CPSC 621 Parallel Processing

Instructor:	Prof. Aaron Koehl
	aaron.koehl@cnu.edu

Office Hours: MW 11am-12pm, 1-2:30pm

Meeting Times: MW 5:30-6:45

OVERVIEW

This course is intended to prepare the student for future research or industry practice by developing an understanding of parallel computation, which will be explored in the context of three major areas of computer science: architecture, operating systems, and algorithms.

OBJECTIVES

In this course, you will be exposed to contemporary topics in parallel and concurrent computing, through lectures, presentations, programming, and reading of modern research.

Upon finishing this course, it is expected that you will be able to:

- Converse intelligently about contemporary concepts in parallel computing.
- Understand the limits of instruction level parallelism provided by uniprocessors.
- Understand the complexity and function of modern parallel architectures.
- Understand when and where parallel computing is beneficial.
- Understand some of the challenges of supporting concurrency within an operating system, with respect to throughput and latency.
- Understand the various models of parallelism and parallel communication.
- Understand the scope of parallel computing research.
- Approach programming problems with new tools and a new perspective.

PREREQUISITES

CPSC 521 (Computer Architecture)

TEXTS

Grama, Gupta, Karypis, and Kumar. <u>Introduction to Parallel Computing</u>, 2nd Ed. Pearson Education Ltd: Essex, England. 2003.

John Hennessy and David Patterson. <u>Computer Architecture</u>, "A Quantitative Approach," 4th Ed., Morgan Kaufmann Publishers: San Francisco, CA. 2008.

CLASS PRESENTATIONS

Each student will be assigned two presentations throughout the semester, chosen from a list provided the first few weeks of class. The slides must be printed and handed in prior to the class presentation. Students will be allotted 25 minutes for presentation content, plus time for questions.

All students will be responsible for reading assigned research papers before the presentation day, and be able to answer questions. However, the presenter for that day must know the paper thoroughly, and be able to answer class questions.

ASSESSMENT

All written assignments must be typeset (ACM style / L^AT_FX preferred). There will be two partial-term tests during the semester. Homework is due at the beginning of class.

- The grading breakdown is as follows:
 - Coursework 35%
 - Midterm Exams (x2) 20%
 - Semester Project 30% 15%
 - Final Exam

Grading Scale

A final score of 90 will guarantee an A-. A final score of 80 will guarantee at least a B-. A final score of 70 will guarantee at least a C-. Lower scores will be considered a failing grade.

COLLABORATION

ALL WORK SUBMITTED FOR A GRADE MUST BE ENTIRELY YOUR OWN WORK.

HONOR POLICY

"On my honor, I will maintain the highest possible standards of honesty, integrity, and personal responsibility. That means I will not lie, cheat, or steal and as a member of this academic community, I am committed to creating an environment of respect and mutual trust."

DISABILITIES

If you have a disability and need special consideration, please make an appointment with me to discuss those needs. In order to receive an accommodation for your disability, it must be on record in the Office of Career and Counseling Services (594-7192).

Week 1OverviewWeek 2Parallelism IntroductionCh. 1, HP 1.8, HP 1.9Instruction Level ParallelismHP 2, 3Week 3Limits of ILPHP 3Shared Address Space ProgrammingCh. 7Week 4Shared Address Space ProgrammingCh. 7Week 5Concurrency: DeadlockPapersWeek 6Concurrency: Distributed Computing Concurrency: MultithreadingPapersWeek 7Parallel Architectures and PlatformsCh. 2Week 8Dynamic MultithreadingCLRS 27Week 9SPRING BREAK (Mar. 5-9)Week 10Week 10Parallel Algorithm DesignCh. 3Week 11Analysis of Parallel AlgorithmsCh. 4Communication PatternsCh. 4Week 12Parallel TopicsParallel TopicsParallel topics selected from: CUDA/GPU, Cell B/F, Parallel TopicsWeek 14Parallel TopicsWeek 15Parallel SortWeek 15Parallel FT, Dense Matrix AlgorithmsCh. 12, 10Ch. 13, 8	TENTATIVE S	TOPIC	<u>Resources</u>
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Week 16 FINAL EXAM, 27-APR, 5 to 7:30pm 28-Apr, All papers due	Week 16	FINAL EXAM, 27-APR, 5 to 7:30pm	