Operating Systems (CSci 144)
FALL 2015

Ming Li
Associate Professor
Department of Computer Science
California State University, Fresno

Phone: 559-278-4792
Office: Science II 256
mingli@csufresno.edu
http://zimmer.csufresno.edu/~mingli

Lecture: M/W/F 3:30pm-4:20pm at PHS 102.

Office hours: M/W 9-10AM @ Science II 256. Additional office hours may be available with appointment.

Lab: No separate lab time assigned. In class instruction will be scheduled for some lab practices. **However,** due to the cancellation of CSCI 144 labs since Fall 2012, we will focus more on operating system concepts, algorithms, and architectures. Students who are interested in learning more operating system coding skills are recommended to take CSCI 148 (System Programming).

Textbook: Operating *Systems*, Principles & Practices, 2nd edition, by Thomas Anderson and Michael Dahlin.

Instruction Style: This course will be taught in "Hybrid" mode, i.e., some portions of the materials are delivered online. Please note that up to 30% of the delivery will be online. The instructor will notify students about the schedule in class and through blackboard.

Resource: Blackboard.com will be used for announcements, materials, submissions, and discussion.

Description: CSCI 144 (4 units): Operating system history and services. File systems. Memory management. Process management -- concurrent processes, communication, semaphores, monitors, deadlocks. Resource management -- processor and disk scheduling. Security and protection mechanisms.

Contents: This course provides a comprehensive study of modern computer operating systems, including architectures, CPU scheduling, process, threads, mutual exclusion and synchronization, deadlock, memory management, file management, and Windows/Linux kernels. Students will also practice multi-thread programming, socket programming, and shell programming.

Course Goals: The aim of the course is to help students understand concepts, principles, and algorithms in operating system design and implementations and be able to apply these knowledge and skills in solving system level implementation problems. In this course, students will
- Understand the general operating system architecture.
- Study operating system tools and features, especially with UNIX commands.
- Implement various programs in multithreads, pipes, and inter-process communications.
- Study computer organization and device management.
- Understand CPU scheduling and UNIX/WINDOWS implementation.
- Investigate critical section, semaphore, and more advanced techniques such as monitor and events for process/thread synchronization.
- Study deadlock concepts, principles, and deadlock avoidance algorithms and models.
- Study memory management and virtual memory concepts, algorithms, mechanisms, and issues.
- Investigation and use of file systems in various operating systems.
- Analyze various operating system issues and propose solutions.

Learning Outcome: By taking this course, students should be able to
- Use Linux/Windows operating systems tools for programming and implementation.
- Design and analyze software systems with various operating system principles.
- Analyze and implement appropriate techniques for inter-process communications in real world applications.
- Study new operating systems for analysis and application.

Prerequisite: CSCI 112 or ECE 118.

Software requirements: This course is taught in C++. Students should know how to use one of the following software:
- **Basic C++:** Unix/Linux g++ or gcc.
- **C++ IDE:** Dev C++, Microsoft Visual C++.

In addition, www.gitlab.com is used for project version control and code management.

Attendance: Attending the class is required and enforced. Important examples will be illustrated in the class. Students are required to attend 80% of the classes in order to obtain the attendance credit (2%).

General characteristics of students who succeed in the class:
- Always attending the class and actively participating in the class discussion.
- Reviewing class materials before working on assignments.
- Finishing all assignments on time.
- Consulting instructors regarding project and experiment requirements before and during the work.
- Willing to challenge themselves for the project.
- Passion and interest in the topic and study at least 3 hours outside of the lectures.
- Preparing for exams, practicing more problems, and asking all questions during instructor office hours.

Common mistakes that should be avoided:
- Missing many lectures.
- Missing many assignments.
- Not spending time outside of the lecture to further their understanding.
- Never ask questions during office hours for difficult topics.
- Working until the last week before the deadline for project.
- Spending too much time on project and much less time on studying lectures.

Written assignments (Homework):
- There are **10** written assignments with 1% each.
- Written assignments are graded based on efforts and serve to help student enhance understanding of critical concepts and applications.
- Assignments and due dates are announced in the class and posted on blackboard.

Quizzes and in-class practices:
- There will be **3** quizzes with 2% each.
- Students should finish the quiz within the TWO day period specified on the tentative schedule.
- All quizzes should be completed through blackboard.
- Several problem sessions will be given and students will practice in the class on various problems.

Individual project
- This is an individual project.
- Course projects involve *thread programming*.
- The description of the project will be announced in the class, posted on class webpage.
- All projects will be graded through demonstration to the instructor individually.

- This project will be 8% with
  - 1% for project report;
  - 1% coding style and comments;
  - 6% for execution of the code and the correctness of the running results.

Problem Sessions:
- There will be multiple in-class practices arranged in the class to enhance students understanding of various concepts and algorithms.
- Each practice usually has 3-4 short questions (mainly from textbook and related sources) and takes around 30-40 minutes to finish.

Class Policy:
- All assignments are submitted through **blackboard.csufresno.edu**. No Email or hardcopy is accepted unless instructed to do so.
- For easy organization, questions/Comments regarding the class materials, assignments, exam should be sent from class blackboard discussion board (for public discussions) or message tool (for private information). Sending email may end up with delay of response.
- Instructor will process student questions on blackboard on a daily basis to make sure questions are processed on time.
- Late assignments and projects may be subject to penalty of 10% and not accepted after the cutoff date (usually one week after the due date).

