CSC/ECE 570-001, -002, -601 - Computer Networks

Time and Place:
Tuesdays and Thursdays, 11:05AM - 12:20PM, 1021 EB2
3:50 PM - 5:05 PM, 2213 EB3

Instructor:
Dr. David J. Thuente
Professor of Computer Science
Department of Computer Science
North Carolina State University
890 Oval Drive, Box 8206
Engineering Building II, Room 3264
Raleigh, NC 27695-8206
Phone: 919-515-7003, fax: 919-515-7896
email: djthuent@ncsu.edu

Office Hours: Tuesdays and Thursdays, 1:30 PM – 2:45 PM
In general, for homework and related issues please get in touch with the TAs first and try to get answers to your questions from them before making an appointment with the instructor. If you need to see the instructor outside these times, please send an email and we can set a mutually convenient time for a meeting or phone call.

Teaching Assistants:
Hee Won Lee: He is the lead TA and a person with many years of networking and TAing experience. Please contact him help on your OPNET Labs, your semester papers and projects. He is the third option on homework. Has message board duties only for OPNET, labs, papers and the Project.
email: hlee17@ncsu.edu
Office: 3045 EB2, 919-513-7526
Office Hours: Mondays, 4:30-5:30 pm, more hours added later, also by appointment.

Yang Song: Primary contact for EOL students. Please contact him for website issues. He is the secondary contact for on-campus students on homework issues and general questions to understand the lectures. Primary contact on grading issues for homework and quizzes. Dr. Thuente is the person for issues on exam grading. Yang is very knowledgeable and helpful and has significant networking TA experience. He will handle most of the message board duties.
email: Yang Song <ysong8@ncsu.edu>
Office: 1235 EB 2, 919-513-7318
Office Hours: Wednesdays 3:40-5:10 pm, Fridays 2:00-3:30 pm, also by appointment.
Fridays 8:00-9:00 pm (Available on Skype, for EOL students only)

Third TA: TBD: Primary contact on homework issues and general questions to understand the lectures.

Please note that, in general, neither the TAs nor Dr. Thuente are available 24/7 for the message board or by email. Except for the period Friday 9 pm to Monday 8 am we will provide at least 24 response time. However, over the weekend, the response time could be closer to 48 or more hours.

Prerequisites: ECE 206 or CSC 246, ST 371 or MA 421, and Senior or Graduate standing
Restrictions: For UGs credits are not allowed for both (CSC401 or ECE 407) and CSC/ECE 570.

Course Objectives and Student Learning Outcomes
General introduction to computer networks. Discussion of protocol principles, local area and wide area networking, OSI stack, TCP/IP and quality of service principles. Detailed discussion of topics in medium
access control, error control coding, and flow control mechanisms. Introduction to networking simulation, security, wireless networking. To introduce the student to advanced networking concepts, preparing the student for entry to advanced courses in computer networking. To allow the student to gain expertise in some specific areas of networking. To learn the use of simulation techniques for network modeling and to use an appropriate simulation tool for that modeling. The stress is on theoretical and conceptual development rather than practical experience with specific technologies.

Outline

General introduction to computer networks and telecommunication networks. Introductory discussion of protocol principles, local area and wide area networking, reliability, OSI stack, TCP/IP, security, QoS principles and wireless. Detailed discussion of some topics in media access control, error control coding, and flow control mechanisms. Introduction to advanced topics: security, wireless networking, OPNET.

The primary objective of this course is to cover the basic concepts of data communication networking and architectures. Upon satisfactory completion of the course, students will be able to:

- Describe layered protocol architectures including the OSI and TCP/IP.
- Describe and analyze the functions and operations of a data link protocol such as flow control, error detection, and error recovery.
- Describe the fundamentals of the Ethernet, TCP/IP and 802.11 architectures.
- Explain and evaluate methods of congestion control and traffic management in data networks.
- Apply simulation techniques, using OPNET, to model and analyze performance characteristics of various networks and protocols.
- Apply statistical methods to perform basic performance analysis of generic ARQ and MAC protocols.
- (time permitting) Network security mechanisms used to describe Pretty Good Privacy (PGP).

