Department of Computer Science **University of San Francisco**

Computer Science 625-01
Parallel and Distributed Computing

Spring 2014

MWF 11:45–12:50, LS 307

Professor: Peter Pacheco
Office: Harney 540
Phone: 422-6630
Email: user: peter, domain: usfca.edu
Office Hours: M 4-5:30, F 1-2, and by appointment

Class Website: `http://cs.usfca.edu/peter/cs625`

Class Mailing List: You will be automatically subscribed to the class mailing list. Please note that this list uses your *USF email address.* If you ordinarily read your email using another account, be sure to forward your USF email to the other account.

Prerequisites: The catalog shows no official prerequisites. However students who haven't had the equivalent of Data Structures and Algorithms (CS 245) will need to do some outside study to understand many of the lectures. Some knowledge of computer architecture and operating systems will also be useful.

Coursework and Grades: I will base your final grade on a seminar presentation, seminar participation, 5 programming assignments, a midterm, and a final exam, weighted as follows.

Seminar Presentation	10%
Seminar Participation	5%
Program 1	3%
Program 2	5%
Program 3	5%
Program 4	5%
Program 5	12%
Midterm	20%
Final Exam	35%
Total	100%

I will assign grades on a straight scale. *Roughly,* 90-100% is an A, 80-89% is a B, 65-79% is a C, 55-64% is a D, and 0-54% is an F.

Seminar: Most Fridays we'll discuss a research paper on some aspect of parallel computing. (See the following course outline for dates.) Each student will be responsible for reading the paper and answering some questions about the paper. Each student will also be responsible for leading the discussion once. Your overall participation will count as 5% of your final grade, and your conduct of the seminar will count as 10%. A list of papers will be put on the class website. Since there are more students than Fridays, many of you will have to double up. However, students who double up will be subject to a higher standard, and *each* student in a team must give part of the presentation.

Programs: Complete, documented copies of your program source code and any makefiles should be put in a `cs625` subdirectory of your subversion project directory by 11 am on the due date. You should also put a printed copy of your source file(s) and any makefiles in my mailbox in Harney 545 by 2 pm on the due date. Due dates are listed in the course outline. Guidelines for grading will be passed out with the assignments. Details for structuring your `cs625` subversion directory will be put on the class website.

Assignment 5 will be a project of your choosing. The project problem and a basic outline of your proposed solution should be submitted to me by Monday, April 14. Each student must present a short report on his or her project during the last week of classes.

Late assignments will not be accepted. If you cannot finish a program, you should submit the work you were able to complete for partial credit.

Midterm: The midterm is scheduled for *Friday, March 21.*

Final exam: The final exam will be comprehensive. It's currently scheduled for *Saturday, May 10 at 12:30 pm.*

Attendance: Attendance is not required. However, you are responsible for *all* of the material covered in class.

Academic Honesty: As a Jesuit institution committed to cura personalis — the care and education of the whole person — USF has an obligation to foster the values of honesty and integrity. The University requires that all the members of the academic community uphold its standards of honesty and integrity. All students are expected to know and adhere to the University's Honor Code. You can find the full text of the code online at `http://www.usfca.edu/fogcutter`.

From a practical standpoint it is fine for you to *discuss* programs with your classmates. Any other collaboration is unacceptable. In particular, copying another person's work is unacceptable. Students who violate these rules will receive an *F* in the course. Repeat violators may be subject to more severe punishment. In the past the University has expelled graduate students who have copied programs.

Learning Outcomes: In this course students will learn

1. The basics of parallel architectures,
2. How to write parallel programs using MPI,
3. How to write parallel programs using Pthreads,
4. How to write parallel programs using OpenMP,
5. How to write CUDA programs,
6. How to evaluate the performance of a parallel program,
7. How to profile and debug parallel programs, and
8. Fundamental parallel algorithms.

Tentative Course Outline:

Week	Material
1/21–1/24	Preliminaries. Intro to parallel computing.
	Foster's methodology.
1/27–1/31	Basic MPI.
	Seminar 1, Friday, 1/31.
2/3–2/7	More on MPI. Pthreads.
	Program 1 due, Wednesday, 2/5.
	Seminar 2, Friday, 2/7.
2/10–2/14	OpenMP.
	Seminar 3, Friday, 2/14.
2/18–2/21	Parallel architectures.
	Seminar 4, Friday, 2/21.
2/24–2/28	GPU's and CUDA.
	Program 2 due, Monday, 2/24.
	Seminar 5, Friday, 2/28.
3/3–3/7	Parallel program performance.
	Seminar 6, Friday, 3/7.
3/17–3/21	Parallel linear algebra.
	Program 3 due, Wednesday, 3/19.
	Midterm, Friday, 3/21.
3/24–3/28	Parallel Sorting.
	Seminar 7, Friday, 3/28.
3/31–4/4	Task parallelism and dynamic load balancing.
	Seminar 8, Friday, 4/4.
4/7–4/11	Distributed termination detection.
	Program 4 due, Monday, 4/7.
	Seminar 9, Friday, 4/11.
4/14–4/17	Graph algorithms.
	Program 5 approval deadline, Monday, 4/14.
4/21–4/25	Dynamic programming.
	Seminar 10, Friday, 4/25.
4/28–5/2	Fourier transforms.
	Seminar 11, Friday, 5/2.
5/5–5/8	Program 5 reports.
	Program 5 due, Monday 5/5.