[CS-GY 6533 / CS-UY 4533] Interactive Computer Graphics

Fall Semester 2016

Lectures:	Tues. 3:00-5:30pm
Classroom:	2 MTC 08.812 (8th Floor)
Software Eng. Lab:	RH223
Course Web Site:	`https://github.com/ivansafrin/CS6533`

Instructor:	Prof. Ivan Safrin
Office:	2 MTC, 08.812 (8th Floor)
Office Hours:	Tues. 5:30-7:00pm
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TA: TBA.

Objectives: This course aims to provide a broad introduction to the field of Computer Graphics, and to describe the techniques that are commonly used in the graphics industry today (such as in production of special effects, computer animation, video games, and virtual reality). This course is combination of algorithms, numerical methods, representations and models of the shape and appearance of real-world objects, and methods for their display and manipulation. It involves a lot of programming, and requires a certain degree of mathematical sophistication (in linear algebra, specifically). But it's also a lot of fun. No artistic skill is required, but it does come in handy.

Outline: An introduction to the field of computer graphics: displays, image formation, visual perception, images, transformations (viewing and projection), programmable pipelines (vertex and fragment programs), modeling (primitives, polygon meshes, smooth curves and surfaces), animation (keyframing, procedural), rendering and realism (visibility, lighting, shading, shadows, texturing, ray tracing).

Prerequisites: CS2134 (Data Structures and Algorithms) or equivalents, knowledge of C++ programming, and a familiarity with Linear Algebra and Calculus.

Expected Work: Students will design, implement, and use interactive graphical applications (using the OpenGL API in C++). This amounts to four coding assignments using the OpenGL C++ API and the OpenGL Shading Language (GLSL). Some of the assignments build off of each other.

Exams: There will be one midterm and a final exam. The exams will be based on the material covered in class, and on what is learned from completing the assignments.

Textbook: Steven J. Gortler, Foundations of 3D Computer Graphics, First Edition, The MIT Press, 2013, ISBN-10: 0262017350, ISBN-13: 978-0262017350.

Recommended Reference: D. Shreiner, OpenGL Programming Guide, The Official Guide to Learning OpenGL, Versions 3.0 and 3.1, 7th Edition, Addison-Wesley, 2009, ISBN-10: 0321552628, ISBN-13: 978-0321552624.

Grading: Midterm: 25%, Final: 25%, 4 Programming Assignments: 50%. Highest grade (A): $>=$ 90% of the points. Fail (F): $<$ 65% of the points. Grade changes will only be issued in cases of calculating and recording errors. Once a final grade has been submitted, it is considered final, see `http://bulletin.engineering.nyu.edu/`.

General Instructions for Programming Assignments: Submit your write-up, your source code (with full comments and documentation), and include your e-mail address as well as brief instructions on how to compile and run your programs. You can submit your assignments via email or via a github repository. Important: You MUST use the skeleton code provided NOTE: You may discuss the programming assignments with other students currently taking the course, BUT EACH WRITE-UP AND PROGRAM MUST BE DONE INDIVIDUALLY AND INDEPENDENTLY, AND YOU SHOULD SHOW THAT YOU PERSONALLY UNDERSTAND EVERYTHING THAT YOU SUBMIT. IN OTHER WORDS, CODE SIMILARITIES WILL BE CONSIDERED CHEATING, AND THE ASSIGNMENT WILL BE GRADED WITH ZERO POINTS. The incident will furthermore be reported to the dean of student affairs, possibly resulting in an F grade for the class, see

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Late Policy: For late projects and homework, 5% of the grade will be deducted for each day the project is not submitted.

Class Oveview (subject to change)

1	9/6	Introduction [Chapter 1]
2	9/13	OpenGL, GLSL and drawing basics. [Chapter 1 and Appendix A]
3	9/20	Linear Transformations [Chapter 2]; Affine Transformations [Chapter 3]
4	9/27	Transformations continued. [Chapter 5]; Projections. [Chapter 6]
5	10/4	Hierarchical Transformations; Quaternions [Chapter 7]
6	10/11	Geometric Modeling, Subdivision Surfaces; Depth [Chapter 11]
7	10/18	Interpolation, Splines [Chapter 9]; Animation, Skinning; [Chapter 23]
8	10/25	**Midterm Exam**
9	11/01	Programming fragment shaders in GLSL. [Ch 12, Ch 13]
10	11/08	Illumination and shading. [Lecture Notes, Ch 14]
11	11/15	Illumination and shading. [Lecture Notes, Ch 14]
12	11/22	Texturing and advanced shading. [Chapter 15]
13	11/29	Compositing and post-processing. [Lecture Notes]
14	12/06	Deferred shading. [Lecture Notes]
15	12/13	Color and light, physically based rendering. [Chapters 19 and 21].
16	12/20	**Final Exam**

Institute Policy on Academic Dishonesty

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