CSCI 3353 (Intro to Computer Graphics) Hibbs, Spring 2024: Syllabus

Course description

This course provides an introduction into the background and unifying basis of the broad field of Computer Graphics (CG), and explores a few specific areas in more depth, including 2D transformations and shapes, data/information visualization, recursive graphics, parametric shapes and curves, 3D rendering, 3D transformations, polygonal meshes, user interactions, lighting models, etc. Additional areas of CG will be mentioned and discussed more briefly, including computer vision, computational geometry, scientific visualization, modeling, animation, etc.

The course content assumes a general knowledge of basic data structures (e.g. linked lists, binary search trees, stacks, etc.), a general knowledge of object-oriented programming concepts, and a general knowledge of math including basics in trigonometry, geometry, linear algebra, and calculus. While we will not be using many advanced concepts from these math areas, we will be touching on all of them; as such some class time/assignment time is devoted to a "math review" -- please treat these seriously and recognize that there are no pretty pictures without lots and lots of numbers.

Basic information

Class meets regularly at:

- TR 11:20-12:35pm, CSI 257

Prerequisites

MATH 1311 (Calculus I); CSCI 2320 (Data Structures); or permission of instructor

Instructor contact information

Dr. Matthew Hibbs
Office: CSI 270K
Office phone: (210) 999-7482

Regular office hours will be held on MWRF afternoons:

- Mon 3:30-5, Wed 2:30-5, Thurs 2-4, Fri 2:30-4*
  - *NOTE: Fri office hours will be canceled about once a month for faculty senate meetings
- If something disrupts my regular office hour schedule, I'll do my best to update my public calendar, which is linked from the course website
- Generally, if my door is open and I'm in my office, I'm available to meet with you
- If my regular times don't work for you, please contact me by email and we can schedule a specific time to meet

E-mail: mhibbs@trinity.edu

E-mail is also a good way to contact me or ask questions. Responses are usually prompt. However, I'm not always available, and may take more time to respond.

TA Information

- Jack Pittman (jpittman@trinity.edu)
- Office hours TBD

Course materials

Textbooks

"Fundamentals of Computer Graphics 3rd Ed." by Peter Shirley and Steve Marschner; which is available from multiple online retailers.

"The Nature of Code" by Daniel Shiffman; we'll just use a few chapters from this book, but it is available for free online

Web page
Most course-related information (this syllabus, homework and reading assignments, grades, etc.) will be made available via Google Classroom. The course web page is a starting point for online course material. Navigate to classroom.google.com and use the registration code provided on the first class day.

Other references
We will be using the Processing programming language (www.processing.org) throughout this course. There are great resources for learning Processing on their website, and a few good books to learn processing, including "Learning Processing" by Daniel Shiffman and "Getting Started with Processing" by Casey Reas and Ben Fry (the creators of the language). These books aren't required for the class (unlike the textbook), but if you're struggling with the language itself, these might be helpful resources.

Once we get to 3D graphics about 1/2 way through the semester, we will continue using Processing, but running in OpenGL mode. OpenGL is a set of libraries and APIs that enable programmers to write optimized graphics code at a relatively high level. There are many great web and textual resources for learning/using OpenGL in particular, including the NeHe Tutorials, "the big red book", and www.opengl.org. OpenGL has evolved tremendously over the years, and made a large transition in its overall architecture and structure (in version 3) to be entirely shader-based in order to work more efficiently with modern graphics cards; however, the learning curve after this change is quite steep (to the point where hundreds of lines of code are needed to draw a simple triangle). As such, we will be using the "classic" OpenGL approach (v2), which is what Processing uses for 3D graphics. However, towards the end of the semester, we will begin to write custom shaders, which is more similar to the approach taken by modern OpenGL.

Course requirements
Grading
The grade for this course will be composed of four components, discussed below. This table summarizes the contribution of each to your grade in the course. All items turned in for a grade in this course are to be pledged. For code, the pledge statement should be put in a comment at the top of the code.

Homework	50%
Finish ITs (FITs)	10%
Midterm	15%
Final	15%
Class Participation	10%

Exams
Exams are comprehensive but will emphasize the most recent material. Both exams will be take-home, open book/note/Internet, and will be largely "practical", meaning that you have a programming assignment to complete on your own during the exam time. No form of communication (cell phones, chat, e-mail, etc.) is permitted regarding the course material (whether directly relating to the exam questions or not) during exams. Your attestation to the honor code will also include a corresponding directive for both the midterm and final exam. The Midterm and Final exam are each worth 15% of the final grade. They are scheduled as follows; please plan accordingly (i.e., avoid scheduling anything else for these times).

- Midterm: assigned Fri 3/1, due Wed 3/6 by 11:59pm
- Final: assigned Fri 5/3; due Tues 5/7 by 11:59pm

Finish It!s (FITs)
About every 2 weeks there will be an activity (typically) begun in class that we will not complete during our class time. You will be assigned to finish these activities and turn them in for a completion grade *BEFORE THE BEGINNING OF CLASS* ON THE DAY THEY ARE DUE. Some of these FITs will be preliminary material for the major homework assignments, so completing these will simplify your workload later. There will be 5-7 FITs throughout the semester, for a total of 10% of your final grade.

