Course Syllabus

Introduction to Computer Networks
Department of Electrical Engineering
National Taiwan University

Course code: 901E31110
Course title: Introduction to Computer Networks
Institution name: Department of Electrical Engineering, National Taiwan University
Instructor's name: Polly Huang
Contact details: pollyhuang@ntu.edu.tw, +886-2-33663599
Term offered: Spring 2025, Feb 17, 2024 to Jun 06, 2025
Weeks of duration: 16 weeks
Hours per week: 3 hours lecture for 16 weeks
Credit value: 3 units

Detailed course description:
This is an introductory course on computer networks, largely the Internet. The course is designed for undergraduate students who are interested in the science and engineering aspects of the Internet. The goal is two-fold: to communicate the technical essence and to foster development skill.

We will take the top-down approach this semester. Following a (hopefully) brief overview, the lectures will go right into the Internet applications most of us are familiar with, e.g., the WWW and the HTTP protocol that's supporting the operation of WWW. HTTP there is referred to as an application-layer protocol.

The intention is to go 3-4 weeks per layer, digging in to the low-level details one layer at a time, e.g., the TCP protocol running at the Transport layer, and the BGP routing running at the Network layer. When time permits, we shall look into the Ethernet protocol running at the Link Layer.

Communication of knowledge is often more effective when it's put into use. Eying also the job prospective, the course features a series of programming assignments (PAs) and accompanying videos to lead you into the world of network and web programming with Go, a programming language adopted widely by the major Internet companies, e.g., Google and Facebook, for server-side implementations.

Course objective(s):
- Overviewing the existence and the components of the Internet
- Examining the mechanisms running in various layers
- Understanding the nature of the problems these mechanisms are trying to solve

- Developing system-level coding skill

Pre-requisites:
- Introduction to Computer Programming (C-like or Python knowledge required)
- Introduction to Computers (fundamental computer system knowledge required)
- Data Structure and Programming Languages (preferred)

Weekly topics discussed:
1. Admin, Overview: Internet and Protocol
2. Overview: Internet edge, Internet core, Performance metrics
3. Application Layer: Overview, Quality of services
4. Application Layer: HTTP, DNS
5. Application Layer: SMTP, P2P, Multimedia
6. Exam #1 (on 3/26)
7. Transport Layer: Overview, UDP, Reliable data transfer - stop and wait
8. Transport Layer: Reliable data transfer - pipelined
9. Transport Layer: TCP error recovery, Flow control, Connection management
10. Transport Layer: General congestion control, TCP congestion control
11. Exam #2 (on 4/30)
12. Network Layer: Router Architecture, IPv4, DHCP, Addressing
13. Network Layer: NAT, IPv6, SDN data plane
14. Network Layer: Routing principles
15. Network Layer: Internet Routing, SDN control plane
16. Exam #3 (on 6/4)

Method of evaluation and grading:
- Quizzes 30%
- Programming Assignment 35%
- Exams 30%
- Participation 5%
- Graded on a curve

Textbooks, reading lists used:
- Computer Networking: A Top-Down Approach Featuring the Internet, 7th Edition. James F. Kurose; Keith W. Ross, Pearson, ISBN-13: 978-0133594140.
- An Introduction to Programming in Go. Caleb Doxsey, Free online: pdf

Course materials and/or assignments:
- https://homepage.ntu.edu.tw/~pollyhuang/teach/intro-cn-spring-25/