

**Computer Science 220-01**  
**Introduction to Parallel Computing**  
**Fall 2011**  
MWF 11:45–12:50, KA 172

**Professor:** Peter Pacheco

**Office:** Harney 540

**Phone:** 422-6630

**Email:** user: peter, domain: cs.usfca.edu

**Office Hours:** Mon 4–5, Wed and Fri 10–11, and by appointment

**TA:** Shah El-Rahman

**Email:** user: snelrahman, domain: cs.usfca.edu

**Office Hours:** Tue and Thu 1:30–2:30 and 4:30–5:30 in HR 530 or HR 535

**Class Website:** <http://cs.usfca.edu/~peter/cs220>

**Class Mailing List:** The earlier instructions for joining the list were incorrect. Please send your *preferred* email address to the instructor, and he'll add you to the list.

Once you're a member of the list you can also post messages by sending email to user cs220 in the domain cs.usfca.edu.

**Texts:**

Required: Brian Kernighan and Dennis Ritchie, *The C Programming Language*, 2nd edition, Prentice-Hall, 1988.

Optional: Peter Pacheco *An Introduction to Parallel Programming*, Morgan-Kaufmann, 2011.

**Prerequisites:** CS 110 and permission of instructor, or CS 112.

**Coursework and Grades:** I will base your final grade on 10 homework assignments, 5 programming assignments, 2 midterms, and a final exam, weighted as follows.

Homework	10 @ 1.5% each	15%
Programs 1 and 2	6% each	12%
Programs 3, 4, and 5	8% each	24%
Midterms	2 @ 12% each	24%
Final Exam		25%
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*.

**Homework:** Homework assignments may involve coding and/or written work. They are *due at 11 am* on the due dates listed in the following course outline. Code should be copied to the appropriate subdirectory of your CS 220 subversion directory. Hardcopies of code and written work should be turned in to my mailbox in the computer science office by *4 pm* on the due date.

There will be 12 homework assignments. Only your best 10 scores will be counted in the calculation of your final average. Late assignments will *not* be accepted.

**Programs:** Due dates for the programming assignments are listed in the course outline. Complete, documented copies of your program source code and any makefiles should be copied to the appropriate subdirectory of your CS 220 subversion 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 *4 pm* on the due date. Guidelines for grading will be passed out with the assignments.

Late programs will *not* be accepted. If you cannot finish an assignment, you should turn in what you were able to complete for partial credit.

**Midterms:** The midterms will be given in class on *Wednesday, October 5*, and *Friday, November 18*.

**Final Exam:** The final exam will be comprehensive. It is scheduled for *10-12 on Wednesday, December 14*.

**Attendance and Lateness:** Attendance is not required. However, you are responsible for *all* of the material covered in class, regardless of whether it is covered in the texts. Being late to class is unacceptable. You may have one unexcused late arrival. Subsequent late arrivals may affect your grade.

**Academic Honesty:** As a Jesuit institution committed to *cura personalis* — the care and education of the whole person — USF has an obligation to embody and foster the values of honesty and integrity. USF upholds the standards of honesty and integrity from all members of the academic community. 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* homework and 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 penalties.

**Computer Access:** You may use any of the Computer Science Department computers in Harney 235, 530, and 536. You do not need to own a computer for this class.

**Learning Outcomes:** In this course students will learn

1. To program in C,
2. The basics of parallel architectures,
3. To write parallel programs using several widely used parallel API's,
4. Basic parallel debugging, and
5. Basic evaluation of parallel program performance.

## Tentative Course Outline:

<b>Week</b>	<b>Material</b>
8/23–8/26	Preliminaries. Overview of Parallel Computing.
8/29–9/2	Basic C. Functions in C. Homework 1 due Friday, 9/2.
9/6–9/9	Pointers and arrays in C. Homework 2 due Friday, 9/9.
9/12–9/16	The preprocessor, strings and structs in C. Program 1 due Wednesday, 9/14. Homework 3 due Friday, 9/16.
9/19–9/23	Dynamic memory allocation and linked lists in C. Homework 4 due Friday, 9/23.
9/26–9/30	Basic MPI and the cluster. Homework 5 due Friday, 9/30.
10/3–10/7	Basic I/O in distributed memory programs. Program 2 due Monday, 10/3. Midterm 1, Wednesday, 10/5.
10/12–10/14	Collective communication in MPI. Bitwise operations in C. Homework 6 due Friday, 10/14.
10/17–10/21	More collective communications. Homework 7 due Friday, 10/21.
10/24–10/28	Two-dimensional arrays in C. Data distributions. Program 3 due Wednesday, 10/26. Homework 8 due Friday, 10/28.
10/31–11/4	Sorting on distributed memory systems. Basic Pthreads. Homework 9 due Friday, 11/4.
11/7–11/11	Critical sections, mutexes and semaphores. Homework 10 due Friday, 11/11.
11/14–11/18	Cache Coherence. Program 4 due Monday, 11/14. Midterm 2, Friday, 11/18.
11/21–11/23	Tree search and TSP.
11/28–12/2	Barriers, condition variables and thread safety. Homework 11 due Friday, 12/2.
12/5–12/7	CUDA. Program 5 due Monday, 12/5. Homework 12 due Wednesday, 12/7.