

# CSC 315 / F22

## Introduction to Computer Graphics

### Dr. Andrew Pounds,

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Office Meeting: MW 12:15-1:00 p.m., F 10:15-11:00 a.m., or arranged via *ZOOM*

*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: 9:30-10:45 a.m.; GSC 218

### Course Materials

REQUIRED: *Computer Graphics with OpenGL, 4<sup>th</sup> 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

Midterm	100 pts
Programming Assignments (3 @ 200 pts)	600 pts
Annotated Bibliography	100 pts
Homework (4 @ 25 pts)	100 pts
Final Exam	100 pts
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Total Possible	1000 pts

### Course Grade Scale

<b>A</b>	≥900 pts
<b>B+</b>	≥880 pts
<b>B</b>	≥800 pts
<b>C+</b>	≥780 pts
<b>C</b>	≥700 pts
<b>D</b>	≥600 pts
<b>F</b>	<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:* Randomly selected individual homework problems will be graded on a three point scale from each assignment and the composite score from all the graded problems converted to a 25 point scale. 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 with zero credit given after three days.

*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."

*Midterm:* The midterm will be a timed takehome exam that is submitted electronically via *CANVAS*.

*Final:* The final exam will be a takehome online "practical" that will require submission via *anvil*. The final will be opened on December 11th at 5 p.m. must be submitted no later than the end of class on December 13th (the end of the final period). Students are advised to check their ability to access the Canvas course and any additional technological requirements prior to the date of the final exam. Any technological difficulty accessing, completing, or submitting the final exam must be immediately reported to the instructor for accommodation. The classroom should be available on both Monday (12/12) and Tuesday (12/13) for students to work on the final.

*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.

*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](mailto: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.

### University Compliance Statements

*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](mailto: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."

*Mental Health and Wellness:* "Mercer University faculty and staff recognize that mental health concerns can impact academic performance and interfere with daily life activities. Because stress is a normal part of the college experience, learning to manage stress effectively is crucial to your well-being and overall success. Please notify your faculty member or academic advisor for academic assistance, as needed. CAPS can also provide support if you are feeling anxious, overwhelmed, depressed, lost or are struggling with personal issues. Please call or visit the Counseling and Psychological Services (CAPS) website at <https://counseling.mercer.edu/> for more information. These services are free and confidential, and support non-traditional, graduate, and undergraduate students. Students may access CAPS at the location of their academic program: MACON – Counseling Center (formerly the Honors House), 478-301-2862; ATLANTA – 215 Sheffield Student Center, 678-547-6060. Students at Regional Academic Center and other locations may obtain assistance in finding local services by contacting the CAPS Office nearest them. We also encourage students to call or text 988 to reach the National Suicide & Crisis Line if needed."

*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.”

*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.”

*FERPA and Assessment:* The College of Liberal Arts is keenly interested in assuring the quality and integrity of its general education program. Every semester, randomly selected samples of student work from general education courses will be independently and objectively assessed. No personally identifiable information about any student will be used for the purposes of this assessment, and assessment results will have no bearing whatsoever on student grades.

## Tentative Class Schedule<sup>1</sup>

Division	Text Chapters	Lecture Topics
- ONE -	Chapter 1 Chapter 2 Chapter 3	Survey of Computer Graphics Graphics Hardware Coordinates and Representations Introduction to <i>OpenGL</i> Keyboard and Mouse Interaction (Chap 20-6)
<i>Representation</i>	Chapter 4  Chapter 5	Coordinate Reference Frames <i>OpenGL</i> Graphics Primitives Polygons Vertex Arrays Display Lists Color Blending Graphical Attributes
- TWO -	Chapter 6	2D Raster Graphics Algorithms Lines, Circles, Conic Sections Polygon Fills Antialiasing
<i>Transformation</i>	Chapter 7  Chapter 8	Linear Algebra Geometrical Transformations (2D) Computing with Matrices Viewing Windowing Clipping <b>MIDTERM EXAM, 10/17/22</b>
- THREE -	Chapter 9  Chapter 10	3D Objects 3D Transformations 3D Viewing Perspective and Projections Viewport Transformations <i>OpenGL</i> Buffers
<i>Animation</i>	Chapter 12  Chapter 13	Animation The Animation Pipeline Polyhedra Curved Surfaces Quadric Surfaces
- FOUR -	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 <b>FINAL EXAM DUE, 12/13/22, 5:00 p.m.</b> (Tuesday)
<i>Illumination</i>		

<sup>1</sup>I reserve the right to modify this schedule as situations warrant.



