

CSC 315 / F18

Introduction to Computer Graphics

Dr. Andrew Pounds,

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Office Hours: TR 10:30 – 11:45 a.m., F 9:00 – 9:50 a.m. (GSC 438) (or by appointment)

When asked about the complexity of the physical world, a physicist once said,

“There are forces in the world, and coordinates, and precious little else.”

Since much of computer graphics involves transforming the physical world into another reality via mathematical abstractions, this statement only has to be slightly modified to describe computer graphics. It should read,

“There are transformations in computer graphics, and coordinates, and precious little else.”

CSC 315 introduces students to the foundational principles of computer graphics. Students in CSC 315 will be exposed to the fundamentals of 2D and 3D graphics hardware and software. Graphics primitives, and the representations of lines, curves, and surfaces in 2D and 3D will be presented as well as the mathematics necessary to carry out the transformations of objects in these spaces. The importance of visual realism and elements of shading and achromatic light will also be introduced. *OpenGL* will serve as the API for the generation of the graphical elements, and the fundamentals of its use will be developed in tandem with the class objectives. Students are expected to have a working knowledge of C or C++. Strategies for code and project management with C/C++, *OpenGL*, and *git* will also be developed. Students in CSC 315 are expected to read at the college level and also set up and solve algebraic and trigonometric equations.

Class Meeting Times and Locations

Lecture: MWF 11:00-11:50; GSC 218

Course Materials

REQUIRED: *Computer Graphics with OpenGL, 4th ed.*, Hearn, *et al.*,
Scientific/Graphing Calculator

Course Structure

Portions from sixteen chapters of the text will be covered during the semester. The actual chapters, topics, and deliverables will be provided on the class website. Students are responsible for all material disseminated by the professor as well as the material from the textual sections listed on the class webpage. Three programming assignments and a group project will also be submitted for grading. Three 50 minute exams will be given per the schedule. A three hour final exam will be administered at the end of the term.

Grading

| | |
|---------------------------------------|----------|
| Tests (3 @ 100 pts) | 300 pts |
| Programming Assignments (3 @ 100 pts) | 300 pts |
| Group Programming Assignment | 100 pts |
| Homework (4 @ 25 pts) | 100 pts |
| Final Exam | 200 pts |
| | ----- |
| Total Possible | 1000 pts |

Course Grade Scale

| | |
|-----------|----------|
| A | ≥900 pts |
| B+ | ≥880 pts |
| B | ≥800 pts |
| C+ | ≥780 pts |
| C | ≥700 pts |
| D | ≥600 pts |
| F | <600 pts |

The above course grading scale is assured, but may be *slightly* lowered based on class exam performance.

General Information

Honor Code: All students in CSC 315 are expected to adhere to the Mercer University Honor Code. Any suspected violations will be reported to the Honor Council for further investigation.

Many students have difficulty in determining how to apply the Mercer honor code to computer courses. A few general guidelines should help you in deciding whether you are violating the honor code or not.

1. You are allowed to receive help on your programs from other students, provided the purpose of the help is to foster your understanding of your own program better, not to write your program for you.
2. You are NOT allowed to use copies of programs written by other students, or copies of programs from published sources, even if you plan to modify them extensively. The only exception to this rule is when the instructor provides you with code that should be incorporated into your program. In such cases the code must clearly be set off and the source or the code noted in the program.
3. You are NOT allowed to give copies of your programs, or parts of your programs, to other students in any form.
4. YOU MUST WRITE YOUR OWN CODE. DO NOT COPY PROGRAMS OR PARTS OF PROGRAMS FROM ANY SOURCE UNLESS I TELL YOU TO DO SO. IF YOU USE CODE I GAVE YOU PLEASE NOTE THE LOCATION OF THIS CODE IN YOUR PROGRAM VIA COMMENTS.

Any violation of the above policies will be treated as academic dishonesty and a violation of the Mercer Honor Code.

Attendance: Except for the first ten class days of the semester, attendance will not be taken. However, students are still accountable for all material covered in class as well as any announcements made during the lecture period.

Homework: Students are encouraged to work together on homework assignments. Each person, however, must turn in their own assignments in their own words.

Homework Grading Policy: Individual homework assignments will be graded on a three point scale and the composite score from all homework assignments converted to a 250 point scale at the end of the semester. Points will be awarded as follows: 3 (essentially correct), 2 (minor errors or omissions), 1 (major errors or omissions), 0 (no effort). Homework will be considered late if it is not turned in by 5:00 p.m. on the date due. Late homework will be penalized 33% per day.

Code Deliverables: While you may use any operating system and IDE you desire to develop your code, final code must be written in C/C++ and be able to be built and run on the departmental linux workstations. For each project a *makefile* to compile and link the code should be constructed and maintained along with the code. All code must be maintained on the departmental *git* server (<http://anvil.cs.mercer.edu>) and the last version of the code checked into the repository prior to the due date/time will be used for grading.

Electronic Submission of Materials: "Students bear sole responsibility for ensuring that papers or assignments submitted electronically to a professor are received in a timely manner and in the electronic format(s) specified by the professor. Students are therefore obliged to have their e-mail client issue a receipt verifying that the document has been received. Students are also strongly advised to retain a copy of the dated submission on a separate disk. Faculty members are encouraged, but not required, to acknowledge receipt of the assignment."