Text:

Additional References:

Many papers in reading list at the end of text and the website and RFCs.


*Data and Computer Communications*, by Willaim Stallings, Ninth Ed., Prentice Hall.


Grading:

There will be one midterm exam, one final exam, ~ seven homework assignments, ~four graded labs (three OPNET and one Wireshark), one final project/paper and ~11 in-class quizzes. OPNET labs will be covered in quizzes or on exams. Makeup exams will be given only under extraordinary conditions and they will be at least as difficult as the original exam. I do not record letter grades until the final grade and consequently missing a B by one point on an exam is not that significant. Your numerical grades are of
course recorded. Each exam will be curved (if it is curved) individually and the project, homework and labs will be curved as groups. The curve for the course, each individual exam, and homework etc. will be at least as generous as the grading scale given by percentages below:

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On-Campus

Homework, Labs 17%  Homework, Labs 19%
Quizzes 3%  Quizzes 0%
Final Project/Paper 14%  Final Project/Paper 14%
Midterm: 28%  Midterm: 28%
Final : 38%  Final : 39%

EOL

Homework, Labs 19%  Homework, Labs 0%
Quizzes 0%  Quizzes 0%
Final Project/Paper 14%  Final Project/Paper 14%
Midterm: 28%  Midterm: 28%
Final : 39%  Final : 39%

Grades given on exams, project, labs, and homework reflect the instructor’s and TA’s professional evaluation of the work submitted. Grades on exams, project, labs, and homework may be reconsidered at the request of the student and at the instructor’s discretion. The student must submit such requests within one day after the exam, etc is returned. Usually the instructor or TA will REGRADE THE ENTIRE EXAM, etc and consequently your grade may actually decrease with a re-grade.

Homework and Test Information:

Homework is usually due at 8:00 am on the due date and must be submitted using SUBMIT on the Wolfware. We will usually cut off submissions at that time via the Wolfware Submit window. They will generally not be due on a class day. Sometimes we will go over homework in the next class period after they are turned in and hence late homework will not receive any score. However, late homework may be accepted but will not be graded. It may be recorded as turned in and recorded as such. Usually homework will be due one week from the day it is assigned, but some homework may have shorter or longer working times.

Please submit your homework as Word or pdf files of modest size (try not submit larger that 1 MB files.) If your file is larger, remove unnecessary resolution. Please try to be clear, precise and concise in your homework answers. Long discourses that contain the answer but much other irrelevant information may not be given full credit. Homework solutions will be made available usually within a week after the due date, but possibly longer for some. We would like to use your work to build the answer key and that is why we want your Word files. If we use your homework as a significant piece in the answer key you will be award a small percentage increase in your homework grade. This would then be awarded to only one student. In all cases, all homework solutions will be available or covered in class before the next test.

Remember that homework solutions are not always model answers, but simply guidelines for students. It allows the student to understand the solution method. Solutions turned in by students, on the other hand, must not only solve the problem but demonstrate that the student has understood the problem and the solution method, and has gained mastery over the material addressed in the problem. Thus they need to be more detailed, provide an insight into a student's particular approach to understanding the problem, and are expected to be different for each student. Homework solutions not demonstrating the background knowledge, and/or worked out incompletely or in insufficient detail, will receive no credit. The homework is an integral part of your learning experience and is an important step in preparing for the exams. Due to the cut in TA budgets, most homeworks will have only part of the problems graded ( this
will be the usual situation). These will be determined only when we are doing the grading process. Solutions will be provided for all problems of course. They will still be graded for completeness. Grades on homeworks will generally be out of 100% but may sometimes be grades as m/n with m the points earned and n the possible number of points.

