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## Essentials: Communication, Content, and Structure

### Communications

Class Meetings: Monday, Thursday 13:10 - 14:25, Room HW 409  
Office: HN1090J  
Office Hours: Wednesdays, 10:30 - 12:30  
Email: [stewart.weiss@hunter.cuny.edu](mailto:stewart.weiss@hunter.cuny.edu)  
Telephone: (212) 772-5469

You can see me during my office hours without an appointment. If you need to see me at a different time, you need an appointment. The best way to make an appointment is to send me email. I can sometimes schedule appointments if you see me before or after class. You can also call my office and leave a message. Regarding email, please note that I read only plain ASCII plain text messages, not HTML or MicroSoft Word-encoded documents. Also note that any email concerning anything that might fall under the FERPA regulations (e.g. questions about grades or other class related issues) must be sent from your "myhunter" account.

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### Resources

*(Optional Text-books):* Gerassimos Barlas. *Multicore and GPU Programming An Integrated Approach*. Elsevier Science & Technology, 2014. ISBN 978-0-12-417137-4.

*Computing Facilities:* Registered students are given user accounts on the Computer Science Department's network, which includes the Linux hosts in the 1001B lab of the Computer Science Department, located on the tenth floor of Hunter North. Access to this lab is limited to students enrolled in selected courses. In addition to the physical lab access, students will be able to use the secure remote login service, *ssh*, to access these accounts.

*Website:* All course materials, including lecture notes, slides, assignments, syllabus, and other resources, including this document, are posted on my website, at [http://www.compsci.hunter.cuny.edu/~sweiss/course\\_materials/csci493.65/csci493.65\\_f17.php](http://www.compsci.hunter.cuny.edu/~sweiss/course_materials/csci493.65/csci493.65_f17.php)

*Discussion Board:* This class will use Piazza as a discussion board. Please see the section below entitled "Course Materials, the Web, Piazza, and Blackboard" for the details.

### Prerequisites

CSci 235 and Math 160 or permission of the instructor.

### Departmental Learning Goals

Material in this course supports the following departmental learning goals: 1a: (understanding the basic foundations and relevant applications of mathematics and statistics, particularly those branches related to computer science) through performance analysis of various software design choices; 1b: (understanding the relationship between computer architecture and software systems) by discussing how hardware supports parallel algorithms and how software can be mapped to different types of hardware; 3a: (ability to communicate ideas effectively) by requiring homework that is graded in part on clarity and proper use of the English language. This course fulfills GER 3/B requirement.



## Course and Learning Objectives

Specific learning objectives of the course are that, after completing the course successfully, the student should be able to:

1. Write a correct and scalable parallel algorithm using both a message-passing based paradigm (MPI) and a shared-memory based paradigm (OpenMP).
2. Read and analyze a program using MPI and/or OpenMPI.
3. Parallelize a serial algorithm by applying task-based decomposition
4. Parallelize a serial algorithm by applying data-parallel decomposition.
5. Determine the speed-up, efficiency, and scalability of a parallel system.
6. Discuss the concept of parallel processing and the relationship between parallelism and performance.
7. Appreciate the need to express algorithms in a form suitable for execution on parallel processors.
8. Explain the basic types of parallel architectures and interconnection networks.
9. Characterize the kinds of tasks that are a natural match for SIMD machines and those more suited to SMP architectures.
10. Explain how various Monte Carlo methods work.

## About C and C++ in This Course

Although both MPI and OpenMP support parallel programming in both C and C++ (as well as Fortran77 and Fortran90), most of the programming examples that I use and all that appear in the textbook are written in C. Some students have a knee-jerk reaction when they hear this, thinking, "but I don't know C." This is not quite true. The C++ language contains most of the C language. If you know C++, you know a great deal of C. There are minor differences that arise in the syntax of declarations (such as structure and function declarations), but the real problem is that most students never learn how to use the C standard libraries. Most students learn C++ stream I/O and never bother to learn what seem to them like archaic functions of the C standard I/O library. These functions are at times much more useful than any found in C++. In general, you ought to know some C, as a student of computer science, because there are things you can do much more easily and quickly in C than with C++. You will be free, however, to use C++ when writing code in the course, if that is your preference.

## Assignments, Exams, and Grading

This is an honors seminar, not an ordinary lecture-style class. For this reason, students are expected to be self-motivated and self-disciplined, and are expected to do all of the assigned reading. The final grade is based upon a weighted average of the following components: class participation (10%), homework grades (80%), and an on-line final exam (10%).

**Assignments.** There will be several assignments, some conceptual, some programming projects of varying sizes. In all cases, the work is to be yours alone; working in groups is not allowed, unless the assignment states otherwise. *Assignments must be submitted on time and will not be accepted after their due dates.* Conceptual assignments will be like the exercises at the ends of the chapters in the textbook. There will be at most four conceptual assignments and six programming assignments. Programs are worth about 10% of the grade each, and the other assignments about 5% each. The percentage may change slightly but the student will be told this at the time that the assignment is posted. Programs must comply with the rules specified in the document [http://www.compsci.hunter.cuny.edu/~sweiss/course\\_materials/csci493.65/programming\\_rules.pdf](http://www.compsci.hunter.cuny.edu/~sweiss/course_materials/csci493.65/programming_rules.pdf). Please read it carefully.