## University Health and Safety Protocols for the Fall 2022 Semester Syllabus Statement for All Students

Office of the Provost 478-301-2110

Campus Health's COVID-19 Hotline 478-301-7425

In order to promote safe campuses, students are required to follow these COVID-19 protocols:

- Check the University [COVID-19 website](#) and your Mercer email for important updates and messages.
- Masks are not required on campus, except at the Campus Health Centers on the Macon and Atlanta campuses. Of course, anyone who chooses to wear a mask on campus for their own protection is welcome to do so. Faculty may require masks when meeting in their individual offices with students, colleagues, or guests. Health science students and employees may be required to wear masks in clinical settings.
- **If you are symptomatic of COVID-19, regardless of vaccination status, you cannot attend** in-person classes, labs, orientations, clinical/field experiences, other on-campus activities, or employment on campus. You should immediately call Campus Health's COVID-19 Hotline at (478) 301-7425 for a testing appointment during regular business hours or get tested immediately at an off-campus location. If symptomatic and tested off campus, please call to inform Mercer Medicine at (478)-301-7425.
- If you are asymptomatic (showing no symptoms) and would like to get tested, go to [go.mercer.edu/covidappt](http://go.mercer.edu/covidappt) to schedule an appointment at the Macon or Atlanta Campus Health Center.

There have been changes to insurance coverage for COVID-19 testing. As a result, Mercer Medicine will bill your insurance company for COVID-19 testing if you are symptomatic or have been exposed recently to someone who has tested positive for COVID-19. The University covers the costs of COVID-19 testing for Mercer on Mission, Study Abroad, and other University-related international travel programs. If you are tested for other reasons, you will be required to pay \$90 at the time of testing.

- Testing locations:
  - Macon – Campus Health Center, Drake Field House, Macon Campus
  - Atlanta – Campus Health Center, Sheffield Building, Atlanta Campus
  - Savannah – Memorial University Medical Center, Savannah Campus (Dr. Kirkpatrick)
  - Columbus – Mercer University School of Medicine, Columbus Campus (Dr. House)
- Mercer Medicine accepts off-campus PCR test results and **positive** antigen test (known as rapid test) results from reputable testing facilities.

Mercer Medicine does NOT accept

- negative antigen test (called rapid test) results;
  - home/self test results; and
  - antibody test results.
- All students must submit **off-campus, positive COVID-19 results** immediately to Campus Health at [mytestreport@mercer.edu](mailto:mytestreport@mercer.edu). In the subject line of the email, type "Macon Test" (for Macon, Savannah, and

Columbus students) or type “Atlanta Test” (for Atlanta, Henry, and Douglas students). Be sure to include your full legal name and Mercer ID in the body of the email.

Off-campus positive results must be submitted to Campus Health as soon as you receive them. If you fail to submit your results in a timely manner, excused absences and academic accommodations will not be provided beyond the five days after testing.

- If you test at the Campus Health Center and test **positive**, a Campus Health staff member will call you from a Mercer phone number with the positive result. With a **negative** result, you will receive an email in your Mercer email account.
- Do not submit COVID-19 results directly to faculty, the Dean’s Office, or Student Affairs for COVID-related, excused absences. All COVID-related absences must be processed through Campus Health and the Office of the Provost. Faculty are then notified of a student’s COVID-related, excused absence(s).
- Faculty are required to provide academic accommodations to students who are in isolation after either testing positive at the Campus Health Center or submitting off-campus, positive test results to Campus Health at [mytestreport@mercer.edu](mailto:mytestreport@mercer.edu).
- If you **are symptomatic and awaiting test results**, you must isolate and be provided academic accommodations during this brief isolation period. If you tested on campus, faculty will be notified. If you are symptomatic, tested off campus, and are awaiting results, contact Campus Health immediately at 478-301-7425 so that faculty can be notified. If you do not receive your results within two (2) business days, contact Campus Health at 478-301-7425 for a testing appointment on campus.
- The isolation period for COVID-19 has been reduced to **five days**. While in isolation, you must complete your daily **Bear Check** as a way for Mercer Medicine to monitor your symptoms. The Bear Check is located in MyMercer > Dashboard > Action Items.

**You must remain in isolation until you are cleared by Mercer Medicine.**

- **Residential students** who test positive have these isolation options:
  - Recover at home, if possible.
  - Isolate in place in your own room. Isolating in place means that you stay in your current residence, distance yourself from roommates/suitemates as much as possible, and wear a mask inside the residence as often as possible. Roommates/suitemates should also wear masks inside the residence as often as possible.

You may leave your assigned room, while wearing a mask, **only** to seek medical care and pick up to-go or delivery meal options to eat in your room. For students on the Macon campus, Aramark provides to-go meals.

Contact the Office of Housing and Residential Life with questions or concerns:

Macon: (478) 301-2687

Atlanta: (678) 547-6104