SU DEPARTMENT OF COMPUTER SCIENCE SYLLABUS

COSC/MATH 482/582 Computer Graphics

Description: This course focuses on generating and manipulating graphic information using computers. Emphasis will be on the mathematical analysis of the fundamental problems associated with those activities and on the structured design of solutions. Note: Credit may not be received for more than one: COSC/MATH 482.

Objectives: At the conclusion of the course, the student will have demonstrated (a) ability to design, and implement on a computer, algorithms to display and manipulate elementary two- and three-dimensional graphics figures and (b) understanding of the mathematics underlying those activities.

Prerequisites: A "C" or better in both COSC 220 and MATH 306.

Textbooks: *Open GL Programming Guide: The Official Guide To Learning Open GL, Version 4.5 with SPIR-V*, The Kronos OpenGL ARB Working Group, Dave Shreiner et.al., Pearson Education, 8th edition, 2016.

	Weeks
Introduction: Conceptual framework for graphics programming. The graphics pipeline, shader pipeline and ray tracing systems. Introduction to the OpenGL and the OpenGL shading language (GLSL) API, GLEW, a windowing system such as GLUT, SDL or SFML and an introduction to a ray tracing system.	1
Graphics Primitives and Techniques: Color, basic modeling, single vs. double buffering, hidden surface removal, clipping, and event driven programming, GLSL basics, creating and loading shaders, vertex arrays and data transfer to graphics device, graphical client-server model and parallel processing via shaders.	3
Lighting, Illumination, and Shading: Lighting models, materials, shading vs. shadowing, coding lighting models in GLSL, intermediate modeling techniques, normal vector calculations.	2
Geometrical Transformations and Viewing: Coordinate-free geometry, linear and affine spaces, homogeneous coordinates, change in frames, translations, scaling, rotations, shear, combinations of transformations, an introduction to animation, matrix stacks, modeling and projection matrices, coding transformations and matrix manipulation in GLSL. Ray tracing commands for geometric transformations.	3
Texture Mapping and Blending: Texture mapping, bump mapping, environment mapping. Texture coordinates, texture coordinate generation and texture transformations. Blending modes, color space transformations, and the alpha channel, coding textures and blending in GLSL. Ray tracing texture modes, bump mapping and transparency.	3
Advanced Techniques of Three-Dimensional Graphics: Bezier curves, advanced modeling, intersection and collision testing, incorporation of a physics engine, radiosity, alternative lighting models, reflection and shadowing.	1
Exams and/or Optional Topics	1
	14

Evaluation
Exams, Quizzes, Programs, and Projects: 40%-80%
Final Exam and Final Project: 20%-60%

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