CDA 4504 -- Introduction to Computer Networks

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Course Description and Goals

In the modern world, Internet is seeping into every aspect of day-to-day life. Thus, it has become imperative for every student majoring in Computer Science to at least have a basic understanding of the `nuts and bolts' that drive today's Internet. After this course, students will know the basic fundamentals of how the Internet works and gain elementary network programming skills. They will also become capable of understanding more advanced material in this area.

Unlike the traditional computer networking courses, this course is organized in a top-down manner--that is, it begins at the application layer and works its way down toward the physical layer. It places emphasis on the application layer, a high "growth area" of computer networking in which most recent revolutions in computer networking--including the Web, audio and video streaming, and content distribution--have taken place. Once students understand how applications work -- such as the Web, FTP or Email which most students use on a daily basis -- they can then easily understand the network services needed to support these applications. They will also learn how easy it is to create their own network applications and application-level protocols. Students will get an early exposure to the notions of application programming interfaces (APIs), service models, and protocols--important concepts that resurface in all of the subsequent layers.

Bulletin description: CDA 4504: Introduction to Computer Networks (3). **Prerequisites**: COP 4530; **Contents:** Circuit switched and packet switched networks, protocols, protocol layering; application layer, socket programming; transport layer, multiplexing and demultiplexing, UDP, TCP, reliability, flow control, congestion control; network layer, routing protocols, switching technologies, multicast, mobility; link layer, local area networks, error detection and correction; wireless networks; multimedia networking; network security; network management.

Pre-requisites

- **COP4530 - Data Structures and Algorithms**
  - *This course requires that the student be proficient with either C/C++ or Java. A student who has programmed only in C/C++ and not in Java should not have any difficulty following the application programming material. Such students can pick up the required proficiency in Java as the course progresses.*
- Students also need to have a user-level knowledge of Unix, and be comfortable working in a Unix environment.
- If you have doubts whether you satisfy the course pre-requisites, send me an e-mail at kartik@cs.fsu.edu.

Textbooks

Required Textbook :

- **Computer Networking : A Top-Down Approach Featuring the Internet (3rd Edition)**
  by James F. Kurose, Keith Ross. Publisher: Pearson Addison Wesley; 3rd edition ISBN: 0321227352

Recommended Reference Textbook :

- **Computer Networks (4th Edition)**
  by Andrew S. Tanenbaum. Publisher**:** Prentice Hall, ISBN**:** 0130661023

Course Contents

The course outline will closely follow the material presented in book by Kurose and Ross. Supplemental material may be included now and then from the book by Tanenbaum. Additionally, hands-on online exercises from the book website for Kurose and Ross will also supplement the class lectures.

1. **Computer Networks and the Internet**
   - What Is the Internet?
   - Packet-Switched Networks
   - Protocol Layers and Their Service Models
2. **Application Layer**
   - Principles of Application Layer Protocols
   - The Web and HTTP
   - File Transfer: FTP
   - Electronic Mail (SMTP, MIME)
   - DNS--The Internet's Directory Service
   - Socket Programming with TCP/UDP
     - Building a Web Server
     - Content Distribution
3. **Transport Layer**
   - Transport-Layer Services
   - Multiplexing and Demultiplexing
   - Connectionless Transport: UDP
   - Principles of Reliable Data Transfer
   - Connection-Oriented Transport: TCP
   - Principles of Congestion Control (mainly TCP)
4. **Network Layer and Routing**
   - Network Service Models
   - Routing Principles
   - The Internet Protocol (IP)
   - Routing in the Internet
   - What's Inside a Router?
   - IPv6
   - Multicast Routing
   - Mobility and the Network Layer
5. **Link Layer and Local Area Networks**

- o Data Link Layer Services
- o Error-Detection and -Correction Techniques
- o Multiple Access Protocols
- o LAN Addresses and ARP
- o Ethernet
- o Hubs, Bridges, and Switches
- o Wireless Links
- o PPP: The Point-to-Point Protocol
- o Asynchronous Transfer Mode (ATM)
- o Frame Relay

