CS 6213 Parallel Processing

Fall 2017, Credit Hours: 3

General Information

Instructor: Hai Jiang
Office: CSM, Room 127
Phone: (870)680-8164
Email: hjiang@astate.edu

Time: Mon Wed 2:00 p.m. - 3:15 p.m.
Location: HSS 1041

Office Hours: Mon Wed 10:15 a.m. - 2:00 p.m. & 3:15 p.m. - 5:00 p.m.
Course Homepage: http://myweb.astate.edu/hjiang/cs6213.html
( Lecture notes, homework assignments, etc. )

Course Description

Parallel programs are notoriously difficult to reason about, develop, and debug. This course is designed to provide senior and graduate students in computer science, computer engineering, and computational sciences with fundamentals in parallel processing. Students will gain hands-on programming experience solving computationally intensive problems in a variety of disciplines. Specific topics include:

- Parallel programming platforms
- Principles of parallel algorithm design
- Basic communication operations
- Analytical modeling of parallel programs
- Programming using the message-passing paradigm (MPI)
- Programming shared address space platforms (POSIX Thread and OpenMP)
- Parallel algorithms
- Advanced topics

Student Learning Outcomes for This Course

- Utilize parallel computing terminology accurately
- Describe the structure of a parallel computer in details
- Write MPI, OpenMP and Pthread programs correctly
- Understand task and data decomposition approaches
- Simulate cache and memory behaviors
- Address communication issues in interconnect networks
- Analyze program and system performance
- Explain scalability theory precisely
- Accomplish course projects for system development skills
M.S. Computer Science Student Learning Outcomes Supported by This Course

- M.S. Computer Science graduate students should have the ability to apply advanced analysis techniques to problem identification and solution in computing applications
- M.S. Computer Science graduate students should have the ability to apply advanced implementation techniques to problem identification and solution in computing applications

Prerequisites

CS 3223 (Computer Organization), or consent of the instructor

Textbook


References

- More course materials will be available on course homepage. Please visit it often for changes and announcements.

Resources

- Ian Foster, *Designing and Building Parallel Programs*, Available at [http://www.mcs.anl.gov/dbpp](http://www.mcs.anl.gov/dbpp)
- POSIX thread (pthread) tutorials:
  - [http://yolinux.com/TUTORIALS/LinuxTutorialPosixThreads.html](http://yolinux.com/TUTORIALS/LinuxTutorialPosixThreads.html)
- OpenMP:
- More links will be posted on course homepage
Grading

Final grades will be calculated based on the following weights:

- Attendance: 5%
- Homework and Programming Assignments: 15%
- Midterm Exams (2): 30%
- Term Project: 25%
- Final Exam: 25%

The final grade will be distributed as:

- A [85-100]
- B [70-85]
- C [60-70]
- D [50-60]
- F [0-50]

Computer Science Classwork and Assessment Delivery Environment

CSCADE system (http://cscade.cs.astate.edu/) will be used for homework submission and grading.

Policies

Food and Drinks

Department policy restricts bringing either food or drinks into the classroom.

Electronic Devices

Cell phones are restricted during class. Cell phones must be turned off during the lecture. If your cell phone rings during class, you may be asked to leave. Other devices (computers, recorders, etc.) may be allowed, but you must ask the instructor before you use them during class.

Special Facilities

Students who require academic adjustments in the classroom due to a disability must first register with ASU Disability Services. Following registration and within the first two
weeks of class, please contact the instructor to discuss the appropriate academic accommodations to ensure equal access to this course.

**Rescheduling Tests**

Tests cannot be rescheduled due to testing in other classes. If a test is missed due to extenuating circumstances then you must notify me as soon as possible. The circumstances must be documented by you and must be excusable in order to reschedule a test.

**Late Assignments**

For most homework assignments, the class will receive a working solution within four days after the due date. *NO* assignments will be accepted that are more than four days late. Assignments that are less than a week late, will be accepted with certain penalty (25% per day).

**Cheating**

You are encouraged to discuss problems and programming assignments with each other. Helping others learn is often the most powerful way of mastering material yourself. However, taking somebody else's solution without their knowledge or consent is cheating and will be punished. Do not leave copies of the programming assignments in the trash can in a public place -- throw them away at home or some other private place. Also do not leave your directories unprotected. There are harsh penalties for those found cheating.

**Attendance**

Attendance is required. If you miss a class, you are responsible for material covered during the class you missed, this includes any assignments made. Note that I do not provide one-on-one instruction for missed classes.