CS 405 Computer Graphics

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**Course Content**

This course is an introduction to computer graphics, modeling, animation, and rendering. Topics covered include basic image processing, geometric transformations, geometric modeling of curves and surfaces, animation, 3-D viewing, visibility algorithms, radiosity, ray tracing, shading, and volume rendering. Students gain experience by developing their own graphics programs producing simple animations.

In the second part of the course, we will cover data visualization basics and how to create interactive visual analytics tools.

**Objectives**

The objective of this course is to understand the workings of computer-generated images, animations, and visualizations. The students will master the basics of computer graphics in theory and practice. At the final project of this course is design and development of a computer game from scratch.

**Recommended or required reading**

Reading material will be distributed.

**Course Outline**

This is the first course on computer graphics, introducing the basics of 2D and 3D graphics. There will be tutorials on Linear Algebra, Signal Processing, Software Engineering, and Advanced Graphics Topics. There will special emphasis on data visualization and 3D interactive software development.

**Course Policies**

Plagiarism: There is no teamwork encouraged in this course. You are expected to research and develop course projects alone. You can use some allowed resources but before using them you must contact the course instructor or assistants to make sure that you are not crossing the line. **This is very important.**

Plagiarism and academic integrity are very important issues. You only have your reputation in the academic world. And it takes only one mistake and it is forever lost. As long as you are a student the rule is simple: be honest and open to your Professor/Adviser. Explain him all the sources you used and how you used. If you are doing something you will get embarrassed explaining to me, you are doing something wrong. ***Any plagiarism will lead to grade F without any exceptions*.**

Project: There will be three projects:

Raytracer: Implemented with C or C++. The project requirements will be distributed separately.

3D Projects. Implemented on **OpenGL 3.3 with C++.** The project requirements will be distributed separately.

Data Visualization Project. Implemented with Python and/or Javascript. The project requirements will be distributed separately.

Grading

Ray Tracing or Visualization             5%

3D Projects    45%

Midterm 15%

Final 35%

We will take the better one of the Ray Tracing and Visualization Project and contribute to 5% of the total grade.

The 3D project will have three parts and each part will have equal weight. In total the 3D project will have 45% of the total grade

Participation is expected and highly rewarded…

**We will announce deadlines for each project separately.**

Week-1

Course                 Introduction / Linear Algebra

Week -2

Course Representation, Camera Projections

Week-3

Course                Shading, Illumination

Week-4

Course                Ray Tracing

**Project Ray Tracing**

Week/Date          5 /

Course                Transformations

Week/Date          6 /

Course                Models, Mesh

**Project 3D Project I**

Week/Date          7 /

Course                 Models, Mesh

Week/Date          8 /

Course                Animations

**Project 3D Project I**

Week/Date          9 /

Course                Curves

Week/Date          10 /

Course                 Textures

Week/Date          11 /

Course                 Textures

**Project 3D Project II**

Week/Date          12 /

Course                 Data Visualization

Week/Date          13 /

Course                 Data Visualization

Week/Date          14 /

Course                 Data Visualization

**Project Data Visualization**