(Additional material if time permits)

6. **Multimedia Networking**
   - o Streaming Audio and Video
   - o Internet Telephony
   - o Quality of Service (Integrated and Differentiated Services)
7. **Security in Computer Networks**
   - o What is network security?
   - o Principles of cryptography
   - o Attacks and Counter-measures
8. **Network Management**
   - o What Is Network Management?
   - o The Infrastructure for Network Management
   - o The Internet-Standard Management Framework

Lecture Slides

TBA

Assignments

TBA

Evaluation Criteria

There will be a final, one midterm, and four assignments. For the fourth programming assignment, students will work in two-person teams on a substantial implementation project.

- Final Exam 39%
- Midterm Exams 28%
- Assignments 33%

Administrative Information

Class Hours : TBA
Location : TBA
Instructor :Kartik Gopalan
Location : Room 164, Love Bldg.
Instructor's Office Hours: 1:00PM to 3:00PM Mon-Wed

Students with disabilities :

If you have a physical, psychological, medical or learning disability that may impact on your ability to carry out assigned course work, I would urge that you contact the Student Disability Resource Center (SDRC), 97 Woodward Avenue South, Florida State University, Tallahassee, FL 32306-4167, (850) 644-9566 (voice), (850) 644-8504 (TDD) , E-mail:sdrc@admin.fsu.edu. Kindly bring a letter to me from the SDRC indicating your need for academic accommodations within the first week of class. The syllabus and other class materials can be made available in alternative format upon request.

Submission Instructions

To submit an assignment.

- Use *only* the CS department machines -- **diablo** or **shell** -- for submission.
- Put all of your submission files (code / documentation) into one directory with a unique name.
- Use the **handin** script in **/home/courses/cen4516/bin** directory to submit your files as follows.
    - **/home/courses/cen4516/bin/handin <directory_name>**
- Check the messages to see if your submission went through successfully. This is important. If there is a failure, please contact the instructor.

Files to be submitted with programming assignments.

- You need to submit all your code - *.c, *.cpp, *.java and *.h files.
- **DO NOT include object files (.o), class files (.class), or any executable files.**
- *You must also include a* **Makefile** . Following links can help you write Makefiles.
    - **C Makefiles**
    - **Java Makefiles**

- Keep the directory structure simple (in case you have sub-directories).
- You must include a **README** file that gives the following information
    - The names and email addresses of all your group members
    - The files in your submission and what the contents of each file are (**in one line-per-file**).
    - Whether your code was tested on Linux or Solaris machines.
    - Contribution of each group member in the assignment.
    - How to execute your program(s).
    - **Briefly** describe the problems or issues you are facing or **anything special** about your submission that the TA should take note of. This is the place where you can **highlight** anything special you have done in the assignment (but please keep it short).

Academic Integrity

Remember that the goal of programming assignments and homeworks is to enhance your analysis, reasoning, and programming skills. Indulging in academic dishonesty defeats this purpose apart from being unfair to other students. In case you have any questions about whether an act of collaboration may be construed as academic dishonesty, *please clarify the issue with the instructor before you collaborate* .

All students should follow FSU [Academic Honor Code](). You might be assigned a grade of **'F'**, if you are found to have indulged in academic dishonesty.

- It is understandable that discussing a problem with other people may lead to more insight into the issues involved. **Thus discussing a problem in assignments/homeworks with other people is fine. However, discussing the solutions to the problem is NOT acceptable.**

- Every student must write his/her own code and homework. **Showing your code or homework to members of other teams, giving it to them, or making it accessible to them (e.g., by making the files world-readable) is academic dishonesty.**

- You are responsible for ensuring that your code/documentation/results are adequately protected and not accessible to other teams. Change permissions of your working directory to 0700 ('chmod 0700 <directory>).

- Consulting code from a textbook, or from the Internet, in order to understand specific aspects of your assignment is fine. However, **copying entire code or large parts of such code will be considered academic dishonesty**. If you borrow small parts of code from these sources, you must acknowledge this in your submission and additionally you must clearly understand and be able to explain how the code works.