CS/ECE 566 Parallel Procssing

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1 Course Goals

This course covers general issues of parallel processing, which include system architectures, programming paradigms, performance evaluation, and applications. Approximately one third of the course will be devoted to basic concepts and techniques, and the remaining two third will be on programming (shared-memory programming, distributed memory programming, GPU programming) and assorted current topics in parallel computing. Several textbooks are recommended as the general guideline of the lecture. Both undergrads and grads are welcome to the class. By the end of this course, students will learn:

- Fundamentals of parallel and distributed computing, which include architectures parallel programming paradigms, current and future trends, and principles of parallel algorithm design.
- Parallel and distributed programming skills, which include shared memory programming (openMP), distributed memory programming (MPI), and data parallel programming (CUDA).
- Performance analysis and tuning techniques, which include performance metrics & evaluation techniques, machine-independent optimization, and machine-dependent optimization.

2 Course Materials

- A. Grama, V. Kumar et al., Introduction to Parallel Computing Addison Wesley, 2003. (highly recommended)
- Gerassimos Barlas, Multicore and GPU Programming: An Integrated Approach MOrgan Kaufmann, 2014. (highly recommended)
- David Kirk and Wen-Wei Hwu, Programming Massively Parallel Processors, Morgan Kaufmann, 2022. (recommended)

3 Course Outline (Tentative)

Week	Topic
week 1	Introduction to parallel processing
week 2	Parallel platforms and programming models
week 3	Parallel performance and evaluation
week 4	Shared memory architectures
week 5	Shared memory programming
week 6	Distributed memory architectures
week 7	Distributed communications
week 8	Exam I
week 9	Message passing programming I
week 10	Message passing programming II
week 11	GPU architecture
week 12	Data parallel programming
week 13	Parallel algorithm design
week 14	Current trends
week 15	Research projects

4 Course Work

40% homeworks, 40% exams, and 20% project & participation

5 Prerequisite

Students are expected to have taken and received an "C" or better in CS 401 and CS/ECE 466 or equivalents, or permission of instructor.