

CS 5565 Syllabus

Overview

This class is directed at graduate students seeking a basic understanding of communication networks, their architecture and protocols. The course will concentrate on the transport, network, and datalink layers as defined in the OSI-ISO reference model. Particular emphasis is given to the Internet protocol suite, the IEEE 802.x protocols, link-state and distance vector routing protocols, and to ATM networking.

The course format will be lectures, homeworks, exams, and a strong lab component in the form of programming projects. The projects are intended to give the student hands-on experience both in the design and programming of communication and routing protocols. This course uses a textbook with additional material drawn from research papers.

This class is conceived after the previously taught CS5516 which it replaces.

Staff Information and Meeting Times

Instructor: Dr Godmar Back
Torgersen Hall 2160A
1-3046

Office hours: Monday and Wednesday 3-5pm.

Class website: <http://courses.cs.vt.edu/~cs5565/spring2006/>

TA: Donghang Guo
Please see website for office hours

Email: To contact teaching staff, use cs5565-staff@cs.vt.edu

Class meets Monday, Wednesday, and Friday in 307 McBryde from 12:20pm to 1:10pm.

Prerequisites

The most important prerequisite is an *ability (and willingness!)* to undertake substantial independent projects, including their design and implementation. Students are expected to bring strong programming skills in a high-level programming language, which

includes familiarity with its development and debugging environment. Do not take this class if you have an aversion to programming.

Students are expected to know basic principles of operating systems, such as multiprogramming, memory, processor, and I/O subsystem organization, as taught in a class such as CS 3204. Previous exposure to concurrent programming practices is helpful. Although the project development can be done on a platform of your choice, a user-level understanding of the Linux operating system is required as well.

Objectives

Upon completion of the course, students should be able to

1. Explain the ISO Reference Model, the purpose of each layer, and identify and describe the protocols constituting each layer.
2. Define the TCP and IP protocols and explain the problems that they solve.
3. Explain the major local area network protocols.
4. Explain the problems in point-to-point communication and the techniques of solving the problems.
5. Explain how the Berkeley socket interface is used to write distributed programs.
6. Explain how remote procedure calls are used to build distributed applications and how to design an RPC subsystem and compiler.
7. Define flow and congestion control problems, and describe algorithms for their solution.
8. Understand the principles and operation of network routing protocols.

At a higher level, this course should enable graduate students to begin engaging in research in communication networks.

Textbook

The required textbook is:

James F. Kurose and Keith W. Ross. *Computer Networking: A Top-Down Approach featuring the Internet*. Third Edition. Pearson Addison Wesley, 2005. ISBN: 0-321-22735-2

Optional books include

Andrew Tannenbaum, *Computer Networks*, Fourth Edition, Prentice Hall, 2003. ISBN: 0-13-066102-3

Douglas E. Comer. Internetworking with TCP/IP Volume I: Principles, Protocols, and Architecture, 3rd Edition, Prentice Hall 1995.

Wright and Stevens, *TCP/IP Illustrated*, Vol 1, Addison Wesley.

In addition, I will assign a small number of research papers.

Format

The course work consists of a mix of lectures, homeworks, exams and programming projects.

Homeworks: There will be 2-4 problem sets.

Midterm: There will be one in-class midterm. The midterm will cover material from the lectures, homeworks and may include material from assigned research papers.

Final: There will be a final exam. The final exam will be comprehensive.

Projects: There will be two larger projects, which are structured as multiple assignments.

Homeworks and projects will be submitted electronically via the Curator system.

Projects

Students can implement the projects in the programming language of their choice, provided the language/environment supports the interfaces required for this project. In the past, students have successfully implemented the projects on Windows using Visual Studio in C++, C, or C#; in Java, Python, or C/C++ on Unix. It is your responsibility to provide the GTA with instructions on how to compile and run your project.

Late Policy

I am generally hesitant to grant individual extensions for projects and homeworks. Instead, each student will have a budget of 4 late days that can be used to submit homeworks or projects late without penalty. You decide when you want to use your late days – there is no need to contact the instructor or GTA beforehand. Late days are granted in whole integer multiples of days: if your assignment is 5 minutes late, you will have used up an entire late day. *Submissions received after you have used up your late days will receive a zero score.* For some assignments, you may work in a team. If you are working in a team, late submissions will count against the budgets of both team members, so make sure that you both have enough late days left or the team member with insufficient days risks getting a zero.