Homework assignments
Homework (primarily programming assignments) is a crucial part of this course; much of what you learn will likely be learned in the course of completing the programming assignments. As such, the homework in this course constitutes the bulk of your grade (50%). Detailed requirements will be provided as part of each assignment; due dates will be announced via the course web page, homework is typically due by MIDNIGHT (11:59pm) ON THE DUE DATE. All required tools are installed on the department's network of machines, but unless otherwise specified for individual assignments, you may use any other system that provides a suitable environment. However, all submitted assignments must run using the Processing install on the CS machines to receive credit.

A note on coding practices: In order to share and understand code (including helping me help you with your questions), basic coding practices are required, just as they are in the field. In Processing, I am fairly lenient, and only require uniform indentation and reasonable documentation. Other coding choices (such as bracket alignments or amount of whitespace) are at your discretion, but you should be uniform, and all blocks of code should be indented beyond the surrounding code.

Late and missed work
Exams can be made up only in cases of documented conflict with a university-sponsored activity, documented medical emergency, or conflict with a religious holiday; or with PRIOR APPROVAL from me.

Unless otherwise stated for a particular assignment, homework will not be accepted late. If a student has a reasonable excuse and seeks PRIOR APPROVAL from me, up to 3 days extension may be granted, with a penalty of 15 percent total point reduction per day late. If you have unusual or extenuating circumstances, please discuss these with me as far in advance as possible.

Class Participation
Attendance at class is expected in order to keep up with the wide range of material covered in this course. I like my classes to be interactive -- I ask lots of questions, and I appreciate your answers (right or wrong). We will do several collaborative coding and mathematical derivations during class, if you are intellectually following along, you'll get much more out of it than if you just passively observe the process.

To measure attendance, there will be an online poll given at the end of each class period. This poll will involve a "word of the day" to verify that you were present, as well as an opportunity to ask any questions that you would like. The poll will also often include comprehension questions related to the topics presented that day, in order for me to gauge the understanding of the class. Your grade for this portion simply requires participation, not correct answers to these questions. Three absences will be provided as a "grace period" (including University approved absences); however, absences beyond these three (unless approved by the University or by me prior to the absence) will result in a

deduction for the participation score. Use of text messages, chat programs, watching videos online, etc will also result in a deduction from the class participation score.

Academic integrity at Trinity

All students are covered by the Trinity University Honor Code, which prohibits dishonesty in academic work. The Code asserts that the academic community is based on honesty and trust. It defines specific violations as well as the procedure to determine if a violation has occurred. It also covers the process of hearings for alleged violations and the various sanctions applied for specific violations, and it provides for an appeal process.

Collaboration and academic integrity in this course

The major homework assignments submitted in the course have the option to be completed individually or in groups of two. Each assignment is "modular" and additional modules are required for a pair of students to achieve the same grade. All provided answers, code, and analyses must be the individual student's (or pair group's) work. This is not to prevent you from discussing your assignment with other students/groups. In fact, discussion of homework assignments among students is encouraged, but not to the point where specific answers are being written collectively. In short, don't share answers, either in person or electronically. If you are uncertain about whether a particular level of collaboration is acceptable, please ask for clarification.

All other work submitted for a grade (individual homework assignments, FITs, and exams) must represent the student's own individual effort. All graded work will be considered pledged work.

Answers that are identical beyond coincidence (either to another student's work or to a sample solution from a previous semester) will be considered to be in violation of the Honor Code, and will result in appropriate action. You are responsible for the security of your work, both electronic and hard copy.

Utilization of AI tools

The rapid development and adoption of artificial intelligence coding tools, especially large language models, such as ChatGPT, Co-pilot, etc. are rapidly impacting coding and programming. As an upper division course, I trust that you have a good grasp on the fundamentals of programming, and as such, the use of these tools is allowed for all homework assignments and exams. However, in my testing of these tools with the planned assignments, I have found the outputs to be of somewhat dubious value. In fact, ChatGPT v4 often makes the same common mistakes that I've seen in the past from students. So don't plan on having these tools complete your assignments automatically. Most assignments in the class involve some level of creativity and customization that LLMs aren't great with at this point, but you may find these tools useful for brainstorming, drafting initial solutions, or debugging your work.

Title IX/Sexual Misconduct Reporting

As a Responsible Employee who is committed to creating an environment where every member of our community can thrive, I want to let you know that I am a Mandatory Reporter under Texas state law. What that means is that I am am required to report any instances of sexual misconduct, including sexual harassment, non-consensual sexual intercourse, non-consensual sexual contact, sexual exploitation, intimate partner violence, stalking, and related retaliation that I am aware of to the Title IX Coordinator. So, if you share information with me about any incidents that implicate the Sexual Misconduct or Anti-Harassment Policies, I am required to report all information to the Title IX Coordinator to make sure you have information about support resources and complaint resolution options. My report does not initiate the complaint process, and you are in control over how you

choose to engage with our Title IX Coordinator. If you or someone you know has experienced sexual misconduct, including sexual harassment, I encourage you to share this information directly with the Title IX Coordinator or one of the individuals who has been designated as a confidential resource on campus. Information about reporting is available here: Reporting.

Academic Support Resources

Trinity faculty hold students to the highest academic standards and also know that the very best students seek out help when necessary. The following resources are in place to support your academic success:

- Academic Success: time management, student skills, test anxiety, note taking, supplemental 1:1 tutoring
- Career Services: major exploration, career guidance
- Counseling Services: mental health concerns, mental health referrals
- Quantitative Reasoning and Skills Center: tutoring for quantitatively demanding coursework
- Student Accessibility Services: accommodations for a diagnosed disability
- Wellness Center: nutrition, sleep, stress management
- Writing Center: starting a paper, finding a thesis, drafting and editing