UNIVERSITY OF CALIFORNIA
UCMERCED

Syllabus for CSE170-01: Computer Graphics

Spring 2017
Instructor: Marcelo Kallmann

Designation:	CSE170 Computer Graphics
Catalog Description:	Basic algorithms in computer graphics enabling students to understand and experience the process of implementing modern computer graphics applications. Topics covered: shader programming, rasterization, clipping, hidden surface removal, transformations, rendering pipeline, scene graphs, curves and surfaces, constructive solid geometry, boundary representation, spatial partition methods, texture mapping, color models, illumination and shading.
Text Books and Other Required Materials:	Fundamentals of Computer Graphics, 3rd Edition, by Peter Shirley, Michael Ashikhmin, and Steve Marschner.
Course Objectives/ Student Learning Outcomes:	This course introduces 1) the basic algorithms employed by 3D graphics programming interfaces such as OpenGL, which are now implemented in practically all graphics cards available in computer systems from high-performance machines to personal and mobile computers, and 2) the basic modeling techniques and mathematical models used in specialized software packages in CAD, geometric modeling and 3D animation. The course focuses both on the theoretical and practical implementation aspects of the algorithms. The goal is to provide students with solid foundations for addressing a wide variety of computational problems in computer graphics, and to provide a thorough knowledge of the most common algorithms and techniques in the area.
Program Learning Outcomes:	
Prerequisites by Topic:	Class Prerequisite: CSE 030: Introduction to Computer Science and Engineering I, Proficient level of programming skills in C and C++ and as well basic knowledge of data structures. Prior knowledge of OpenGL is desired but not required.
Course Policies:	The course is organized in about 2h of lectures and two lab sessions per week. While the lectures introduce the covered topics, the students perform several programming assignments during the lab sessions in order to understand and practice the several algorithms and techniques discussed in class. About 10 programming assignments are introduced and developed during the lab sessions. Optional assignments are also provided and can be used as a mechanism for students to improve their final grade. The assignments are organized in a way to cover important topics and to provide the basic pieces for the students to be able to implement two larger projects, one focusing on hierarchical transformations, and a final project where the topic can be chosen among several topics in computer graphics.
Academic Dishonesty Statement:	a. Each student in this course is expected to abide by the University of California, Merced's Academic Honesty Policy. Any work submitted by a student in this course for academic credit will be the student's own work.

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	b. You are encouraged to study together and to discuss information and concepts covered in lecture and the sections with other students. You can give "consulting" help to or receive "consulting" help from such students. However, this permissible cooperation should never involve one student having possession of a copy of all or part of work done by someone else, in the form of an e mail, an e mail attachment file, a diskette, or a hard copy. Should copying occur, both the student who copied work from another student and the student who gave material to be copied will both automatically receive a zero for the assignment. Penalty for violation of this Policy can also be extended to include failure of the course and University disciplinary action. c. During examinations, you must do your own work. Talking or discussion is not permitted during the examinations, nor may you compare papers, copy from others, or collaborate in any way. Any collaborative behavior during the examinations will result in failure of the exam, and may lead to failure of the course and University disciplinary action.
Disability Statement:	Accommodations for Students with Disabilities: The University of California Merced is committed to ensuring equal academic opportunities and inclusion for students with disabilities based on the principles of independent living, accessible universal design and diversity. I am available to discuss appropriate academic accommodations that may be required for student with disabilities. Requests for academic accommodations are to be made during the first three weeks of the semester, except for unusual circumstances. Students are encouraged to register with Disability Services Center to verify their eligibility for appropriate accommodations.
Topics:	Rasterization, clipping, hidden surface removal, transformations, rendering pipeline, scene graphs, interpolation, curves and surfaces, constructive solid geometry, boundary representation, spatial partition methods, texture mapping, color models, illumination and shading, and overview of selected advanced topics in computer graphics, animation and GPU shader programming.
Class/laboratory Schedule:	2h of lectures and two 3h lab sessions per week
Midterm/Final Exam Schedule:	Tentative schedule: Midterm by week 8 Final exam by week 15
Course Calendar:	Tentative Calendar (week number, topics, and typical assignments) 1 Rendering Pipeline; PA1:2d drawing 2 Transformation Matrices; PA2:wire 3d object 3 Transformations, Scene Graphs; PA3:hierarchical 3d object 4 Barycentric Coordinates, Color; PA4:3d smooth shading 5 Illumination, Shading; PA5:view mesh 6 Textures, Rasterization; PA6:textures 7 Clipping, Ray Tracing; Midterm Exam 8 Parametric and Implicit curves; Project 1 9 Lagrange, Hermite, Bézier curves; PA7:Lagrange & Bézier 10 B-Splines, Interpolating Splines; PA8:B-Splines 11 Subdivision Surfaces, Ray Tracing; PA9:Interpolating Splines 12 Euler Formula and Manifolds; PA10(optional):Bézier Patches 13 BRep Structures, Euler Operators; PA11(optional):Marching Squares 14 Modeling by Decomposition, CSG; PA12(optional):Sphere LOD 15 CSG and review; Final exam

Designation:	CSE170 Computer Graphics
Professional Component:	
Assessment/Grading Policy:	Tentative assessment plan: 30% Exams: two exams (midterm and final) 20% Quizzes: 4 or 5 quizzes 25% Projects: two projects (one focusing on transformations and a final project with open topic) 25% Programming Assignments: around 10 assignments covering the most important topics seen in lecture. Note: depending on the number of students the final project may be developed in groups.
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