

# EE 7700-2

## GPU Microarchitecture

*Open to undergraduate students who have completed  
75 credits and have at least a 3.5 GPA.*

### Where/When

228 Tureaud Hall, Mon. Wed. Fri. 11:40–12:30 **Spring 2011**

<http://www.ece.lsu.edu/gp/>

RSS: [http://www.ece.lsu.edu/gp/rss\\_home.xml](http://www.ece.lsu.edu/gp/rss_home.xml)

### Who

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Office hours: Monday–Friday: 14:00–15:00.

### Prerequisites

By Topic: Computer architecture and digital logic.

Also, students must also have a familiarity machine language and C++ programming.

### Topics

- Basics of 3D Computer Graphics
  - Transformations, projections, lighting, textures, etc.
- GPU/GPGPU APIs: OpenGL, Shader Languages, Direct3D, CUDA, OpenCL
  - The rendering pipeline model; vertex/geometry/tessellation/fragment shaders.
  - Projects using C/C++ with OpenGL, OpenGL Shader Language, and OpenCL or CUDA APIs.
- Analysis of 3D Graphics Algorithms
  - Determination of computational and data-transfer needs.
  - Determination of control complexity and parallelism.
- Fixed Function and Early Programmable GPU Designs
  - Exploitation of control simplicity and abundant parallelism.
  - GPU/CPU communication, execution control, and GPU organization.
  - Multithreaded execution, latency hiding, and design simplicity.
- Microarchitecture of Modern Programmable GPUs and GPGPUs
  - Collection-of-SIMD-cores organization and its rationale.
  - Memory hierarchy, memory access techniques.
- GPU/GPGPU Code Performance, and Algorithms
  - Data placement and setup overhead (uniform vs. attribute, etc.)
  - Multithreading and latency hiding.
  - GPU and GPGPU algorithms.
- GPU Research
  - Larrabee: Intel's more CPU-like GPU concept.
  - Real-time ray tracing.

Topics subject to change.

### Text

Papers and other references. Recommended (not required) text: Tomas Akenine-Möller, Eric Haines, and Naty Hoffmann, "Real-Time Rendering," A. K. Peters (Publisher).

### Grading

35% Midterm Exam • 35% Final Exam • 30% Homework and Projects

Final exam weight may be increased for a student who shows significant improvement on the final exam.

Late assignment penalty: 10% per day late deducted. Missed-midterm-exam policy: at instructor's discretion either a makeup exam, use final exam grade for midterm grade (*i.e.*, 70% final exam weight), or use of zero for midterm grade. Daily attendance: optional, however students are responsible for all material, instructions, and notices presented in class.

