Syllabus of CS174A – Introduction to Computer Graphics - Fall 2022

Instructors & TAs

Name	Asish Law	Chenda Duan (A)	Noor Nakhaei (B)	Wuyue Lu (C)	Junlan Lu (D)
Role	Instructor	TA	TA	TA	TA
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Class Location	BUNCHE 2209A	BROAD 2160E	PERLOFF 1102	KAPLAN A65	DODD 146
Class Hours	TR 6 - 8 PM	F 4 - 6 PM	F Noon - 2 PM	F 2 - 4 PM	F 4 - 6 PM
Office Location	Bunche 2209A	Zoom	Zoom	Zoom	Zoom
Office Hours	TR 8:00 - 8:30 PM	W 10 AM - Noon	R 3 - 5 PM	M 2 - 4 PM	W 11 AM - 1 PM

Main E-Textbook (Optional)

Pearson eText Interactive Computer Graphics -- Access Card (Edition 8e); ISBN: 978-0135258262

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, fault diagnosis, etc.

Getting Information

Class Website: https://bruinlearn.ucla.edu/courses/140100

We will be using Canvas Discussions for class discussions and questions and should be your primary mode of communication with the TAs, I and each other.

Grading Scheme

There are **500** points available in this class:

- **Midterm: 100 points (20%)**
- **Final: 175 points (35%)**
- **Assignments: 75 points (15%)**
  There will be 4 preliminary assignments, totaling **75** points, starting with a simple one (**0 points**) for getting your environment setup and working. The rest 3 assignments (**25 points each**) will ask you to demonstrate concepts progressively covered in class.
- **Final Team Project: 150 points (30%)**
  Preliminary proposal: 5%; final proposal + midway evaluation: 5%; final demo + report: 20%
  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 10th week of class. Live, final presentations will take place during week 10 in randomized order. All members must present.

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-: 60%+, D: 63%+, D+: 67%+,
C-: 70%+, C: 73%+, C+: 77%+,
B-: 80%+, B: 83%+, B+: 87%+,
A-: 90%+, A: 93%+, A+: 97%+

PNP option: https://www.seasoasa.ucla.edu/academic-updates/

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.

Topics Covered

Graphics Pipeline, Modeling Transformations, Viewing Transformation, Projections, Polygonal Representations and Modeling Hierarchies, Local and Global Illumination, Texture Mapping, Raytracing, Particle & Volume Rendering.

Schedule

Week#	Date	Topics	Book Sections	Assignments (mostly due by Sunday midnight)
Week 00	09/22/21	Class and assignments overview, state of graphics field, graphics history, applications	1.1	
Week 01	09/27/21	Graphics program anatomy Linear Algebra Review, Vector math	1.2, 4.1.1 3.3, 3.4	
	09/29/21	Linear Algebra (contd.): vectors and matrices	4.1, 4.3.1, 4.5	**A1**: Set up and use Chrome Developer Tools (due 10/02)
Week 02	10/04/21	Coordinate Systems, Polygons, Interpolation	2.4.1, 4.3.0-4.3.1, 4.2	
	10/06/21	Vertex Arrays, Indexing, Matrix transformations, Hierarchies	4.6.0-4.6.3 4.7-4.9	
Week 03	10/11/21	Change of Basis, Concatenating of Transformations, Graphics Pipeline	4.3.2, 4.10	
	10/13/21	Concatenations (contd.), Projections, Viewing, View Volumes	5.0, 5.1.0, 5.1.1, 5.1.2, 5.1.5, 5.2, 5.3	**A2**: Tilting Boxes (due 10/16)
Week 04	10/18/21	Normalized projections, window-to-viewport mapping	5.4.0-5.4.4, 5.5, 5.6, 5.7	
	10/20/21	Geometrical calculations, HSR Algorithms: Painter's, Z-Buffer, Scanline Z-Buffer	5.8, 12.5, 12.6	
Week 05	10/25/21	Midterm Review	Notes	
	10/27/21	**MIDTERM**: closed notes/books/electronics		During class hours
Week 06	11/01/21	Lighting/Illumination: Ambient, Diffuse, Specular	6.0-6.4	
	11/03/21	Flat vs Smooth Shading, Barycentric coordinates, Interpolation	6.5	
Week 07	11/08/21	Non-photorealistic rendering, Global illumination (Radiosity, Ray Casting) Mappings: Texture, Bump, Displacement, Environment	6.11, 6.12, 7.0-7.8	Initial project proposal, including team member names (due 11/08) **A3**: Solar System (due 11/09)
	11/10/21	Team project midway demos		Online (Zoom)
	11/11/21	VETERANS DAY (HOLIDAY)		
Week 08	11/15/21	Mappings (contd.) Shadows: 2-pass z-buffer, shadow volumes	5.10, 5.11	
	11/17/21	Ray Casting	13.2, 13.3	**A4**: Textures (due 11/20)
Week 09	11/22/21	Ray Tracing, Alpha Blending, Particle Rendering	10.0, 10.1, 10.2, 10.8	Final project proposal (due 11/22)
	11/24/21	THANKSGIVING (HOLIDAY) Online evaluations open (8 AM)		
Week 10	11/29/21	Prof Demetri: Biometric Human Simulation		
	12/01/21	Volume Rendering, Aliasing/Anti-Aliasing Final Exam review	13.9, 13.10, 13.13, 12.8	
	12/02/21	Team project presentations		TA discussion sessions 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.
	12/03/21	Online evaluations close (8 AM)		
Week 11	12/06/21	**FINAL EXAM:** closed notes/books/electronics		6:30-9:30 PM, in person, in class