<table>
<thead>
<tr>
<th>Module Code</th>
<th>CS7GV3</th>
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<tbody>
<tr>
<td>Module Name</td>
<td>Real-time Rendering</td>
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<tr>
<td>ECTS weighting</td>
<td>5</td>
</tr>
<tr>
<td>Term</td>
<td>HT (2nd Semester)</td>
</tr>
<tr>
<td>Contact Hours</td>
<td>2 lecture hours per week</td>
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<tr>
<td>Module Personnel</td>
<td>Assistant Professor Michael Manzke</td>
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### Learning Outcomes
On successful completion of this module, students will be able to:

- GV3LO1 explain the differences between fixed function graphics pipelines and shader architectures, including pixel, vertex and geometry shaders.
- GV3LO2 architect a shader pipeline in a game context.
- GV3LO3 develop specific shaders to implement lighting models, shadowing, geometry processing and post-processing effects.
- GV3LO4 analyse and compare different approaches to real-time rendering.
- GV3LO5 discuss state-of-the-art issues in real-time rendering.

### Module Learning Aims
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 game graphics engine architectures and developing real-time graphics applications, both for desktop PC and Xbox360. The module will explore advanced rendering concepts presented at leading international conferences such as SIGGRAPH and GDC.

### 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

### Recommended Reading List
- Various research papers from SIGGRAPH
- Excerpts from GPU PRO, GPU Gems, Graphics Gems series of books

### Assessment Details
Coursework: 100%

Coursework will consist of labs 50% and a project 50%.