

## Syllabus of CS174A – Introduction to Computer Graphics - Spring 2019

(Updated 4/1/19 - tentative and subject to adjustment as needed)

**Instructor:** Garrett Ridge ([garett@cs.ucla.edu](mailto:garett@cs.ucla.edu))

**Office hours:** Weds 3:00pm, Engineering VI Conference Room 372

**Lecture:** Young Hall CS76, Tues-Thurs 4-5:50pm

**TAs:** Alan Litteneker <[alitteneker@cs.ucla.edu](mailto:alitteneker@cs.ucla.edu)>, Zeel Rakesh Doshi <[zeeldoshi@cs.ucla.edu](mailto:zeeldoshi@cs.ucla.edu)>

### Getting Information

We will be using Piazza for class discussions and questions and should be your primary mode of communication with the TA's and I and each other. Join at:

<https://piazza.com/g.ucla.edu/spring2019/cs174a>

**Topics Covered:** The Graphics Pipeline, Modeling Transformations, Viewing Transformation, Projections, Polygonal Representations and Modeling Hierarchies, Shader Writing, Local and Global Illumination, Parametric Curves and Surfaces, Texture Mapping, Raytracing, and Animation.

### Summary:

This course introduces the fundamental principles of Computer Graphics (CG).

The lectures will divide their focus between the mathematical foundations of computer graphics, and hands-on programming. The same goes for Friday TA discussions, which will additionally involve Q&A.

A major goal of the course is to acquire better programming skills and tooling, so prepare to do heavy programming. We will explore web browsers' developer tools, Github, and fault diagnosis.

**Grading Scheme:** There are at least **1000** points available in this class with a few opportunities for extra points, possibly adjusted along the way.

The end of the class centers around a team project of 3 to 4 members. Your team can create whatever they like for your project as long as it is primarily an interactive, graphics-based application. It will be evaluated based on originality, technical impressiveness, and creativity. The team project is due at the end of the 9th week of class. Live, final presentations will take place during week ten in a randomized order. All members must present. The team project will be worth **500** points. Those points will be awarded in three parts. The first **350** will come from my evaluation of your project and how impressive it is. The next **100** will come self-grading by your teammates and the final **50** points will come from your classmates based on your class

presentation. They will also award extra points based on class voting in technical achievement and popularity.

Prior to the team project there will be five preliminary assignments of increasing value (**10 30 50 70 90**), totalling **250** points, starting with a simple one for getting your environment setup and working. The rest will ask you to demonstrate concepts progressively covered in class.

There will be two exams, a midterm (short answer) worth **100** points and a final (multiple choice) worth **150** points.

Curving final grades up or down is not ruled out, if needed to move the distribution so that grades are not too uniform or too low. Besides that, final grades will be awarded as follows:

**D-: 500+, D: 550+, D+: 600+, C-: 650+, C: 700+, C+: 750+, B-: 800+, B: 850+, B+: 900+, A-: 950+, A: 1000+, A+: 1100+**

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**Main Textbook:** E. Angel, D. Shreiner, Interactive Computer Graphics: A Top-Down Approach With WebGL, 7th Edition, Pearson, 2015.

### **Policy**

Group work is not permitted until specified. Re-use of code from other students is prohibited. Usage of outside resources and libraries must be explicitly disclosed, when allowed. Refer to Section 102.01 of the [UCLA Student Conduct Code](#). Any dishonesty will be referred to the Office of Student Conduct and receive zero credit.

**Schedule:** (Experimental; expect changes)

Week 1: 4/01-4/05

Class / project overview, state of graphics field, graphics history, graphics program anatomy  
JavaScript review

Week 2: 4/08-4/12

Linear Algebra Review, Vector math

Vertex Arrays, Indexing, Polygons, Interpolation

**A1 due:** Set up and use Chrome Developer Tools

Week 3: 4/15-4/19

Flat vs Smooth Shading

Matrix transformations and their order; Hierarchies

**A2 due:** Use WebGL calls in a simple program to draw shapes

Week 4: 4/22-4/26

Viewing, Projections, View Volumes  
Shaders, Interpolation, Lighting

**A3 due:** Place some shapes (matrix transformations and their order)

Week 5: 4/29-5/03

More Shaders, Smooth Motion in Scenes, Timing in Scenes, Texture Mapping, Alpha Blending

**A4 due:** Modify shaders for a scene

Week 6: 5/06-5/10

Collision Detection, Animation, Curves, Surface Patches, Scene Graphs

**Midterm** Tuesday 5/06 in class. Multiple choice, don't bring any notes/books, bring scantrons if we announce they'll be used

Week 7: 5/13-5/17

Environment and Normal Mapping, Shadow Mapping, Picking, Scan Conversion, TBD

**A5 due:** Advanced Graphics Topics

Try out certain advanced effects, design an interactive document around it

Week 8: 5/20-5/24

Research topics: Ray Tracing, Volume rendering, spatial hashing, meshing, TBD

Week 9: 5/27-5/31

Research topics: Caustics, Volumetric Light Scattering, TBD

**Project due:** Team graphics competition (Cutoff for editing what you will submit for grading. You can still touch projects up for presentation afterwards, but your project must work by this date)

Week 10: 6/03-6/07

**Project presentations** in class

6/14 (Friday):

**Final exam** 11:30-2:30