

CS324E Syllabus

Elements of Graphics, Summer 2023

Welcome to CS 324E! This is a course about techniques and programming in computer graphics. We will use various languages and toolkits to explore how to generate and process images on computers.

Course Goals

Graphics is the set of skills, techniques, and ideas involved with creating digital images using a computer. In this course, we will explore various aspects of this field. Although we will cover many different application areas, we will almost always be focused on answering one of four core questions:

1. How can we represent shapes, colors, and visuals in a way that the computer can understand?
2. How can we tell the computer where these visual elements should go?
3. How can we make the answers to the previous two questions change “nicely” over time, so that we get moving pictures?
4. How can we organize a program to do all this in a way that doesn’t become overwhelming?

By the end of the course, you should have experience in answering each of these questions in 2D and 3D settings, as well as some graphics-adjacent fields like image processing and game development.

Course Information

Course Staff

Instructor	Kevin Song (he/him)
Email	kcsong@utexas.edu

Instructor	Nikitha Gollamudi (she/her)
Email	nikithag@utexas.edu

Course Meetings

Class Location	RLP 0.102
Class Time	MTWRF 12:00-1:30pm
Unique Number	85883

Prerequisites

Completion of CS313E, CS314, or CS314H with a grade of C- or better, or consent of instructor.

Course Materials/Resources

There is no required textbook for this class. You may find the [tutorials on the Processing website](#) to be useful.

In order to do the assignments in this class, you will need a computer capable of running [Processing](#) and Javascript. Most laptops are capable of running these programs.

The CS department provides computer labs in GDC which has computers with this software preinstalled. If you would like a CS account to access these computers, please visit the [Account request page](#). Note that CS account approvals take place overnight, so make sure to request your account at a day or two before you need it.

Communication Methods

Communication to You

[Canvas](#) will be used to distribute course materials, release and submit assignments, and post scores. You should check this platform regularly to make sure that changes of deadlines or material do not catch you off-guard. I suggest you check the platform regularly in order to make sure that you are aware of upcoming due dates. However, I will do my best to ensure that changes that affect you (e.g. changes in due dates, class plans, etc.) are announced on EdStem as well.

[EdStem](#) will be the primary method of communication in this class. Announcements and reminders pertaining to the class will usually be posted here. I expect that announcements posted to EdStem will be read before the next class.

Finally, if we need to contact you individually, we may send email to your official email address that you have registered with UT. You can check which email this is on the [Address Change page](#). Similarly to EdStem announcements, I expect that messages sent this way will be read before the start of the next class.

I expect that you will check EdStem *at least* once a day (ideally more often, as this is a fast-paced summer course), and that any announcements posted to EdStem by the course staff will have been read by the start of the next class.

Communications to Us

If you would like to contact any of the course staff, please use one of the following methods:

1. Send a DM or Private Question on EdStem.
2. Send an email to the email addresses listed above, with “CS324E” somewhere in the subject line.

This is not to say that other methods of contacting us (other email addresses, Canvas messages, etc.) are invalid or worthless, but it gets *very* tiring having to check 5 different platforms 10 times a day to see if something needs my attention.

Any attempt to contact the course staff using a method that is not one of the two listed above may result in a delayed response or non-response.

Expectations

Course Structure

This course is heavily structured around in-class activities, learning how to create graphics by creating graphics, and obtaining ideas from other students. Accordingly, I expect that you will attend class every day, and the course grading reflects this. See the Evaluation section for what to do if you are unable to attend. I will measure both attendance and participation by index cards which are submitted at the end of class.

In class, we will usually cover an idea in graphics, then see how it can be implemented in code. You will then spend some time writing code to explore the concept further. These in-class assignments will be due a few hours after class, and I may select a few of them to showcase during the next class period.

In addition to the in-class assignments, there will be several take-home assignments or “mini-projects” which will explore an area that we have been discussing in class in greater depth. The first few of these will be solo projects—later on, you will have the option to work in groups if you so choose.

Course Schedule

This course schedule is approximate and may need to be changed depending on how quickly we move through material.

