CS 200: *Computer Graphics I*

Prerequisites:

CS 170, MAT 140.

General Information

Lecture:	TuTh 2:00–3:20pm in Van Gogh
Lecturer:	Jason Hanson, Ph.D.
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Email Address:	`jhanson@digipen.edu`
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Office Hours:	MW 12:00–1:00pm, TuTh 9:00–11:00pm

Course Description [taken from the course catalog]

CS 200 presents fundamental mathematical elements, data structures, and algorithms useful for animating and viewing two dimensional primitives. The course aims to fulfill two objectives. The first objective is to provide students with a sufficient mathematical and algorithmic background to design and implement 2D graphics applications. The second objective is to prepare students with the knowledge required for writing three dimensional graphics applications. The first half of the course deals with scan–conversion algorithms for rasterizing 2D primitives such as lines, circles, ellipses, triangles, and arbitrary polygons. The second half of the course is concerned with the viewing and animation of these 2D primitives. The course covers topics such as interpolation techniques, transformations, culling, clipping, animation techniques, and the 2D viewing pipeline.

Course Objectives and Learning Outcomes:

Upon successful completion of the course, the student will be able to perform the following specific tasks: (1) implement a 2D mathematics package for manipulating points, vectors, and affine transformations, (2) use modeling transformations to place 2D triangular meshes into world space, (3) use camera and device transformations to view objects in world space, (4) clip and cull objects to a 2D viewport, (5) interpolate colors and textures, and (6) scan convert lines, circles, and polygons efficiently.

Required Text

Computer Graphics: From Pixels to Programmable Graphics Hardware, by Alexey Boreskov and Evgeniy Shikin; published by Chapman and Hall/CRC, 2013; ISBN: 9781439867303. Note that the text can be accessed on–line using Safari Books Online, which is available through the DigiPen Library web site.

In–class Lab Work

Roughly once a week, some class time will be set aside for a lab session. Lab work will consist of written problems for the students to solve during the session, and will involve the material discussed during the lectures. The lab assignments will be collected and graded.

Homework

Several programming assignments will be given over the course of the semester. These should be turned in by midnight of the day that they are due; late assignments are accepted, but with a ten percent penalty for every week after the due date. All code submitted should adhere to reasonable coding standards. In particular, all files should have a header that contains the name of the student, the course number, the assignment number, and the due date of the assignment. Code should be written in *standard* C++ (C++11 may be used) that compiles without warnings using the MSVC 2013 and the GNU (whichever version is installed on the DigiPen machines) compilers.

Grading

The final numerical average for the class will be a weighted average of the programming assignments, lab assignments, midterm exam, and final exam; these items are weighted as follows.

Lab: 25% *Programming:* 25% *Midterm:* 25% *Final:* 25%

Individual lab assignments and programming projects will be considered to be of equal weight in computing their respective averages. The final letter grade for the class will be determined from the above numerical average according to the *Standards of Progress* section of the DigiPen course catalog.

Course Organization

The rough plan for the semester is as follows; however, it is entirely possible that temporal deviations will occur.

Week 1: Overview of the 2D viewing pipeline.

Week 2: World space and modeling transformations. Polygonal meshes.

Week 3: Camera/viewing transformations. Device coordinates.

Week 4: Graphics architecture model, pixels, coordinates.

Week 5: Scan conversion of lines.

Week 6: Scan conversion of circles.

Week 7: Midterm exam.

Week 8: Scan conversion of ellipses.

Week 9: Scan conversion of triangles.

Week 10: Scan conversion of polygons.

Week 11: Clipping and culling line segments.

Week 12: Clipping and culling polygons.

Week 13: Color interpolation and texture mapping.

Week 14: Other topics as time permits.

Academic Honesty

Students are welcome to work together, ask the instructor for help, and consult alternate text books; however, all work submitted must the individual students own work. Any student found plagiarizing the work of others, or cheating on exams, will be given the grade of F (0%) for the class and will be subject to disciplinary action.

Disabled Student Services

If students have disabilities and will need formal accommodations in order to fully participate or effectively demonstration learning in this class, they should contact the Disability Support Services Office at (425) 629-5015 or `dss@digipen.edu`. The DSS Office welcomes the opportunity to meet with students to discuss how the accommodations will be implemented. Also, if you may need assistance in the event of an evacuation, please let the instructor know.