Missed Exams: Anyone missing an exam for *any* reason (personal illness, death in the immediate family, or other emergency) must notify Dr. Pounds in advance. The absence will be considered unexcused otherwise. Make-up exams will be individually scheduled.

Partial Credit: Partial credit will not be awarded on any exam unless individuals show their work and clearly delineate how they arrived at their answers.

Re-grading Policy: If a student suspects that an error was made in the grading of a submitted work, they may return the paper for re-grading with the understanding that the entire work will be re-graded and not only the portion in question.

Posting of Grades: Grades will not be posted. If you are curious about your cumulative grade, see Dr. Pounds.

Starfish: This course will use Mercer's web-based success platform, *Starfish*. Throughout the term, you may receive *Starfish* emails containing feedback. These communications are sent to support your success at Mercer. You can access Starfish through your MyMercer portal.

Accommodations and ADA/504: “Students in need of accommodation due to a disability should contact the Access and Accommodation Office to complete the verification process to become approved for services. In order to receive accommodations, each term, students will request accommodation and faculty notification forms through the Access Office online system Accommodate. Students are strongly encouraged to schedule a meeting with each professor in a timely manner to discuss arrangements. Accommodations are not retroactive in nature. Note - Disability accommodations or status are not reflected on academic transcripts. Students with a history of a disability, perceived as having a disability or with a current disability who do not wish to use academic accommodations are also strongly encouraged to complete the verification process with the Access Office. Students must request accommodations in a timely manner to receive accommodations in a timely manner.

The Access Coordinator for Macon Campus is

Katie Johnson, Director and ADA/504 Coordinator.
Phone: (478) 301-2778; email: johnson_kc@mercer.edu
Website: <https://access.mercer.edu>

Please note the following additional information from the Access and Accommodation Office (AAO):

In compliance with Section 504 of the Rehabilitation Act of 1973 (504) and the Americans with Disabilities Act Amendments Act of 2009 (ADAAA), “otherwise qualified” students with disabilities are protected from discrimination and may be entitled to “reasonable accommodations” intended to ensure equal access to all courses, programs, and services without a change of curriculum. Examples of accommodations include but are not limited to: testing accommodations, providing alternative format textbooks and tests, note-taking support, and modifications of policies or procedures. Equal Access may require moving a class or event to a physically accessible room, making websites accessible to screen readers, providing sign language interpreters, and captioning videos. All students requesting to be recognized as a student with a disability or requiring accommodations must first self-identify by requesting accommodations with the designated Access Coordinator for their campus or program and complete the verification process.”

Cell Phones and Pagers: “Out of courtesy for all those participating in the learning experience, all cell phones and pagers must be turned off, or placed on vibrate, before entering any classroom, lab, or formal academic or performance event.”

E-mail Listserv: I communicate heavily with the class (and encourage you to do the same) via an e-mail listserv which I maintain myself. Please subscribe to the listserv by going to

<http://theochem.mercer.edu/mailman/listinfo/csc315>

and filling out the required fields. Once subscribed, you may send e-mail to the class by using the e-mail address csc315@theochem.mercer.edu I personally moderate all requests to limit e-mail spam.

Course Evaluations: In an ongoing effort to improve the quality of instruction, each student enrolled in this course is required to complete an end-of-semester course evaluation. Details about the evaluation process will be provided at the end of the term.

Tentative Class Schedule¹

| Division | Text Chapters | Lecture Topics |
|--------------------------------------|---|--|
| - ONE - <i>Representation</i> | Chapter 1 Chapter 2 Chapter 3 Chapter 4 Chapter 5 | Survey of Computer Graphics Graphics Hardware Coordinates and Representations Introduction to <i>OpenGL</i> Keyboard and Mouse Interaction (Chap 20-6) Coordinate Reference Frames <i>OpenGL</i> Graphics Primitives Polygons Vertex Arrays Display Lists Color Blending Graphical Attributes EXAM #1, 9/21/18 |
| - TWO - <i>Transformation</i> | Chapter 6 Chapter 7 Chapter 8 | 2D Raster Graphics Algorithms Lines, Circles, Conic Sections Polygon Fills Antialiasing Linear Algebra Geometrical Transformations (2D) Computing with Matrices Viewing Windowing Clipping EXAM #2, 10/22/18 |
| - THREE - <i>Animation</i> | Chapter 9 Chapter 10 Chapter 12 Chapter 13 | 3D Objects 3D Transformations 3D Viewing Perspective and Projections Viewport Transformations <i>OpenGL</i> Buffers Animation The Animation Pipeline Polyhedra Curved Surfaces Quadric Surfaces EXAM #3, 11/19/18 |
| - FOUR - <i>Illumination</i> | Chapter 17 Chapter 18 Chapter 19 | Light Sources Illumination Models Surface Detail Texture Mapping Color Models Issues in High Performance Computer Graphics Optimizing the Pipeline Group Presentations FINAL EXAM, 12/13/18, 9 a.m. (Thursday) |

¹I reserve the right to modify this schedule as situations warrant.