

## ECE/CS 508: Parallel Algorithm Techniques, Spring 2023

**Catalog Description:** Algorithm techniques for enhancing the scalability of parallel software: scatter vs. gather, problem decomposition, spatial sorting and binning, privatization for reduced conflicts, tiling for data locality, regularization for improved load balance, compaction to conserve memory bandwidth, double-buffering to overlap latencies, and data layout for improved efficiency of DRAM accesses.

**Prerequisite:** ECE408 or CS420 or equivalent. This course **should NOT be** your first GPU/CUDA course.

**Additional Information:** This course requires previous knowledge of parallel programming. The course is designed to teach graduate students the parallel algorithm skills needed to use commodity many-core GPUs to solve their domain problems. It is also designed to teach the techniques that can benefit from compiler and library support.

This course will require reading of technical papers and articles, and may be helpful to junior graduate students in identifying a thesis research topic. The final project involves research.

### Recommended (Background) Reading and APIs:

- Kirk and Hwu, *Programming Massively Parallel Processors*, 4th ed.
- NVIDIA, *NVIDIA CUDA 12.0 Programming Guide*

**Grading:** This is a lab-oriented course, thus two-thirds of your grades are based on assignments.

- Quizzes: 5%
- Exam: 30%
- Labs: 35%
- Project: 30%
  - Design Document: 25%
  - Project Presentation: 25%
  - Demo/Performance/Report: 50%

### Due Dates and Late Policy:

Labs will be released early enough for you to work around other commitments (interviews, paper deadlines, and so forth), thus **NO LATE SOLUTIONS** will be accepted.

Labs will generally be **due on Tuesdays** (nominally 11:59:59 p.m. in Champaign). Check the announcements on the web page to be sure that you have the latest version of an assignment before starting it. In general, I won't make changes less than two weeks in advance of a lab's deadline (MP0 and MP1 will be ready on the first day of class).

**Academic Integrity:** See Section 1-402 of the UIUC Academic code. You are allowed and encouraged to discuss assignments/MPs with other students in the class. Getting verbal advice/help from people outside the class is also fine. Any copying or exchange of code is unacceptable, including from public sources (other than the assignments themselves). Giving/receiving help on an exam from anyone other than the course staff (and team members for the final project ONLY) is unacceptable. Penalties for the first case of academic dishonesty will be a 0 on the assignment / exam and reduction of final letter grade by one full letter. Subsequent infractions will lead to failing the course and possibly administrative action.