Date	Lecture	Other
07/10	Intro to Graphics	
07/11	Attributes + Color	
07/12	Images	Project 1 Available
07/13	Images	
07/14	Interactivity	
07/17	OOP + Composition	
07/18	Composition + Inheritance	Project 1 Due, Project 2 Available
07/19	Scene Hierarchies and Shapes	
07/20	Transformations	
07/21	Interpolation	
07/24	3D Shapes + Lighting	Project 3 Available
07/25	Lighting + Textures	Project 2 Due
07/26	Particles	Project 4 Available
07/27	Physical Simulation	
07/28	Cellular Automata	Project 3 Due
07/31	GUIs	
08/01	Animation + Timers	Final Project Proposal Due
08/02	Data Formats	Project 4 Due
08/03	Graphics Pipelines	
08/04	Intro to Shaders	
08/07	Student Choice Topic	
08/08	Student Choice Topic	
08/09	Presentations	Final Presentations Due
08/10	Presentations	
08/11	Something Else	Final Project Code Due

Changes to the schedule will be announced on EdStem.

Whole-Person Care

Life does not stop when we enter the classroom. We are all people with concerns outside the classroom. Below are my policies for how I’ll deal with select issues which might affect your ability to learn.

While it is not feasible for me to create a personalized course of study for everyone in the class, if there is a situation that is affecting your ability to learn in the class, I encourage you to let me know. I will try to make reasonable accommodations for your situation.

Personal Pronouns

Class rosters are provided to the instructor with the student's chosen name, which you may update through [UT Direct](#). These rosters also provide a gender marker to faculty, which can be updated following the [instructions from the Gender and Sexuality Center](#).

Regardless of these, we will be happy to honor your request to address you by a name that is different from what appears on the official roster and by the pronouns you use. Please advise us of any changes early in the semester so that we may make appropriate updates to our records.

Mental Health

Being in school is a time of change, growth, and adjustment, and in many cases, struggle. All of us benefit from support during times of struggle. You are not alone.

There are many helpful resources available on campus and an important part of the college experience is learning how to ask for help. Asking for support sooner rather than later is often helpful. If you or anyone you know experiences any academic stress, difficult life events, or feelings like anxiety or depression, we strongly encourage you to seek support. You may begin by talking to any of us, and we'll help you get connected to resources. If you prefer to talk directly to the professionals, [the CMHC is available to you at any time](#).

Religious Holy Days

Religion (or lack thereof) is an important part of who we are. If a holy day observed by your religion falls during the semester and you require accommodations due to that, please let me know as soon as possible. In order to guarantee accommodations around big deadlines, I will need notice of at least one week. If you are unable (or forget!) to provide that notice, please contact me anyway in case I can still accommodate you.

University-required language: A student who is absent from an examination or cannot meet an assignment deadline due to the observance of a religious holy day may take the exam on an alternate day or submit the assignment up to 24 hours late without penalty, ONLY if proper notice of the planned absence has been given. Notice must be given at least 14 days prior to the classes which will be missed. For religious holy days that fall within the first 2 weeks of the semester, notice should be given on the first day of the semester. Notice must be personally delivered to the instructor and signed and dated by the instructor, or sent certified mail. Email notification will be accepted if received, but a student submitting email notification must receive email confirmation from the instructor.

Students with Disabilities

My policy is to fully support all students with disabilities to the best of my ability. At no time is it required that you disclose the nature of your disability to me, and I will not ask you to do so.

If you are a student with a UT-acknowledged disability, I ask that you meet with me one-on-one to discuss accommodations as soon as you have your accommodation letter in hand. I do ask that you meet with me by the 12th class day so that we can put your accommodations in place as soon as possible.

If you are a student with a disability that has not yet been acknowledged by UT's Services for Students with Disabilities, I hope that you will be willing to let me know that you need accommodations. I ask that you meet with me 1-1 to develop a plan for your success this semester.

University-required language: The University of Texas at Austin provides upon request appropriate academic accommodations for qualified students with disabilities. For more information, contact the Division of Diversity and Community Engagement, Services for Students with Disabilities at 471-6259, 471-4641 TTY.

Policies on Children in the Classroom

Children are always welcome. I understand that if you have childcare responsibilities, you are a special-level of exhausted. Please talk to me if you need help.

Emergency Situations

If you experience an emergency situation during the semester, Student Emergency Services is here to help you. They can help in the event of family emergencies, medical or mental health concerns, and interpersonal violence, among other situations. If you experience such an emergency, you may contact them directly through email (studentemergency@austin.utexas.edu) or by phone (512-471-5017), or you may contact one of us and we will assist you with the process.

