CS 4513 Distributed Computing Systems
Craig E. Wills
Tuesday, October 25, 2005

WPI, B Term 2005
Syllabus

Instructor

Craig E. Wills, FL-236, cew@cs. Office hours: 1:00–3:00 Mondays, 9:00–10:00 Thursdays, any time for short questions. Electronic mail is an effective method to contact me.

Assistants

- TA Hao Shang, hao@cs.
- SA Abe Lourenco, aln@wpi
- faculty + assistants: cs4513-staff@cs.

Course Web Page

Copies of all handouts, assignments, notes and old exams will be posted as appropriate on the course Web page. The address for it is `http://www.cs.wpi.edu/~cs4513/b05/`.

Laboratory

Linux-specific projects will be done in the Fossil Lab located in FL-B17. Machines in this lab are running the Linux operating system. The web page for the lab is available at `http://fossil.wpi.edu/`. It contains links to lots of useful information about the lab and Linux.

Accounts on machines in the lab must be obtained from the course TA. Student groups will have root access for one of the machines. Deliberate irresponsible use of this privileged access is grounds for an NR grade in the course and possible referral to the WPI Judicial system.

Purpose

This is an undergraduate course in the design of advanced systems. It focuses on the issues of advanced operating systems and distributed systems, which have evolved from general-purpose multiprogramming systems covered in CS3013. The course covers file systems, distributed systems, distributed file systems, remote communication, performance evaluation

and other issues related to advanced and distributed systems. The goals are 1) to acquaint students with the components of single-machine and distributed file systems, 2) to acquaint students with issues in distributed systems 3) to show students abstractions underlying design choices, tradeoffs, and their consequences, and 4) to give students "hands on" experience with operating and distributed systems.

Prerequisites

A first course in operating systems, such as CS 3013. An interest in reading, thinking about and discussing issues in advanced system design.

Recommended background: CS3013.

Text Books

It is expected that all students will have one of two Operating System textbooks as background for the course and as reference for material on file systems.

Operating Systems Concepts. A. Silberschatz, P.B. Galvin and G. Gagne Addison Wesley, 7th edition, 2005 (6th edition should also be fine).

Modern Operating Systems. Andrew S. Tanenbaum, Prentice Hall, 2nd edition, 2001.

The following textbooks are good references for material on distributed systems.

Distributed Systems Principles and Paradigms. Andrew S. Tanenbaum and Maarten van Steen, Prentice Hall, 2002.

Distributed Systems Concepts and Design. George Coulouris, Jean Dollimore and Tim Kindberg, Addison Wesley, 4th edition, 2005.

Grading Policy

Final grades will be computed as follows:
Midterm Exam: 30%;
Final Exam: 30%;
Homework, projects, quizzes, and class participation: 40%.

Grading policy for each project and homework will be provided at the time of the assignment. In general, each assignment will have a basic objective for the majority of the assignment points and an extended objective for demonstrating additional work and understanding.

Final grades will reflect the extent to which you have demonstrated understanding of the material, and completed the assigned projects. The base level grade will be a "B" which indicates that the basic objectives on assignments and exams have been met. A grade of

"A" will indicate significant achievement beyond the basic objectives and a grade of "C" will indicate not all basic objectives were met, but work was satisfactory for credit. No incomplete grades will be assigned unless there exist exceptional, extenuating circumstances.

- **Programming Assignments**

  There will be 3-4 programming assignments Assignments will involve programming in C/C++/Java on the Fossil Lab Linux systems. There will likely be a combination of group and individual projects.

  Students are assumed to be competent in a high-level programming language such as C, C++ or Java. C/C++/Java and Linux/Unix will NOT be taught as part of this course. System calls and other aspects of Linux/Unix will be introduced as the course progresses and programming projects are assigned.

- **Exams and Quizzes**

  There will be two in-class exams (including a final exam during the last week), plus the possibility of pop quizzes for which no advance notice will be provided. Exams will be closed book, closed notes. The majority of each exam will cover basic ideas and objectives of the class with a few questions testing additional understanding and insight.

- **Written Homeworks**

  There is a possibility of written homework assignments. Written assignments consist of problems from the book, made up problems, or readings from literature.

Late Policy

Each homework and programming assignment will be given a point value when it is handed out. The point value indicates the weight of the assignment relative to the other assignments. Late programs and homeworks will be be penalized 5% of total assignment value per day (with the weekend counting as one day) or partial day, and no assignments will be accepted after seven days beyond the due date. All programs and written homeworks are due at the *start* of class on the due date. Homeworks and programs turned in after the start of class will be counted late. Projects will be submitted as directed in class. Exceptions to these rules can be made only *a priori*. Finally, no assignments will be accepted after Thursday, December 15 to allow sufficient time for grading.

Academic Honesty

Unless explicitly noted, all work is to be done on an individual basis. You are encouraged to talk with others about ideas and material in the course, particularly in preparing for exams. However all work, in the form of code or answers to problems, you submit for grading must

be your work. Misrepresentation of the work of another as one's own submitted work is a violation of academic honesty. Aiding someone else to commit an act of academic dishonesty is also a violation. Submitting individually-assigned work that was jointly done with another person is a violation of academic honesty.

Any violation of the WPI's guidelines for academic honesty will result in no credit for the course and referral to the Student Affairs Office. More information on definitions, responsibilities and procedures regarding the WPI academic honesty policy can be found at `http://www.wpi.edu/Pubs/Policies/Judicial/sect5.html`.

Schedule

The following is a tentative outline of the material that will be covered in this course. All references to chapters are from Silberschatz/Galvin/Gagne (SGG), as well as Tanenbaum's Operating System (TOS) and Distributed Systems (TDS) books. Not all sections will be covered from each chapter and the lectures will be supplemented with material from other sources. Each week will entail four classes unless otherwise noted.

week 1: 10-25–10-28. Three classes. Introduction. File systems, SGG Chapters 11-12, TOS Chapter 6.

week 2: 10-31–11-4, File systems (cont.),

week 3: 11-7–11-11. Distributed systems, SG Chapter 15, TDS Chapter 1. Communication in distributed systems, TDS Chapter 2.

week 4: 11-14–11-18. Communication (cont.). Midterm Exam.

week 5: 11-21–11-22. Two classes. Distributed file systems, SGG Chapter 16, TDS Chapter 10.

week 6: 11-28–12-2. Distributed processing, TDS Chapter 3. Synchronization/Clocks, SGG Chapter 17, TDS Chapter 5.

week 7: 12-5–12-9. Advanced topics. Advanced topics in distributed systems.

week 8: 12-12–12-15. Three classes. Advanced topics. Final Exam.