**Module Code**  | CS7GV3  
---|---
**Module Name**  | Real-time Rendering  
**ECTS Weighting**  | 5 ECTS  
**Semester taught**  | Semester 2  
**Module Coordinator/s**  | Assistant Professor Michael Manzke  

### Module Learning Outcomes

On successful completion of this module, students will be able to:

- **LO1.** explain the differences between fixed function graphics pipelines and shader architectures, including pixel, vertex and geometry shaders.
- **LO2.** architect a shader pipeline.
- **LO3.** develop specific shaders to implement lighting models, shadowing, geometry processing and post-processing effects.
- **LO4.** analyse and compare different approaches to real-time rendering.
- **LO5.** discuss state-of-the-art issues in real-time rendering.

### Module Content

1. Overview of graphics pipeline  
2. Introduction to GPUs  
3. Introduction to shader / stream programming using GLSL  
4. Illumination/ Surface models (Phong, Blinn, normal maps etc.)  
5. Shadowing Techniques (shadow maps, volumes etc.)  
6. Global Illumination (reflection, refraction etc.)  
7. Stylised and Non-photorealistic Rendering  
8. Voxel rendering

### Teaching and Learning Methods

This module deals with programming for GPU pipeline architectures e.g. geometry, rasterisation, texturing, fragment / pixel and vertex shaders. Students will be introduced to shader systems and shader coding and will learn about modern architectures and developing real-time graphics applications for desktop PC. The module will explore advanced rendering concepts presented at leading international conferences such as SIGGRAPH and GDC.

### Assessment Details

<table>
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<tr>
<th>Assessment Component</th>
<th>Brief Description</th>
<th>Learning Outcomes Addressed</th>
<th>% of total</th>
<th>Week set</th>
<th>Week due</th>
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<td>Coursework Labs</td>
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<td>LO1, LO2, LO3, LO4, LO5</td>
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<td>Coursework Project</td>
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### Reassessment Details

Coursework (100%)

### Contact Hours and Indicative Student Workload

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<th>Activity</th>
<th>Hours</th>
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<td>lecture</td>
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<td>laboratory</td>
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<td>tutorial or seminar</td>
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<td>other</td>
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<td>Independent study (outside scheduled contact hours), broken down by:</td>
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<td>preparation for classes and review of material (including preparation for examination, if applicable)</td>
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<td>completion of assessments (including examination, if applicable)</td>
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<td><strong>Total Hours</strong></td>
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### Recommended Reading List

- Various research papers from SIGGRAPH
- Excerpts from GPU PRO, GPU Gems, Graphics Gems series of books

### Module Pre-requisites

- C++ and OpenGL

### Module Co-requisites

### Module Website

- Blackboard

### Last Update

26/09/2019 by Prof. M. Manzke