

**Course Number:** CSC 645/745

**Course Title:** Computer Networks

**Number of Credits:** 3

**Schedule:** Three hours of lecture/discussion per week.

**Prerequisite:** CSC 415 with grade of C or above. Students should be familiar with process management, memory management, I/O processing and file system implementation techniques. A good working knowledge of the C/C++ programming language is prerequisite.

### **Catalog Description**

Computer network design, evaluation, and testing. Computer network standards and implementation. Hardware/software design and compatibility issues. Paired with CSC 745. Students who have completed CSC 645 may not take CSC 745 later for credit. Extra fee required.

### **Spring 2007 Detailed Description**

This course will introduce advanced computer science students to networking and internetworking. The design, implementation, and use of the DARPA Internet Protocols (TCP/IP) will be discussed in detail. The ISO/OSI reference model and layer protocol standards will be surveyed and compared with TCP/IP. Basic analytic techniques used in network design and performance evaluation will be introduced, along with advanced C/Unix programming techniques.

### **Expanded Description**

- 1 Introduction, Internetworking, ISO/OSI Protocol Stacks and Services
- 2 Network Hardware , Physical-Data Link-Network Layers/ MAC Layers/  
Introduction to WLAN and CC, Ethernet, ARQ (Windowing) protocols
- 3 Internetworking, RARP, ARP, IPv4 & IP v6, ICMP
- 4 Programming with the Internet: Sockets & other Unix Systems Calls
- 5 Internetwork Routing, X75 VC
- 6 Implementing Applications Oriented Services, UDP/TCP, Client/Server  
Interaction, software development using high level networking frameworks
- 7 Advanced Topics (as time permits): Name Servers, ISO Transport, Session,  
Presentation, Application Layers

### **Course Objectives and Role in Program**

The objectives of this course include:

- Introduce the student to the TCP/IP Internet protocols and techniques for implementing distributed applications using the socket systems calls
- Teach advanced C programming (using low level system calls and appropriate debugging techniques) in a Unix/Linux environment
- Review process management and IPC from the CSC 415 Operating Systems course prerequisite

Students will implement and evaluate a series of programs utilizing low level Unix system calls culminating in a sliding window implementation and evaluation, then work through a series of programming labs to develop a RPC library (using both TCP and UDP

sockets) and a simple distributed application. A working knowledge of advanced programming techniques (including development of distributed sockets-based applications) and the Unix/Linux platform play an important role in developing our students into skilled professional programmers.

### **Learning Outcomes**

At the end of this course students will

- Write correct and well documented advanced C code using low level Unix/Linux system calls, including the sockets family of system calls, that is demonstrated to execute correctly
- Know where to look for platform specific programming information and be familiar with reading and using man page information as well as other standard reference materials
- Clearly and accurately explain design decisions in written program documentation
- Be familiar with the mechanics of Unix/Linux distributed application programming, testing and debugging in a multi-machine environment.

### **Method of Evaluation**

Student learning will be evaluated on the basis of

- Completeness and quality of programming/homework assignments.
- Grade on quizzes after each major topic is completed
- Grade on final examination
- Class participation.

The weight assigned to each element of evaluation will be determined by the instructor of the course on the first day of the class.

### **Required Textbooks**

*Douglas Comer, "Internetworking with TCP/IP, Volume I, Fifth Edition",  
Prentice Hall, 2005*

*M. Murphy, "CSC 645/745 Course Reader, Spring 2007", published on-campus*

*Additional Supplementary readings are available through the SFSU Library On-Line Reserves (ERES) and/or posted to the class Web site.*

### **Recommended References**

*Kurose and Ross, Computer Networking, Third Edition, Addison-Wesley, 2004*

*Peterson & Davies, "Computer Networks: A Systems Approach", Morgan Kaufmann, Second Edition, 2000*

*W. Richard Stevens, "TCP/IP Illustrated, Volume 1 The Protocols", Addison-Wesley, 1994*

*Douglas Comer, "Internetworking with TCP/IP, Volume 3, BSD Socket Version", Prentice Hall, 1993*

*Tanenbaum, "Computer Networks, Third Edition", Prentice-Hall 1996*

*Dimitri Bertsekas and Robert Gallager, Data Networks, Second Edition, Prentice-Hall 1992*

*Uyless Black, "OSI A Model for Computer Communication Standards", Prentice Hall, 1991*

*William Stallings, "Data and Computer Communications, Fourth Edition", MacMillan, 1994.*

**Modified by:** M. Murphy

**Date of Last Modification:** Spring 2007