

# CS537

## Catalog Description:

This is an introductory-level course to computer graphics. No previous knowledge on the subject is assumed. The objective of the course is to provide a comprehensive introduction to the field of computer graphics, focusing on the underlying theory, and thus providing strong foundations for both designers and users of graphical systems. The course will study the conceptual framework for interactive computer graphics, introduce the use of OpenGL as an application programming interface (API), and cover algorithmic and computer architecture issues. Prerequisite: CS 385 or CS 590. Cross-listed with CPE 537.

## Textbook(s)

### Required:

- Edward Angel and Dave Shreiner, *Interactive Computer Graphics: a top down approach with shader-based OpenGL* (6th ed.), Addison Wesley, ISBN-10: 0132545233, ISBN-13: 978-0132545235.
- Dave Shreiner, *OpenGL Programming Guide* (7th ed), Addison Wesley, ISBN-10 0321552628

## Week-By-Week

### Syllabus

Week	Topic(s)	HW
Week 1	<ul style="list-style-type: none"> <li>• Course overview and objectives</li> <li>• Graphics programming, the APIs</li> </ul>	<p><b>Project 1 Assigned:</b> The goal is to get your feet wet in OpenGL and GLUT programming, and try out the basic methods for building scenes and animations, and deal with basic interaction.</p>
Week 2	<ul style="list-style-type: none"> <li>• The Pixel and TL Pipelines. Programmable shaders.</li> <li>• Building Simple Scenes</li> <li>• Basics of Viewing and Projection. The 2D case.</li> </ul>	<p><b>Final Projects Proposal Discussions</b></p> <p>You can either propose your own project or use the default project described defined by the instructor.</p> <p>The final project must show your mastery of the fundamentals of computer graphics covered in the course:</p> <ul style="list-style-type: none"> <li>• Modeling and scene hierarchy</li> <li>• Smooth animation of camera and object motions</li> <li>• Entertaining and easy interaction</li> <li>• Pleasing, and engaging appearance using: appropriate illumination, materials texture mapping</li> <li>• In addition to the required components listed above you may include at least one of the pseudo-realism effects: transparency, refraction, shadows, object</li> </ul>

		reflections using stencil buffering, environment mapping(cube/sphere mapping)
Week 3	<ul style="list-style-type: none"> <li>• Buffers in OpenGL. Animation.</li> <li>• Interaction, selection, and picking.</li> </ul>	<b>Project 2 Assigned:</b> In this homework we will begin to build a true 3D graphics application. The scenario you should keep in mind is a game in which you are holding a complex dynamic object "in your hand" and are exploring it by turning it around and looking at it.
Week 4	<ul style="list-style-type: none"> <li>• Mathematics for Graphics Part 1</li> </ul>	<b>Project 1 Due</b>
Week 5	<ul style="list-style-type: none"> <li>• Math Part 2</li> <li>• Viewing and Projection in 3D</li> </ul>	<b>Project 3 Assigned:</b> The goal in this homework is to build a small world and a flying camera which will enable you to navigate smoothly in a 3D world. The user is identified with the flying camera.
Week 6	<ul style="list-style-type: none"> <li>• Hierarchical modeling</li> </ul>	<b>Project 2 Due</b>
Week 7	<ul style="list-style-type: none"> <li>• Flying cameras</li> </ul>	<b>Project 4 Assigned:</b> In this homework we will combine scene building and advanced viewing with advanced interaction techniques. The scenario you should keep in mind is a game in which you: observe a scene; pick one of several objects "in your hand"; and then explore it by turning it around and then looking at it.
Week 8	<ul style="list-style-type: none"> <li>• Shading</li> </ul>	<b>Project 3 Due</b>
Week 9	<ul style="list-style-type: none"> <li>• Textures, Skyboxes, Combining Shading and Texture Mapping</li> </ul>	
Week 10	<ul style="list-style-type: none"> <li>• Scene graphs</li> </ul>	<b>Project 5 Assigned:</b> Note this homework is designed to: <ol style="list-style-type: none"> <li>1. Make sure you have fixed all the bugs from the previous homeworks.</li> <li>2. Get you to work with shading and non-trivial 3D interaction.</li> <li>3. Make sure you have a good base to do the final project.</li> </ol>
Week 11	<ul style="list-style-type: none"> <li>• Shadows</li> </ul>	<b>Project 4 Due</b>
Week 12	<ul style="list-style-type: none"> <li>• Reflections and transparency</li> </ul>	
Week 13	<ul style="list-style-type: none"> <li>• Global illumination</li> </ul>	
Week 14	<b>Final Project Status Review Presentations</b>	<b>Project 5 Due</b>