All homework assigned in this course is individual. Students are encouraged to work on homework problems either individually or in groups according to preference. However, each student must individually submit homework solutions, which are their personal products. Evidence of unfair collaboration in producing the final solutions will be considered a violation of the academic integrity standards and will be treated accordingly. It is acceptable and indeed highly desirable for students to talk over a problem and work together in solving the problem subject to the "Clean Board Policy", but not okay for one student to use the fruits of another's work.

The "Clean Board Policy" may make this more concrete: when you work together with other students, do so at a whiteboard (or the equivalent) on which you collaborate. Once your discussion is over, wipe the board clean. Each student must walk away with the results of the discussion only in his/her head; do not copy anything down. When you are writing down (typing) your homework answers, you must do so alone and individually, reproducing your own understanding on paper.

The homework must be submitted with the problems in the order given on the assignment and should also include the problems as given. Typed homework is strongly preferred but homework must always be legible.

Homework, labs and the project are usually due at 8:00 a.m. on the due date and must be submitted via Wolfware Submit. Again the Submit window will usually close at that time.

Any homework/lab or part of homework/project that is plagiarized from any source including the Internet or from another student (including students from a previous term) will receive a negative amount equal to the value of the entire homework/lab. If it is modestly egregious, I will file an academic integrity violation and that frequently means an F in the course. Plagiarism of any kind on the final project will incur a score of at best -50% and possibly -100% of the value of the project. Plagiarism is use of words, ideas, any work of others without proper attribution. If you cut and paste and do not attribute to the proper source, it is ALWAYS plagiarism. This includes the case where you subsequently extensively modify the copied material.

The midterm and final tests are closed book and closed notes except for “approved cheat sheets” which are not only allowed but strongly encouraged. Tests are completely individual measures of performance. Accordingly, any cooperation what-so-ever on the part of students will be considered a violation of the academic integrity standards and will be treated accordingly, see above. The score awarded for that exam will be -50% of the value of the exam. There will be no makeup tests without a compelling reason, so plan your semester accordingly. See the Schedule section for test dates. No cell phones, cameras, or calculators are allowed in any exam or quiz.

**Quizzes:** ~11 quizzes will be given in the on-campus sections. You must take the quizzes in the class for which you are enrolled to be given credit for them. Some will have significant questions on the covered material while others will be very easy. Simply taking the quiz will guarantee at least a minimal grade (not close to passing) on it.

Approved cheat sheets are one page of 8 ½ x 11 paper with writing allowed on both sides. These must be hand written in the students own hand and cannot be copied (even by hand) from another student. No photographic or electronic means may be used to make your cheat sheet. You must write on the top right corner of the sheet that you have produced this sheet yourself and then sign and date it. It must be turned in with the exam. I will return them to you and you may have a total of two for the final (the midterm and
a new one for the final). Each must be done for that exam and there is no “backfill.” I and hundreds of my students, some of whom now are professors and use this, have found these notes to be a very effective learning tool and I hope you do as well. Some have used these very sheets for Qualifying Exams.

**Final Project/Paper:**
You will be allowed to choose between a project or a paper. The paper would be from a set of approved topics and would be largely unique to each student. You absolutely cannot use previous work or the work from another class for this (here -50%). The projects can be team projects with teams of one, two, or three persons. OPNET projects will be one choice. We will not have Openflow projects (software defined networks) this year because of the TA time limitations and our VCL has never been set up for this. Some of the projects may require a ~30 minute presentation in addition to the written report to the instructor or the TAs after classes have concluded. We will have more on papers and projects later. Project and paper requirements will be posted on the website.

**Labs:** Three modest OPNET labs plus Wireshark Network Analyzer lab.

**Policies:**
Students are expected to attend class. The lecture notes will be made available on the class website, but downloading the notes will not be a substitute for coming to class. The website notes are not aimed to be a complete coverage of the course and they are NOT sufficient to master the material in the course. In addition, there will be in-class quizzes, which will be part of the instruction. More than three absences are likely to significantly impact the class participation, in class exercises and hence the grade of a student. Effective education depends in part, perhaps largely, on the participation of the students in the process. Part of the responsibility of on-campus students is to participate in the class in an active manner. Disruptive behavior will not be tolerated.

