

**Course Title:** Foundations of Computer Graphics

**Course Number:**  CS-AD 216

**Number of credits:** 4

**Prerequisites, co-requisites, and cross-lists:**

Prerequisites:

CS-AD 105, Algorithms

CS-AD 103, Data Structures

**Instructor Information:**

Name: Saurabh Ray

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Office number: A2-187

**Class time: TBD**

**Office hours: TBD**

**Course Description:**

The aim of the course is to give an overview of the fundamental concepts in computer graphics along with hands-on experience in interactive 3D graphics programming. The course will cover basic mathematics related to computer graphics (geometric primitives, 2D and 3D transformations, orthographic and perspective projections),  fundamentals of geometric modeling (mesh representation and manipulation),  the modern graphics pipeline,  shading and lighting models, mapping techniques (texture, bump, shadow, environment), and ray tracing. Relevant basics of mathematics, algorithms and data structures will also be covered in this course. However, prior experience in programming will be very useful as the course is programming intensive. There will be several programming assignments.

**Learning Outcomes:**

**Students who successfully complete this course will be able to:**

1. Understand the theory behind graphics techniques including some advanced

techniques

2. Apply graphics concepts to build interactive 3D applications

3. Thoroughly understand and exploit the capabilities of modern graphics hardware

4. Handle large programming projects

**Teaching and Learning Methods:**

There are four main teaching and learning methods employed in this course:

**1. Class discussions.** During each class, there will be numerous questions posed by the Instructor to help students engage in the topics and to promote discussion.

**2. Coding Assignments.** There will be several coding assignments that will help students to gain an in-depth understanding of the various graphics concepts and the architecture of the graphics system.

**3. Reading Assignments.** There will be several reading assignments which introduce the students to some on the interesting ideas and applications that we are unable to do in class.

**4. Theoretical Assignments.** There will be several theoretical questions which will sharpen the students’ ability to understand the theoretical basis of the techniques they learn.

**Course Materials:**

3D Math Primer for Graphics and Game Development by Dunn and Parberry, 2nd edition (November 2011), AK Peters/CRC press.

Interactive Computer Graphics - A Top-Down Approach with with WebGL by Angel and Shreiner, 7th Edition (March, 2014), Pearson.

**Assignments and Grades:**

There will be assignments (almost) every week. These will include theoretical as well as programming exercises.

**Grading:**

The final grade will consist of the following:

10 written assignments 40%

Midterm exam 30%

Final exam 30%

**Course Schedule:**

Week 1: Introduction

Week 2: Getting Started with Programming using Javascript and WebGL

Week 3: Basic WebGL concepts, Adding Interaction, Basic Mathematics

Week 4: More Mathematics for Computer Graphics

Week 5: Computer Viewing

Week 6: Computer Viewing (contd.)

Week 7: Lighting

Week 8: Texture mapping

Week 9: Ray Tracing

Week 10: Ray Tracing (contd.)

Week 11: Ray Tracing (contd.)

Week 12: Meshes

Week 13: Meshes (contd.)

Week 14: Animation

**Plagiarism:**

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