EE 7700-1
GPU Microarchitecture
(Schedule Booklet Title: GRAPHICS PROCESSORS)

Where/When
218 Tureaud Hall, Mon. Wed. Fri. 11:40–12:30 Spring 2010
http://www.ece.lsu.edu/gp/
RSS: 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, Direct3D, CUDA
  The rendering pipeline concept, and its relationship to GPUs and APIs.
  Coding projects using OpenGL, OpenGL Shader Language, and CUDA.
- 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.
  Programmable units’ instruction, memory, and register organizations.
  Multithreaded execution, latency hiding, and design simplicity.
- Microarchitecture of Modern Programmable GPUs and GPGPUs
  Collection-of-SIMD-cores organization and its rationale.
  Implementation of shader language and CUDA APIs.
- 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
  Larrabbee: Intel’s more CPU-like GPU concept.
  Real-time ray tracing.

Topics subject to change.

Text
Papers and other references. (No textbook.)

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.