Absence for scheduled tests or lateness in assignment submission will in general result in the student receiving no score for that test or assignment, unless it is excused in accordance with the University's policy in this matter or prior consultation with the instructor.

**Audits and Credit-only:** Are not allowed per Department of Computer Science.

**Academic Integrity:** Students should refer to the University policy on academic integrity found in the Code of Student Conduct (http://policies.ncsu.edu/policy/pol-11-35-01). It is the instructor's understanding and expectation that the student's signature on any work product means that the student neither gave nor received unauthorized aid in producing that work.

Please keep in mind that academic integrity in the classroom translates to professional integrity in the workplace. Moreover, awarding similar grades to students who have maintained academic integrity and to students who have cheated results in conferring equivalent degrees on them, and reduces the value of that degree in the workplace. It is the responsibility of every student as well as the instructor and TAs to see that this is not allowed to happen.

**Students with Disabilities:** Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with Disability Services for Students: DSO is located on the Second Floor of the Student Health Services Building, phone: 919.515.7653, URL: [http://dso.dasa.ncsu.edu/](http://dso.dasa.ncsu.edu/), Email: [disability@ncsu.edu](mailto:disability@ncsu.edu).

**Other Policies and Procedures:**
*Attendance:* The instructor follows university policies regarding excused absences and incompletes: [http://policies.ncsu.edu/regulation/reg-02-20-03](http://policies.ncsu.edu/regulation/reg-02-20-03).
Except when university-approved situations apply, students are expected to be here, be on time, and be prepared. Attendance is expected each class.

* During the lecture please turn off any cellular phones, PDAs.

**Website:** A Wolfware locker has been created for the course. It can be accessed through the Wolfware website or directly at [http://courses.ncsu.edu/csc570/lec/002/](http://courses.ncsu.edu/csc570/lec/002/) Note the section number.

There is a link from each homepage for the various CSC and ECE section to [http://courses.ncsu.edu/csc570/lec/002/](http://courses.ncsu.edu/csc570/lec/002/)

**VERY TENTATIVE AND VERY AMBITIOUS SCHEDULE** (will be revised including additional activities and exact dates for other OPNET labs and papers so please check the website.) Much material beyond the section in the text and the content of the slides will be covered in class. This list does provide a good indication of the general material covered.

**Week of (Tuesday of that week)** Chapter/Activity (Considerable material beyond what is in the text will be covered and not all material in all sections will be covered.)

- **August 22 (Thursday)** 1
- **August 27** 1, 2.1 - 2.2
- **September 4** 2.2 – 2.4,
- **September 10** 2.5, 2.6
- **September 17** Probability Review
- **September 24** 3.1, 3.2
- **October 1** 3.2, 3.3
- **October 8** 3.5, Fall Break
- **October 15** Midterm exam (Evening Exam: - 15 October, 7:30 – 9:15 pm), 4.1
- **October 18** Last day to drop class
- **October 22** 4.2, 4.3
- **October 29** 4.3, 4.7
- **November 5** 5.2, 5.3
- **November 12** 5.4 - 5.6, 6.1
- **November 13** 6.1 - 6.3
- **November 20, 22** 6.4, Thanksgiving
- **November 27** 6.5 Network Security, Slides
- **December 2** Review, Final Homework due and Major Project (11:59 pm Dec. 4) via Wolfware.

**COMPREHENSIVE FINAL EXAM**

11:05 - 12:20 p.m. TH Class

December 12 (Thursday) from 8 - 11a.m. in our classroom, 1021 EB2.

3:50 - 5:05 p.m. TH Class

December 17 (Tuesday) from 1 - 4 p.m. room TBD.

**Review Sessions:** There will be a 1 ½ hour review session an evening shortly before the midterm and final exams.

**Please** try to look at the lecture slides before class. We will not have time to go through all of them carefully and will just hit the highlights of some.