Exams:
- There will be one review class immediately before each exam.
- The style/format of exams will be announced in the review class.
- Make-up exam is not allowed. Exceptions are permitted only in special cases and are handled case by case.

Grading:
A: 85-100; B: 70-84; C: 55-69; D: 40-54; F: <40

Attendance	**2% (80% of the classes)**
10 Homeworks	**10% (1% each)**
Project	**8%**
3 Quizzes	**6% (2% each)**
Midterm exam	**34%**
Final exam	**40%**

Note: This syllabus and schedule are subject to change in the event of extenuating circumstances. If you are absent from class, it is your responsibility to check on announcements made while you were absent.

University Policies

The syllabus must note the university **Policy on Students with Disabilities, the University Honor Code, the Policy on Cheating and Plagiarism**, a **statement on copyright**, and the **university computer requirement** University policies can be included in the syllabus by reference to statements in the University Catalog and Class Schedule. For example, one might state: "For information on the University's policy regarding cheating and plagiarism, refer to the Class Schedule (Legal Notices on Cheating and Plagiarism) or the University Catalog (Policies and Regulations)." These may also be incorporated by directing students to the online required syllabus policy statement page: http://www.csufresno.edu/academics/policies_forms/instruction/RequiredSyllabusPolicyStatements.htm Below are some sample statements that provide more than just the reference. In all instances, it is recommended that specific examples of what you consider to be cheating and plagiarism be included. See also those listed in the University Policy.

Students with Disabilities: Upon identifying themselves to the instructor and the university, students with disabilities will receive reasonable accommodation for learning and evaluation. For more information, contact Services to Students with Disabilities in the Henry Madden Library, Room 1202 (278-2811).

Honor Code: "Members of the CSU Fresno academic community adhere to principles of academic integrity and mutual respect while engaged in university work and related activities." You should:
   a) understand or seek clarification about expectations for academic integrity in this course (including no cheating, plagiarism and inappropriate collaboration)
   b) neither give nor receive unauthorized aid on examinations or other course work that is used by the instructor as the basis of grading.
   c) take responsibility to monitor academic dishonesty in any form and to report it to the instructor or other appropriate official for action.

Cheating and Plagiarism: "Cheating is the actual or attempted practice of fraudulent or deceptive acts for the purpose of improving one's grade or obtaining course credit; such acts also include assisting another student to do so. Typically, such acts occur in relation to examinations. However, it is the intent of this definition that the term 'cheating' not be limited to examination situations only, but that it include any and all actions by a student that are intended to gain an unearned academic advantage by fraudulent or deceptive means. Plagiarism is a specific form of cheating which consists of the misuse of the published and/or unpublished works of others by misrepresenting the material (i.e., their intellectual property) so used as one's own work." Penalties for cheating and plagiarism range from a 0 or F on a particular assignment, through an F for the course, to expulsion from the university. For more information on the University's policy regarding cheating and plagiarism, refer to the Class Schedule (Legal Notices on Cheating and Plagiarism) or the University Catalog (Policies and Regulations).

Computers: "At California State University, Fresno, computers and communications links to remote resources are recognized as being integral to the education and research experience. Every student is required to have his/her own computer or have other personal access to a workstation (including a modem and a printer) with all the recommended software. The minimum and recommended standards for the workstations and software, which may vary by academic major, are updated periodically and are available from Information Technology Services (http://www.csufresno.edu/ITS/) or the University Bookstore. In the curriculum and class assignments, students are presumed to have 24-hour access to a computer workstation and the necessary communication links to the University's information resources."

Disruptive Classroom Behavior: "The classroom is a special environment in which students and faculty come together to promote learning and growth. It is essential to this learning environment that respect for the rights of others seeking to learn, respect for the professionalism of the instructor, and the general goals of academic freedom are maintained. ... Differences of viewpoint or concerns should be expressed in terms which are supportive of the learning process, creating an environment in which students and faculty may learn to reason with clarity and compassion, to share of themselves without losing their identities, and to develop and understanding of the community in which they live . . . Student conduct which disrupts the learning process shall not be tolerated and may lead to disciplinary action and/or removal from class."

Copyright policy: Copyright laws and fair use policies protect the rights of those who have produced the material. The copy in this course has been provided for private study, scholarship, or research. Other uses may require permission from the copyright holder. The user of this work is responsible for adhering to copyright law of the U.S. (Title 17, U.S. Code). To help you familiarize yourself with copyright and fair use policies, the University encourages you to visit its copyright web page:
http://www.csufresno.edu/library/about/policies/docs/copyrtpolicyfull.pdf

Technology Innovations for Learning & Teaching (TILT) course web sites contain material protected by copyrights held by the instructor, other individuals or institutions. Such material is used for educational purposes in accord with copyright law and/or with permission given by the owners of the original material. You may download one copy of the materials on any single computer for non-commercial, personal, or educational purposes only, provided that you (1) do not modify it, (2) use it only for the duration of this course, and (3) include both this notice and any copyright notice originally included with the material.   Beyond this use, no material from the course web site may be copied, reproduced, re-published, uploaded, posted, transmitted, or distributed in any way without the permission of the original copyright holder. The instructor assumes no responsibility for individuals who improperly use copyrighted material placed on the web site.

For complete university policies, please refer to
http://academicaffairs.csufresno.edu/assocprovost/RequiredSyllabusPolicyStatements.htm