

Southern Illinois University Carbondale
CS520: Introduction to Parallel Computing
Spring 2012

General Information

Instructor: Dr. Mengxia Zhu
Office room: 2142 Faner Hall
Office hours: MW 2pm~5pm or walk in at your convenience
E-mail: mzhu@cs.siu.edu
Office Tel: 453-6057
Lecture time: MWF 1:00pm – 1:50pm Lecture place: Lindgren 18

Course Objectives

Study various parallel architectures and network topologies; Learn different parallel schemes and related strategies including pipelining, message passing, process communication and synchronization, process level parallelism, data parallelism, task partitioning and load balancing; Study the parallel algorithms and issues that influence the speedup and efficiency of parallel programs; know how to design and write parallel programs using Message Passing Interface (MPI) as well as OpenMP for shared memory multiple processors given a specific scientific problem which is computing intensive. General purpose graphics processing units based (GPGPU) computing using CUDA may also be covered if time permits.

Project Presentations

Students will work either individually or with one partner to complete a term project. You will select a research problem after conducting extensive background review on related paper/s. Design parallel algorithm and implement it under Athena Linux cluster at hands-on lab. A 20-25 minutes presentation will be given to demonstrate your design and present experimental results.

Assignments

Several written home works and programming assignments will be given related to the material covered in class. Important Note: Make sure that you regularly check your siu email for announcements, assignments, and other course related materials. You are recommended to get a copy of the slides and bring them to class for the purposes of taking notes easily during instruction.

Recommended Textbook

1. Parallel Programming: Techniques and Applications Using Networked Workstations and Parallel Computers (2nd Edition) Barry Wilkinson, Michael Allen Publisher: Prentice Hall; ISBN-10: 0131405632 ISBN-13: 978-0131405639

Other Reading Materials

- MPI: www-unix.mcs.anl.gov/mpi/
- OpenMP: www.openmp.org/
- I will provide other material that will be used in this class.

Resources

You should use Blackboard system to receive course announcements, download assignments and upload finished home works and lab projects by the due dates. Your SIUC ID and password are required to login. Lecture slides are available at <http://www.cs.siu.edu/~mengxia/Teaching.htm>

Evaluation

Grading components:

Attendance	5%
Homework	25%
Project	25%
Midterm	20%
Final	25%

Grading scale*:

Grade	CS520
A	90 – 100
B	80 – 89
C	70 – 79
D	60 – 69
F	59 and below

Late Policy:

Students are expected to complete work on schedule. The late policy for all assignments is as follows: 10% points off, if submitted within 24 hours after the due date; 25% off, if submitted 24-48 hours after the due date; no credit if submitted two days or more days after the due date unless prior arrangements are made with the instructor with acceptable reasons. Partially finished assignments will receive partial credit.

Academic Integrity:

Plagiarism behavior in any form is unethical and *will be punished*. All work submitted by a student (home works, projects, programming assignments, and exams etc.) has to be a student's own work. Students are allowed and encouraged to discuss with other students and look up resources in the literature (including the Internet) for their assignments, but *appropriate references must be included for the materials consulted*, and appropriate citations should be made when the material is taken verbatim.

Definitions and policies on academic dishonesties are described in detail on the website (<http://www.cs.siu.edu/departments/cheating.html>). The instructor will expect students to be aware of these guidelines and to conduct themselves accordingly. If cheating occurs, the student will receive a failing grade on the assignment and (at the instructor's discretion) a failing grade in the course. The instructor may also decide to forward the incident to the University Judicial Affairs Office for further disciplinary action.

Emergency Procedures:

Southern Illinois University Carbondale is committed to providing a safe and healthy environment for study and work. Because some health and safety circumstances are beyond our control, we ask that you become familiar with the SIUC Emergency Response Plan and Building

Emergency Response Team (BERT) program. Emergency response information is available on posters in buildings on campus, available on BERT's website at www.bert.siu.edu, Department of Safety's website www.dps.siu.edu (disaster drop down) and in Emergency Response Guideline pamphlet. Know how to respond to each type of emergency.

Instructors will provide guidance and direction to students in the classroom in the event of an emergency affecting your location. It is important that you follow these instructions and stay with your instructor during an evacuation or sheltering emergency. The Building Emergency Response Team will provide assistance to your instructor in evacuating the building or sheltering within the facility.

Tentative course topics

Week	Topic
1	<ul style="list-style-type: none"> • Introduction to Parallel Computing
2,3	<ul style="list-style-type: none"> • Message-passing Computing • Basic MPI Routines
4	<ul style="list-style-type: none"> • Embarrassingly Parallel Computation
5, 6	<ul style="list-style-type: none"> • Analytical Modeling of Parallel Programs • Evaluate Parallel Programs
7	<ul style="list-style-type: none"> • Partitioning and Divide and Conquer Strategies
8	<ul style="list-style-type: none"> • Review and Midterm
9	<ul style="list-style-type: none"> • Pipelined Computations
10	<ul style="list-style-type: none"> • Synchronous Computation
11,12	<ul style="list-style-type: none"> • Load Balancing and Termination Detection
13	<ul style="list-style-type: none"> • Programming Shared Address Space Platforms • Introduction to OpenMP
14,15	<ul style="list-style-type: none"> • Sorting & Dense Matrix Algorithm & Image Processing
16	<ul style="list-style-type: none"> • Presentation