



Visual Computing

Spring Semester 2023

Syllabus

Administrivia

Class Time: Tuesday and Thursday (1:30pm - 2:45pm)

Place: Music/Theater Building 1005

Instructor: [Craig Yu](#) (Email: craigyu@gmu.edu)

Description

This course is a requirement of the **ACS Game Design** degree and can be used as a **CS Related Elective** for the BS CS degree.

The focus of this course is programming essential mathematical and geometric concepts underlying computer graphics. It covers fundamental topics in computational geometry, 3D modeling, graphics algorithms, and graphical user interfaces using both 2D and 3D implementations. Furthermore, it reinforces Object Oriented programming practices.

Course Outcomes:

1. Have a firm grasp of basic computer graphics algorithms and their underlying mathematics.
2. Be able to describe the various components of a graphics pipeline at a high level.
3. Know how to represent and manipulate 2D images and 3D models as well as a virtual camera.
4. Be able to design, implement and evaluate a simple graphics modeling package.
5. Have understanding of the consequences of various software system design choices.

Prerequisites

- Introduction to Low-level Programming (CS 262)
- Data Structures (CS 310)
- A good working knowledge of C/C++ programming
- Some simple UI programming
- Some mathematical sophistication, linear algebra, calculus
- (No prior knowledge of computer graphics or vision is assumed.)

Recommended text

- D. Forsyth and J. Ponce, *Computer Vision : A Modern Approach*, Prentice Hall (Online version: [38.8M PDF file](#))
- Richard Szeliski, *Computer Vision : Algorithms and Applications*, Springer, (Draft version: [22.2M PDF](#))
- John F. Hughes et al., *Computer Graphics: Principles and Practice* Third Edition. Addison-Wesley Professional, 2013.
- You may find very useful information in [CVonline](#)

Supplemental texts

- Peter Shirley et al., *Fundamentals of Computer Graphics* Third Edition. A K Peters, 2009.
- LaValle, Steven M. *Virtual Reality*, 2016. ([online FREE version \(very good, highly recommended\)](#))
- Woo, Neider, Davis, and Schreiner. *OpenGL Programming Guide* Fifth Edition. Addison-Wesley, 1999. ([online version](#))

Score and Letter Grade

The total score is 100 points. The breakdown is subject to change as a whole. This is the general breakdown we'll be using:

Projects: 53 pts

Homework: 2 pts

Participation: 3 pts

Final Exam: 42 pts

Homework and projects are to be completed individually. Though you may discuss the problems with others, your answers *must be your own*.

Midterm and final exams are *closed-book-closed-notes exams*. The formats of the exams will be announced later.

The final letter grade will be obtained using the following absolute scale:

| Total score (pts) | Letter Grade |
|-------------------|--------------|
| >=95: | A+ |
| >=90: | A |
| >=85: | A- |
| >=78: | B+ |
| >=74: | B |
| >=70: | B- |
| >=66: | C+ |
| >=60: | C |
| >=55: | C- |
| >=50: | D |
| <50: | F |

Extra Credits (Masons)

You are highly encouraged to implement the extra credits in each project. In the project page,



means 0.5 extra credit (i.e. 0.5 point)



means 1.0 extra credit (i.e. 1.0 point)

An actual implementation of an extra credit item may be worth somewhat more or less than its nominal value, depending on how well it was implemented.

Note:

- 1) You need to **describe** the extra credits you have implemented in your **readme** file.
- 2) **No extra credit** will be awarded for any **late** submission.
- 3) **No extra credit** will be earned until **ALL** of the required parts of the project are complete.

You may still get the maximum score in this course (i.e. 100 pts, an A+) even if you don't try any extra credit. But it is absolutely worth trying some of them, to make up some points you missed just in case, and also for fun.