These late days are intended to account for various minor emergencies, such as network outages or lab downtime: please

contact the instructor for extensions only if you have truly extraordinary circumstances that would prevent you from completing the assignments on time. Job interviews do not count as extraordinary circumstances. Trips to conferences related to your research generally do count.

Late Drop Policy

Less-than-hoped-for performance, or realizing you have taken on too much work this semester, are not permissible reasons to drop the class after the drop deadline (Feb 27, 2005).

As an exception to this rule, following past precedence, late drops might be granted if a student's thesis or dissertation advisor explicitly requests it. The final decision rests with your advisor and me. (This option does not apply to MS students choosing the coursework-only option.)

Grading

I estimate that the contributions of the different portions to your final grade will be as listed below, but I reserve the right to adjust these weights as necessary:

10%	Homework/Problem Sets
15%	Midterm
25%	Final Exam
50%	Projects

Collaboration Policy and Honor Code

On the class website you will find links to the following policies applying to this class: University Policy of Class Attendance, the Honor Code, and the ACM and IEEE Code of Ethics.

The tenets of the Virginia Tech Graduate Honor Code will be strictly enforced in this course, and all assignments shall be subject to the stipulations of the Graduate Honor Code. For more information on the Graduate Honor Code, please refer to the GHS Constitution, located online at <http://www.gradhonor.grads.vt.edu/>

The following policies regarding collaboration apply in this class.

- All graded work is expected to be the original work of the individual student unless otherwise directed by the instructor. In working on problem sets, discussion and cooperative learning are allowed and, in fact, encouraged. However, copying or otherwise using another person's detailed solutions to assigned problems is an honor code violation.

- Projects are to be the work of the individual student or team. You may discuss general concepts, such as system calls, software libraries, Internet resources, or class and text topics, with others. However, discussion of project solutions, specific code, or detailed report content is an honor code violation. All source material used in project code and reports must be properly cited.
- For the projects, you may team up in groups of 2 students. Teaming up is voluntary. You may switch teams or form new teams, but only between projects. You may work with at most one partner on a given project. Students must contribute equally to the project within a team. It is not acceptable for students to either not contribute to the project or not to let the other group member contribute equally to the project. Please bring any problems in this regard to the instructor's attention early on.
- You are required to read-protect your work on shared file space so students outside of your team will not have access. Failing to do so is an honor code violation.
- Borrowing code (for instance, from previous offerings of CS5516 or CS5565) is an egregious violation of the honor code. We will use plagiarism detection software, i.e., MOSS, to screen out students attempting to do this.
- Not having read the honor code and its stipulations is no excuse for violating it.
- If you have any doubt about what is and is not allowed, it is your obligation to ask the instructor beforehand.

Communication Etiquette

Website: The class website is the primary means of communication. I will post announcements there as well as a FAQ for project questions. Check the website to see if your question is already answered there before sending me email.

Office hours: Please reserve the instructor's office hours for small questions and administrative matters. Send email for an appointment if you have questions that you think will take longer to discuss. You are also welcome to come by my office anytime if my door is open without sending email beforehand.

Email etiquette:

- Class-related email should be sent to cs5565-staff@cs.vt.edu. This ensures that it reaches both the

instructor and TA, and ensure that it will be archived separately.

- Please set your full name in your email client so it shows in the From: line in email you send. I may not respond to email sent from aawuh24@vt.edu if I don't recognize the sender as a student.
- Email sent from certain accounts (e.g., hotmail) may end up in my spam folder and be overlooked.
- If you send an attachment, please include the date and your VT pid in the filename, e.g., gback_problemset2solutions_20050208.pdf. Consider sending larger attachments by reference (i.e., as a URL), unless, of course, they are assignments: these must be submitted through the electronic submission system; instructions will be posted on the website. State in the body of the email your name and the content of the attachment.

Students with Disabilities

If you need adaptations or accommodations because of a disability (learning disability, attention deficit disorder, psychological, or physical), if you have emergency medical information to share with the instructor, or if you need special arrangements in case the building must be evacuated, please meet with the instructor as soon as possible.