GPU HW/SW (CS 7295 001)

Fall 2026

Course information

- Course prefix and number: CS 7295 001
- Course name: GPU HW/SW
- Instructor: Prof. Hyesoon Kim
- Email: hyesoon@cc.gatech.edu
- Head TA: Gerald (Scott) Madeira
- Delivery: 100% Web-Based Asynchronous
- Semester and academic year: Fall 2026

Course description

This course explores the software and hardware aspects of GPU development. Through hands-on projects, you will gain basic CUDA programming skills, learn optimization techniques, and develop a solid understanding of GPU architecture. You will study compiler principles to understand software-related GPU issues and read research papers on hardware challenges. By the end of the course, you will have strengthened your knowledge of compilers, programming, and computer architecture for modern GPUs.

Course learning outcomes

By the end of this course, students will be able to:

1. Develop foundational CUDA programming skills.
2. Optimize the performance of CUDA programs.
3. Explain GPU architecture performance issues.
4. Apply static code analysis techniques to identify and address GPU performance issues.

Topics

- GPU programming
- Parallel programming fundamentals
- Compiler background
- GPU architecture
- CUDA program optimizations

Prerequisites

- C/C++ and Python programming skills are necessary.
- Prior CUDA programming experience is not required.
- Familiarity with basic computer organization (instruction sets, pipelining, etc.), as in a typical undergraduate computer architecture course, is expected.
- Recommended (not required): CS 6200 for large C++ projects (especially projects 3–5); CS 6290 for architecture simulators (projects 3–4); CSE 6220 for CUDA-heavy projects (1–2); CS 6340 for program analysis (project 5).

Required course materials

No textbook is required. All readings will be provided on Canvas. If any textbook or other material carrying an ISBN is assigned during the term, it will be identified by full citation including ISBN.

Grading policy

Grades are based on the components below. Weights sum to 100% (plus optional participation).

Grading breakdown (Fall offering)

Assessment	Type	Weight	Description
Project 1: CUDA Programming	Programming assignment	5%	Basic CUDA programming concepts (C++).
Project 2: CUDA Programming II	Programming assignment	20%	Performance optimization of CUDA programs (C++).
Project 3: GPU Simulator	Programming assignment	20%	Add GPU warp scheduler policies and tensor core timing models in a trace-driven GPU simulator (C++).
Project 4: CUDA Programming for ML	Programming assignment	20%	Implement ML algorithms in CUDA.
Project 5: GPU Code Analysis	Programming assignment	15%	Add a GPU code analysis pass in a Python-based framework.
Homework	Multiple-choice quizzes	10%	Understanding of lecture content and readings.
Final exam	Exam	10%	Comprehensive;

Assessment	Type	Weight	Description
			covers all course topics.
Participation points (optional)	Ed	3%	Ed participation points.

Final letter grades

- A: 90–100% overall and at least 40% on the final exam.
- B: 80–89%
- C: 70–79%
- D: 60–69%
- F: Below 60%

Weighting note

Component percentages above are the official weighting for this course. Optional Ed participation (3%) can adjust outcomes when your overall percentage is within 3% of a letter-grade boundary; see "Ed participation (optional)" below.

Late work and exams

- Homework / quizzes: No late submissions unless an exception is approved as described under Deadlines.
- Projects: Each calendar day late reduces the project score by 10%.
- Exams: Exams use the Honorlock proctoring system. During the first week, a syllabus quiz may use Honorlock (including room scan). You may use one 8.5×11 inch sheet of paper (both sides) for the final exam unless otherwise announced. The final is comprehensive; reviewing quiz items is a useful preparation strategy.

Attendance and participation

This section is delivered online and asynchronously. There are no required synchronous class meetings. You are expected to engage with weekly modules, keep pace with deadlines, monitor Canvas and Ed announcements, and complete proctored assessments during the published windows.

Additional criteria for successful completion

Successful completion requires meeting all published deadlines (or approved extensions), completing required submissions at a passing level, following academic integrity rules, participating in proctored assessments as required, and complying with Georgia Tech academic and conduct policies.

Communication

- Private questions: Use Ed private messaging to reach the instructor and TAs.
- General questions: Use Ed public posts so classmates can benefit from answers.

Online platforms

- Canvas: Assignment submission and lecture materials.
- Ed: Discussion and Q&A.

Deadlines and extensions

Assignments and quizzes are due at the end of the stated day (Eastern Time), unless a different time is posted. Extensions for projects or exams are granted only for documented, excused circumstances, verified and approved by the instructor or the Office of the Dean of Students.

Quiz attempts

Unless announced otherwise, each quiz allows one submission. Verify your answers before submitting. If a quiz allows two attempts (for example, some later quizzes), that will be announced in advance.

Ed participation (optional)

When your final average is within 3% of a letter-grade cutoff, constructive Ed contributions may be used to resolve borderline cases. The exact formula is not published; historically, strong posts have received on the order of 0.1 points per contribution.

Academic and research honesty / integrity

Georgia Tech expects ethical conduct. Review the Student Code of Conduct and the Academic Honor Code. Suspected cheating or plagiarism may be referred to the Office of Student Integrity.

Student–Faculty Expectations Agreement

Georgia Tech emphasizes mutual respect between faculty and students. Read the Student–Faculty Expectations Agreement (catalog rule 21) for baseline expectations in this course.

Office of Disability Services

Students who need accommodations should contact the instructor early in the term and register with Disability Services to obtain an accommodation letter.

Core IMPACTS

Insert the official Core IMPACTS designation(s) for this course as listed in the Georgia Tech catalog for CS 7295. If none apply, state that explicitly per unit guidance.

Nondiscrimination

Georgia Tech prohibits discrimination and harassment based on any protected characteristic. Diverse viewpoints are welcome; discriminatory or harassing behavior is not tolerated.

Changes to the syllabus

This syllabus and schedule may change. Updates will be announced via Ed (and email when used). You are responsible for monitoring announcements and email.