Central Connecticut State University
CS 490: Computer Communications Networks & Distributed Processing
(aka Computer Networks)

Spring 2014

Instructor: Dr. Chad A. Williams, Professor of Computer Science

Office: MS 30309 Phone: 860-832-2719
Office hours: MW 4:30-5:45, TR 9:00-10:45 and by appointment.
e-mail: cwilliams@ccsu.edu
Course website: Blackboard Learn
Class: 1:40 - 2:55 in Tuesday and Thursdays in Social Sciences Hall 106

Textbook and other reference material:

- Computer Networking, 6th edition by Kurose and Ross, Addison Wesley, ISBN 0132856204
- Blackboard Learn will contain lecture materials
- In-class handouts
- Companion web site available at http://wps.pearsoned.com/ecs_kurose_compnetw_6/
- Wireshark packet sniffer available at http://www.wireshark.org

Catalog description
Study of networks of interacting computers. The problems, rationale, and possible solution for both distributed processing and distributed data bases will be examined.
Prerequisites: CS 253 and 254. 3 credit hours

Program educational objectives and student outcomes
This course supports the following program objectives and program learning outcomes:

- *PEO-1:* Graduates will have a broad understanding of the fundamental theories, concepts, and applications of computer science.
  - *SO-a:* An ability to apply knowledge of computing and mathematics appropriate to the discipline
  - *SO-b:* An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution.
  - *SO-c:* An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs
- *PEO-2:* Graduates will be engaged in a wide range of careers in computer science and information technology.
  - *SO-i:* An ability to use current techniques, skills, and tools necessary for computing practice
  - *SO-j:* An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices
  - *SO-k:* An ability to apply design and development principles in the construction of software systems of varying complexity
- *PEO-3:* Graduates will communicate effectively, both orally and in writing.
  - *SO-d:* An ability to function effectively on teams to accomplish a common goal
- *PEO-5:* Graduates will act ethically and with social responsibility in their careers.

- *SO-e:* An understanding of professional, ethical, and social responsibilities
- *SO-g:* An ability to analyze the impact of computing on individuals, organizations, and society, including ethical, legal, security, and global policy issues

Course learning outcomes

Program objectives and program learning outcomes are supported by the following course learning outcomes achieved by students upon a successful completion of this course students will have the ability to:

- *CLO-1:* Apply fundamental underlying principles of computer networking (a,b);
- *CLO-2:* Evaluate the details and functionality of layered network architecture (a,j);
- *CLO-3:* Apply mathematical foundations to solve computational problems in computer networking (a,j);
- *CLO-4:* Analyze and summarize research literature describing P2P file sharing system architectures (e,g);
- *CLO-5:* Evaluate ethical, legal, security, and social issues related to computer networking (e);
- *CLO-6:* Synthesize a medium scale team project utilizing modern software development tools (a,b,c,d,i);
- *CLO-7:* Apply the cumulative course concepts to design and implement a P2P file sharing application utilizing several application and transport layer protocols (a,b,c,i,j,k).

Grades and evaluation:

Students will be evaluated regularly during the semester and should be aware of their progress continuously during the semester. The final course grade will be reported according to the stated University policy. The final course grade will be calculated according to the following distribution of points:

Percentage of grade:	
Lab Assignments	15pts 3 at 5pts each
Assignments	15pts 3 at 5pts each
Exams	20pts 2 worth 10pts each
Project: survey paper	5pts
Project: design	5pts
Project: final deliverable	15pts
Final exam	20pts
Class participation	5pts

Letter grade will be calculated according to the following table:

A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F
95-100	90-94	87-89	84-86	80-83	77-79	74-76	70-73	67-69	64-66	60-63	0-59

Lab assignments

During the labs students will work on hands-on problems focusing on the material covered in class lectures and reading assignments. Students can work on lab assignments individually or in teams of two. Deliverable for each lab is due no later than two weeks after the lab date. Deliverables for each lab assignment must be submitted via Blackboard Learn - no other submissions will be accepted.

Assignments

Each assignments will consist of a set of mostly theoretical problems based on the textbook and

lecture material. Students must work on assignments individually and turn in printed or neatly hand-written solutions. Not showing appropriate work for a problem will result in not receiving any credit for the problem. All submitted pages must be stapled together; the first page must have the student name and the assignment number.

Midterms/Tests
Midterms are non-cumulative and are designed as elementary evaluation devices and to prompt the student to stay abreast of assigned topics. Each test will take the full class period. Make-up tests may only be given if a student can provide a written proof of a serious reason for missing a test (such as illness or accident).
Questions on a test may include:

- True/false questions,
- Multiple choice questions,
- Fill in the blank questions,
- Short answer questions.

Course project
While working on the course project, students will use the knowledge and skills obtained in this course covering many if not all of the course topics. Working in teams of two (preferably the same teams as on the labs), students will design and implement a simple peer-to-peer file sharing system. Course project is delivered in three stages: a survey paper discussing different existing P2P architectures for file sharing; a detailed design of of the system to be implemented including its protocols (students are strongly encouraged to use UML, in particular, sequence and class diagrams); and the final demonstration of the working system (all source code and any changes to the design document must also be submitted at that time).
More details on deliverables and their due dates are available here.

Final exam
Final exam is a cumulative objective test of representative content of the entire semester's course offerings.

Participation

Class participation is very important and I don't just mean showing up. I expect more from you and I have described what I mean in http://www.cs.ccsu.edu/~williams/classes/WhatDoesClassParticipationMean.pdf. My basic philosophy is that class participation and assignments are your chance to understand the concepts and how to do the problems; the final project and exams evaluate whether you have understood the material and learned from your mistakes.