Harassment Reporting Requirements

Senate Bill 212 (SB 212) is a Texas State Law that requires all employees (both faculty and staff) at a public or private post-secondary institution to promptly report any knowledge of any incidents of sexual assault, sexual harassment, dating violence, or stalking "committed by or against a person who was a student enrolled at or an employee of the institution at the time of the incident". Please note that the instructors and the TAs for this class are mandatory reporters and MUST share with the Title IX office any information about sexual harassment/assault shared with us by a student whether in-person or as part of a journal or other class assignment. Note that a report to the Title IX office does not obligate a victim to take any action, but this type of information CANNOT be kept strictly confidential except when shared with designated confidential employees. A confidential employee is someone a student can go to and talk about a Title IX matter without triggering that employee to have to report the situation to have it automatically investigated. If you would like to speak with someone who can provide support or remedies without making an official report to the university, please email advocate@austin.utexas.edu. For more information about reporting options and resources, visit <http://www.titleix.utexas.edu/>, contact the Title IX Office via email at titleix@austin.utexas.edu, or call 512-471-0419.

Evaluation

Your grade in this course will come from several categories. There is also a course attendance policy—pay careful attention to this, as it interacts with the course grading in a somewhat atypical way.

Category	Weight
Projects	50%
In-Class Assignment	30%
Final Project	10%
Participation	10%

Attendance

Since this class is built around in-class assignments and collaboration, attendance is mandatory. It will be taken via index cards which you are expected to turn in at the end of class. If you do not turn in an index card, you will be considered absent for that day.

There are ways to get your absence waived (described below). For every unwaived absence, your final grade will be reduced by a full letter grade. This means that after four unwaived absences, you are guaranteed to fail the course, no matter how well you were doing previously.

In order to allow for flexibility, you start the semester with four grace days. You may use one grace day to waive an absence. You do not need to email me to justify your absence in order to use these, though I do appreciate such a heads-up if you are able to provide it.

If you are out of grace days, or would like to avoid using a grace day, you may write an essay exploring a topic covered in class that is particularly interesting to you. Such an essay must:

- contain your name, EID, and date of class missed
- be 500 words long, double spaced
- be submitted within 48 hours of the end of the missed class

Certain class days (towards the end of semester) cannot be waived—I will announce them in class and provide instructions on what to do if you need to miss them.

Participation

Participation will be assessed by the index cards you turn in. These will ask you to write one thing you learned, one question you have, and any other questions or concerns you have about the class. Reasonable responses will result in participation credit.

You may also lose participation points by being excessively off-task or disruptive during class.

In-Class Assignments

In each class, you will be given time to work on in-class assignments, which will give you a chance to think about and practice particular techniques in graphics. These assignments will be due a few hours after lecture to allow time for those who did not finish in class, as well as to allow students who missed class a chance to turn them in.

Projects (Take-Home Assignments)

We will have several projects in this class. These are meant to give you a chance to more deeply explore several aspects of graphics. All projects except for the final project will be individual work—the final project will allow for groupwork.

Projects may be submitted late for a point reduction of 33% of maximum points per day. A project is considered late if it is not submitted by the deadline, with every fraction of a day counted as a full day.

You begin the semester with three slip days. You may elect to use slip days when turning in a project. A slip day will nullify a late penalty of a single day when used (e.g. with three slips, you can turn in one project 3 days late or three projects one day late each). You must make a comment on Canvas indicating that you intend to use slip days on your assignment.

The final project will have the option for work in teams. More details will be announced when the final project is made available. Slip days may not be used on the final project.


Regrade Policy

If you believe a grade was in error, you may request a regrade for that assignment. To prevent the instructors from being overwhelmed with regrade requests, there are additional rules that you must follow in order for your request to be considered. Failure to follow these rules may result in your request being ignored.

To request a regrade, contact an instructor requesting a regrade. Your request may be in any plain text format (e.g. Markdown, text file, written in the email body, etc.) but do not send formats like PDF or Word documents. The request must contain the following information:

- Your name
- Your EID
- The assignment you are requesting a regrade for
- Clear evidence that the original grade was in error

Acceptable examples of evidence include:

- I was told I lost points for not implementing feature X, but the feature is implemented on lines 37-104.
- The answer key is wrong. It says that A is the correct answer, but if you try to run it, the program crashes. B runs correctly and does what the question asks.
- My grade on Canvas is , which is not a valid grade.

