THE OHIO STATE UNIVERSITY

COLLEGE OF ENGINEERING

Real-Time Rendering

CSE 5542

Credit Hours:
3.00

Course Levels:
Undergraduate (1000-5000 level)
Graduate

Course Components:
Lecture

Course Description:
Comprehensive list of topics in real-time rendering using OpenGL and GLSL, including coordinate systems, transformations, viewing, illumination, texture mapping, and shader-based algorithms.

Prerequisites and Co-requisites:
Prereq: 3901 (560) or 3902 or 3903, and Math 2568 (568) or 571.

Course Goals / Objectives:
- Master graphics programming and the theory of real time rendering
- Be familiar with various techniques for creating 3D realism
- Be exposed to the state of the art in graphics hardware API
- Be competent with developing real time graphics applications

Course Topics:
- Overview of graphics APIs (OpenGL and GLSL)
- Overview of graphics hardware - geometry processing, fragment procssing, pixel processing; graphics pipeline
- Coordinate systems in rendering pipeline - local space, world space, eye space, clip space, window space
- Modeling transformation - rotation, scaling, translation; hierarchical transformation; transformation between different spaces
- 3D viewing - viewing transformation, projection transformation
- Basic lighting algorithms - Phong illumination model and Gouraud shading
- Introduction to OpenGL Shading Language
- OpenGL shader overview - vertex shaders, geometry shaders, fragment shaders
- OpenGL vertex shaders
- OpenGL geometry shaders
- OpenGL fragment shaders
- OpenGL raster operations - scissor test, stencil test, depth test, blending
- OpenGL buffer objects - vertex buffer objects, frame buffer objects, pixel buffer objects
- Real time shadow algorithms - planar shadows, shadow volumes, shadow maps
- OpenGL texture mapping
- Bump mapping
- Environment mapping
- Advanced texture mapping and anti-aliasing
- Advanced shading and lighting algorithms - real time global illumination
- Non-photorealistic rendering
- Real time volumetric rendering

Designation:
Elective