

Master Course Syllabus
School of Engineering and Computer Science
Washington State University Vancouver

CS 455
Introduction to Computer Networks
3 Semester Hours

Catalog Description

Principles and implementation of computer networks; architectures, protocols, internetworking and addressing case studies.

Prerequisite Courses

CS 360 – Systems Programming

Prerequisite Topics

- Programming Proficiency
- Mathematical proof techniques
- Basic digital logic
- Use of Unix environment for coding, compilation, debugging and testing
- Use of Unix operating system API, particularly low level I/O and file system access

Measured Course Outcomes

Students taking this course will:

1. Describe and analyze the design principles and protocols in the application layer, such as HTTP and FTP protocols (*Contributes to performance criterion A-3*)
2. Describe and analyze the design principles and protocols in the transport layer, such as congestion control, flow control, reliability control algorithms and TCP/UDP protocols (*Contributes to performance criterion A-3*)
3. Describe and analyze the design principles and protocols in the network layer, such as routing algorithms and IP addressing principles (*Contributes to performance criterion A-3*)
4. Describe and analyze the design principles and protocols in the link layer, such as error control and flow control algorithms (*Contributes to performance criterion A-3*)
5. Describe and analyze the design principles and communication protocols in the physical layer, such as Nyquist theorem and Shannon-Hartley Law (*Contributes to performance criterion A-2*)

6. Implement and debug network algorithms, protocols or systems with modern programming languages and platforms (*Contributes to performance criterion I-5*)

Required Textbooks

Computer Networking - a top-down approach featuring the Internet, by James F. Kurose, Keith W. Ross, 4th Edition, 2007. ISBN: 0-321-49770-8

Reference Material

UNIX Network Programming Volume 1, by W. Richard Stevens, 2nd Edition, Prentice Hall, 1998. ISBN: 0-13-949876-1

Computer Networks, by Andrew S. Tanenbaum, 4rd Edition, Prentice Hall, 2003. ISBN: 0-13-066102-3

Major Topics Covered in the Course

1. Concepts and evolution of computer networks
2. Network architectures
3. Lectures and assignments will work down through the protocol stack addressing both idealized and industry standard protocols:
 - i. Physical Layer
 - ii. Data Link Layer (including Medium Access Control sublayer)
 - iii. Network Layer
 - iv. Transport Layer
 - v. Application Layer
4. Network system design and programming
5. Current issues and emerging technologies related to computer networks

Laboratory Projects

Programming Project Area	Weeks
Network algorithm programming	4
Network system programming	4

CSAB Category Content

	FUNDAMENTAL	ADVANCED		FUNDAMENTAL	ADVANCED
Data Structures	0	0	Computer Organization and Architecture	0	1
Algorithm & Software	0	2	Concepts of Programming Languages	0	0

Design _____

Oral and Written Communications

There are no significant oral or written communications required in this course. Virtually all assignments consist of writing computer programs or solving problems.

Social and Ethical Issues

This course contains approximately 1 hour of coverage of social and ethical issues related to network security, anonymity and data encryption.

Theoretical Content

Topic	Hours
Network Control Algorithms	6
Nyquist Theorem and Shannon-Hartley Law	1

Problem Analysis

Students are given 5-8 non-programming assignments requiring their analysis of bandwidth limitations, protocols, error detection, etc. Students are expected to use or extend example analyses from lectures to find answers to the problems.

For the programming projects, students are usually given requirements for the programs but must perform sufficient analyses of the requirements to arrive at an effective program design.

Solution Design

Solutions to many of the non-programming assignment problems are of a mathematical nature involving proofs or mathematical derivations.

Programming projects require the student to perform substantial design to arrive an implementation that fulfils the functional requirements and is both robust and well organized.

CC2001

This course provides coverage of topics in the following areas (hours listed are minimums):

NC1. Introduction to net-centric computing [core]	2
NC2. Communication and networking [core]	12
NC3. Network security [core]	3
NC4*. The web as an example of client-server computing [core]	3
NC6. Network management [elective]	6
NC9. Wireless and mobile computing [elective]	6
SE2. Using APIs [core]	2

** general client-server computing principles*

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