Unacceptable examples of evidence include:

- I acknowledge that my project set your computer on fire when you tried to run it, but I still think I should get partial credit because I really understood what the project was about.
- I didn't implement feature Y, but I don't think it's worth 10 points.
- I really need this grade to get into _____ (grad/med/law) school.

Finally, your regrade request must comply with the [Four Corners Rule](#). Everything needed to evaluate the request must be written into the regrade request itself. If you have talked to a staff member and been told to submit a regrade request, we mean that you have brought up a point that should be examined further, **not** that a regrade request will automatically be approved. Any requests submitted with “instructor told me to submit regrade” may be rejected unless other justifications are also provided.

Collaboration and Cheating

In spite of the technological advances of the last 10,000 years, sometimes the best way to learn something is to sit down with someone and just talk about ideas. You are encouraged to take part in this tradition. However, any work you submit for this class must be your own, unless working in a group.

In particular, you may not do any of the following:

- Copy code from StackOverflow or any other source, unless explicitly approved by the instructor
- Allow another student to look at your code
- Talk another student through the implementation of a function
- Provide solutions for assignments to anyone else
- Submit attendance for another student

The above list is not exhaustive.

A general rule (although not a catch-all) for staying on the right side of the rules is to never talk with someone else and work on your code at the same time. If you ever find yourself looking at someone else's code while programming, **you have crossed the line into cheating**. If you're discussing implementation details, both of you should have your computers and writing implements stowed away. After the discussion, wait a little bit (maybe go get a coffee) before continuing to work.

If you are uncertain about whether something is allowed, ask me.

The above rules still apply in group work, except that they now apply to another group's work instead of another person's—working with your group members is expected.

The **minimum** penalty for any student caught cheating is a zero on the assignment, an additional reduction in final grade for the course, and referral to the Dean of Students, who will record the incident and may impose additional penalties. Repeat or flagrant violations may result in failure of the course.

Special Note: Large Language Models

In the last few years, large language models (LLMs) have revolutionized what is possible with programming tools. Effective use of these tools is going to be critical to be a successful computational professional in the future.

However, it is still important to be able to understand what you are doing and think outside of using an LLM. After all, if all you can do is plug in a query to ChatGPT and echo what it tells you, you're already obsolete!

For this class, I will be experimenting with a new policy regarding LLMs. For all assignments, including the final project, you may use any of the models above (or others, if you are interested), subject to the following rules:

1. You may not ask the model to solve the entire project for you in a one-shot fashion.
2. You must explicitly mark any sections of your code that were AI-generated.
3. You **must** download and attach a transcript of any LLM assistance you received: that is, the queries you submitted and the responses you received.

Rule 1 means that you may not use the LLM's response to a single logical query. That is, if you type a single question in and the response is your entire submission, you have broken this rule. There are of course, ways to skirt around this while not *technically* having everything be in a single response: you

could, for example, ask the LLM to output the first line of the program, wait for you to say “go”, then output the second line, etc. This is still considered a single logical query, and is not allowed.

The intent of rule 1 is to require you to do some thinking as to how you want to break down the problem into smaller pieces and integrate the pieces back up (as will be virtually required once you try to solve more difficult problems with these models). I appreciate that there is some interpretation involved in trying to follow this rule: as long as you follow rules 2 and 3, I will forgive minor violations of rule 1, though repeated violations even after being warned will be treated as dishonesty.

To help with rule 3, I suggest you download the transcript in Markdown—there are several plugins for Firefox and Chrome that can do this for you—and submit it alongside your submission on Canvas as a ZIP file. If you are using the GPT models, OpenAI has added the ability to permalink conversations—please include one of these links in addition to a full chat log (given how often ChatGPT becomes unavailable, please include the log in addition to the link).

Finally, I suggest that you avoid using GitHub’s Copilot or CopilotX due to the nature of their integration with the editor: while it’s possible to follow the rules described above, the fact that these tools do not indicate what the query to the LLM is, and that the response becomes embedded in your program with no special markers, makes it very difficult to stick to the rules involving LLM usage.

Malediction and Miscellaneous Items

This syllabus, as written, does not form a contract between the student and instructor. I reserve the right to change the syllabus as needed. Changes to the syllabus will be announced on EdStem in accordance with the announcement policy.

I would like to thank Sarah Abraham for providing materials and the skeleton for this course, as well as excellent discussion on adapting it to the summer environment, and Alison Norman and Devangi Parikh for ideas for this syllabus.

Life is too short to spend uninformed. Let’s learn some stuff.