exam (30%)

Course Administration

- An English course
  - Lectures and student presentations are in English
  - All homework submissions too
  - ☞ Audience can use Mandarin if so desired
- Course webpage
  `http://cc.ee.ntu.edu.tw/~hyhsieh/teaching/communication07s`
  - Announcements
    - Course administration
  - Syllabus and course materials
    - Reading lists
    - Supplementary materials
  - Homework assignments and submissions