

Spring 2014

CX 4220: Introduction to High Performance Computing

Lectures: TR 3:05-4:25 pm

Location: Guggenheim 244

Instructor: [Edmond Chow](#)

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Office Hours: After class, or by appointment in KACB 1312

Course Description

Design of algorithms and software for high performance computing platforms used in computational science and engineering. Topics include parallelism, locality, machine architectures, and programming.

Students are expected to complete readings prior to each class in order to participate in class discussions and be able to complete short programming assignments in class. Students must be able to bring a laptop computer to class.

If you want to learn how to make programs run really fast, then this course is for you!

Prerequisites

CS 1332, 1372, 2110 or CX 4010. This course requires heavy programming in C/C++. You should have significant programming interest and experience beyond that of the prerequisite courses. Familiarity with using Linux systems is strongly recommended.

Topics

- Aspects of computer architecture and networks
- Parallel algorithms
- Performance modeling
- Parallel scientific applications
- Distributed memory (MPI) programming
- Multithreaded programming (p-threads, OpenMP, etc.)
- Accelerator programming, e.g., Intel Xeon Phi and GPUs
- Other programming models, parallel languages, and tools

Grading

50% Class participation and in-class activities

25% Project 1

25% Project 2

What You Need to Succeed in this Course

- Desire to learn how to make programs run fast
- Curiosity, for example to investigate performance anomalies
- Engage and participate in class discussions and activities (to do this, you need to keep up with homework and bring a laptop to class)
- Expertise in C or C++ programming
- Familiarity with using the Linux command line
- Not be afraid of matrix operations

Computer Resources

Students in this course will use the jinx cluster, which runs Linux. Accounts will be available at the beginning of the semester. Log into the jinx cluster at jinx-login.cc.gatech.edu using your Georgia Tech user name and password. More information about jinx is available at: <https://support.cc.gatech.edu/facilities/instructional-labs/jinx-cluster>.

Textbooks

- **Required:** Introduction to High Performance Computing for Computational Scientists and Engineers, Georg Hager and Gerhard Wellein, CRC Press, 2010.
- **Supplementary:** Introduction to Parallel Computing, 2nd edition, A. Grama, A. Gupta, G. Karypis, and V. Kumar, Addison Wesley, 2003. This book is available electronically through the GT library website.