**Final Exam.** There will be a Blackboard-based, multiple choice, final exam on December 14 from 1:45 to 3:45 P.M..

## Incomplete Grades

All assignments must be submitted by their due dates. Late assignments will not be accepted. Failure to take an exam counts as a zero grade on that exam. The only exceptions to these two rules are in the case that you have a legitimate medical or personal emergency that prevents your timely completion of homework or sitting for an exam and have notified me in a timely manner about this emergency. I will schedule a make-up exam or allow a homework extension only in that case. I do not give incomplete (IN) grades except to those students who were unable to complete the work because of legitimate, documented medical or personal problems, and this is entirely at my discretion.

## Class Calendar

There is no class on Monday September 4 (Labor Day), Thursday September 21, Monday October 9, and Thursday, November 23. The last day of class is Monday, December 11. Tuesday, September 19 follows a Thursday schedule and thus there is class.

## Programming and System Access

All students enrolled in the class are given accounts on the Computer Science Department's network. This entitles you to around-the-clock access to the 1000G lab, which is equipped with Linux workstations. This lab is normally open "24/7". The account also enables you to work from home or another remote computer by connecting to any of the lab machines remotely. The details are described below.

The advantage of working in the lab, as opposed to working remotely, is that you will be sitting at the console of a Linux host and will not be subject to potential disconnections that can take place when working remotely. You will also be much less affected by network problems than if you connect remotely from outside of Hunter. The disadvantage is that you have to be in school to do this.

When you are in the lab there are a few important rules that must be followed:

- Never power down a machine for any reason.
- Never leave a machine without logging out.
- Never use lockscreen to lock the screen in your login.

There are several other rules regarding lab use; they are posted there. Please take the time to read them and then follow them.

The Computer Science Department makes a UNIX host, named

`eniac.cs.hunter.cuny.edu`,

available to students who have accounts on the network. `eniac` is a gateway computer - you will be able to login to this host from any computer that has `ssh` client software and is on the Internet. Once you login to `eniac`, you must login from `eniac` to one of the computers in the Linux Lab, which are named `cslab1`, `cslab2`, `cslab3`, and so on, up to `cslab29`<sup>1</sup>. You cannot `ssh` directly to those machines from outside of Hunter College for security reasons. For example, you can first login to `eniac`, and then when it gives you a prompt such as "`$`", you would type

```
ssh cslab5
```

and re-enter your network password at the prompt from `cslab5`.

<sup>1</sup> or less than 29 if some machines have been taken out of service



Many computers come with a version of *ssh* already installed. If yours does not, you can get one for free. In particular, all Apple computers have the *ssh* client installed and available by opening the terminal application and typing the *ssh* command, such as

```
ssh eniac.cs.hunter.cuny.edu
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There are several free versions of *ssh*. *OpenSSH* is an open source version developed for the *OpenBSD* project. *PuTTY ssh* is a free version for the Windows operating systems, available at

<http://www.chiark.greenend.org.uk/~sgtatham/putty/>.

## Course Materials, the Web, Piazza, and Blackboard

All lecture notes will be posted on the course's home webpage (whose URL is above), which does not require special privileges to access. The only thing for which I use Blackboard is for posting of grades, which will be posted in the grade center there. This term we will be using Piazza for class discussion. The system is highly catered to getting you help fast and efficiently from classmates and me. Rather than emailing questions to me, you are to post your questions on Piazza. If you have any problems or need feedback for the developers, email [team@piazza.com](mailto:team@piazza.com).

You can find our class page at:

<https://piazza.com/hunter.cuny/fall2017/csci49365/home>.

An invitation to join the Piazza discussion board will be sent to your Hunter College email address close to the start of the semester. You should accept this invitation. Your Hunter email address can be used for reading and sending messages to the group, or you can change the email address or add another on the settings page. In fact, you can request to join the group with any email address you choose, at

<http://piazza.com/hunter.cuny/fall2017/csci49365>

I require that you use the following protocol if you have a question:

1. Check whether the question you want to ask has been posted and answered on Piazza.
2. If it has been answered, you are finished. If not, post the question on Piazza.
3. Anyone in the class can answer the question. If no one else answers the question in a timely manner, I will post an answer to it.

I will ignore any non-personal questions sent to my Hunter email address. Personal questions (such as a questions about a grade or a missed class or alternative times to meet with me) should be sent via private email to my Hunter email address, not to Piazza.

## Academic Honesty

Unless I state otherwise, all assignments and projects are to be your work alone. If someone else does part of this for you, it is considered to be academic dishonesty. Hunter College regards acts of academic dishonesty (e.g., plagiarism, cheating on examinations, obtaining unfair advantage, and falsification of records and official documents) as serious offenses against the values of intellectual honesty. The college is committed to enforcing the CUNY Policy on Academic Integrity and will pursue cases of academic dishonesty according to the Hunter College Academic Integrity Procedures. In this class, I will enforce the University's Policy on Academic Integrity and bring any violations that I discover to the attention of the Dean of Students Office.

## ADA Compliance

In compliance with the *American Disability Act of 1990* (ADA) and with *Section 504* of the *Rehabilitation Act of 1973*, Hunter College is committed to ensuring educational parity and accommodations for all students with documented disabilities and/or medical conditions. It is recommended that all students with documented



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disabilities (emotional, medical, physical and/or learning) consult the *Office of AccessABILITY* located in Room E1124 to secure necessary academic accommodations. For further information and assistance, the student can call (212-772-4857)/TTY (212-650- 3230).

## **Changes to This Syllabus**

Except for changes that substantially affect the implementation of the grading statement, this syllabus is a guide for the course and is subject to change with advance notice. Any changes will be posted to the course website and to the Piazza group for the course.