Attendance: I expect students to attend class sessions regularly. **For each absence (unless university excused) over 4 your overall final grade will be reduced by 1/4th of a letter grade. Skipping classes can seriously affect your final grade!** If you are going to miss class please email me before class. Each student is responsible for making-up any missed study or work on their own. Limited assistance will be offered to those with plausible reasons for absences; unexcused absences result in the student being totally responsible for the make-up process. You are responsible for all announcements and material covered in the event that you do miss class, and should get that information from one of your classmates. In the event of a weather emergency that requires curtailment or cancellation of classes, listen to WTIC (1080 AM) or call (860) 832-3333.

Academic Honesty: Students are expected to practice the highest standards of ethics, honesty and integrity in all of their academic work. Possible disciplinary actions may include failure for

part of or all of a course as well as suspension from the University. I absolutely require that you fulfill your academic obligations in a fair and honest manner. This includes turning in work that is uniquely yours, unless I explicitly require you to work on a project in a group. I strongly suggest that if you work with others, you only work together in the idea generation phase. When it comes to writing your work, you must do so independently. It is in your best interest to never look at any solutions written by another student and to never let another student see any solutions you have written. If you do turn in work that I suspect is the result of cheating, it will be dealt with **harshly**. Any form of academic dishonesty (e.g., plagiarism, cheating and misrepresentation) may result in disciplinary action. ***Penalties for cheating go beyond just receiving a zero for the assignment and could result in penalties as harsh as failure of the course and an Academic Misconduct Report being filed. From a disciplinary standpoint, an Academic Misconduct Report goes to a Faculty Hearing Board which may impose sanctions such as probation, suspension or expulsion.***

Specific items that I consider cheating are:

- *Turning in someone else's work as your own (with or without that person's consent).* This includes turning in a copy of something that can be mechanically transformed into a copy of someone else's work. Don't even try to disguise cheating by simply modifying someone else's work and calling it your own.
- *Allowing someone else to turn in your work as his or her own work.* This includes allowing fellow students access to your electronic copy.
- *Using a solution developed in a previous term, found in a book or on the web.*
- *Plagiarizing*

You may refer to the Student Code of Conduct here http://web.ccsu.edu/academicintegrity/ and find the full Academic Misconduct Policy online at: http://finalsite.ccsu.edu/page.cfm?p=6757
Please read it carefully.

Students with disabilities

Please contact me privately to discuss your specific needs if you believe you need course accommodations based on the impact of a disability, medical condition, or if you have emergency medical information to share. I will need a copy of the accommodation letter from Student Disability Services in order to arrange your class accommodations. Contact Student Disability Services, Willard Hall, 101-04 if you are not already registered with them. Student Disability Services maintains the confidential documentation of your disability and assists you in coordinating reasonable accommodations with your faculty.

Tentative schedule

Please note that this schedule may change as we progress through the course material

Reference: KR - Kurose & Ross, Computer Networking

Week 1: January 13 - 17

- Lecture: Introduction; course overview and objectives.
- Reading: none
- Lecture: Network edge and network core
- Reading: KR 1.1-1.3

Week 2: January 20 - 24

- Lecture: Delay, loss and throughput; Layered architectures
- Reading: KR 1.4-1.6

Week 3: January 27 - 31
- Lecture: Delay, loss and throughput; Layered architectures
- Reading: KR 1.4-1.6
- Lab 1 is available
- Assignment 1 is handed out
- Lecture: Network applications
- Reading: KR 2.1

Week 4: February 3 - 7
- Lecture: HTTP
- Reading: KR 2.2
- Lecture: FTP and email
- Reading: KR 2.3-2.4

Week 5: February 10 - 14
- Lecture: DNS and P2P
- Reading: KR 2.5-2.6
- Assignment 1 is due
- Lab 1 is due
- Lab 2 is available
- Lecture: Transport layer services; multiplexing/demultiplexing
- Reading: KR 3.1-3.2

Week 6: February 17 - 21
- Test 1

Week 7: February 24 - 28
- Lecture: UDP; reliable data transfer
- Reading: KR 3.3-3.4
- Lecture: TCP
- Reading: KR 3.5
- Lab 2 is due
- Project part 1 (survey paper) is due

Week 8: March 3 - 7
- Lecture: Congestion control
- Reading: KR 3.6-3.7

Week 9: March 10 - 14
- Project part 2 (system design) is due
- Lab 3 (part 1, part 2) is available
- Assignment 2 is handed out
- Lecture: Network layer, virtual circuits and datagram networks
- Reading: KR 4.1-4.2

Week XX: March 17 - 21
- Spring break

Week 10: March 24 - 28
- Lecture: Principles of routing and switching
- Reading: KR 4.3
- Lecture: IP
- Reading: KR 4.4

Week 11: March 31 - April 4

- Lecture: Routing algorithms
- Reading: KR 4.5
- Lab 3 is due
- Assignment 2 is due
- Lecture: Internet routing
- Reading: KR 4.6

Week 12: April 7 - 11

- Lecture: Broadcast and multicast routing
- Reading: KR 4.7
- Test 2

Week 13: April 14 - 18

- Lecture: Link layer services; error correction and detection
- Reading: KR 5.1-5.2
- Assignment 3 is handed out

Week 14: April 21 - 25

- Lecture: Multiple access protocols
- Reading: KR 5.3
- Lecture: Layer addressing and Ethernet
- Reading: KR 5.4

Week 15: April 28 - May 2

- Assignment 3 is due
- Project demonstration
- Project part 3 (final deliverables) is due

Final: May 5 - 9

- Final exam: Thursday, May 8th, 2:00 - 4:00 pm