Projects

There will be three mandatory projects, to be completed independently. Each project will require you to extend some skeleton project with new features to create a working graphics application. Please check the due dates of the projects in the project webpages. Beyond required extensions to the base project, you are strongly encouraged to attempt the extra credits, which translate into (a bounded number of) points.

The grader reserves the right to question any part of your submission, even it looks correct. You are supposed to have clear knowledge of what you implemented. **If you do not understand what you have implemented, points will not be counted.**

If you discuss your projects with others, you should submit their names along with the assignment material. Reverse engineering the sample executable and using code from previous offerings of the course or from any other source constitute plagiarism and are strictly prohibited. We will use automated tools to check for plagiarism.

Late Submission and Makeup Policy

(1) Unless a solid reason and **its supporting evidence are given**, e.g., due to illness, emergency, NO makeup is acceptable for students missing an exam;

(2) Homeworks and projects are due **at 11:59pm** on the due date. They may be submitted late by no more than 24 hours, weekend and holiday counted. **The penalty for late submission within 24 hours is 20% of the score. If the submission is late for more than 24 hours, zero score will be given.**

(3) That said, you are given a **one-day chance** for late project submission without penalty, to accommodate for important events such as participating in a sports competition (needs supporting evidence). However, **this the only chance**. You must email the instructor with supporting reasons when you want to use this chance to compensate for a late submission, so that your score will be counted accordingly. After this chance is used up, there is no more.

Note again: No extra credit will be awarded for any late submission (even you used your one-day chance to compensate for the lateness).

Honor Code:

GMU is an Honor Code university; please see the [Office for Academic Integrity](#) for a full description of the code and the honor committee process, and the [Computer Science Department's Honor Code Policies](#) regarding programming assignments. The principle of academic integrity is taken very seriously and violations are treated gravely.

What does academic integrity mean in this course? Essentially this: when you are responsible for a task, you will perform that task. When you rely on someone else's work in an aspect of the performance of that task, you will give full credit in the proper, accepted form. Another aspect of academic integrity is the free play of ideas. Vigorous discussion and debate are encouraged in this course, with the firm expectation that all aspects of the class will be conducted with civility and respect for differing ideas, perspectives, and traditions. When in doubt (of any kind) please ask for guidance and clarification.

[Important] Also note that posting projects or solutions on public websites **requesting or offering to pay for outside assistance is strictly prohibited**. It is also not allowed to publicly post your solutions, even this is for free, as it allows other students to copy them and hence results in plagiarism. These are all serious academic dishonesty. Students (whether past or current students) involved in these activities will be identified and sanctioned.

Accommodations for Disabilities:

If you have a documented learning disability or other condition that may affect academic performance you should: 1) make sure this documentation is on file with [Disability Services](#) (SUB I Suite 2500; 703-993-2474; <http://ds.gmu.edu>) to determine the accommodations you need; and 2) talk with me to discuss your accommodation needs.

Privacy:

Students must use their MasonLIVE email account to receive important University information, including messages related to this class. See <http://masonlive.gmu.edu> for more information.

Anti-Racism Statement:

Please find the anti-racism statement [here](#).

Names and Pronouns Statement:

Please find the names and pronouns statement [here](#).

Other useful campus resources:

- **Writing Center:** Robinson Hall A114; 703-993-1200; <http://writingcenter.gmu.edu>
- **University Libraries:** [Ask a Librarian](#)
- **Counseling and Psychological Services (CAPS):** 703-993-2380; <http://caps.gmu.edu/>

- **Student Support and Advocacy Center (SSAC):** Student Union Building (SUB) I, Suite 3200; 703-993-3686; <http://ssac.gmu.edu/>
- **University Policies:** The [University Catalog](#), is the central resource for university policies affecting student, faculty, and staff conduct in university academic affairs. Other policies are available at <http://universitypolicy.gmu.edu/>. All members of the university community are responsible for knowing and following established policies.
- [GMU Academic Calendar](#)

Welcome to the Course Website

CS 351 Visual Computing
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