Overview

Most interaction with data now happens through computer graphics. Even the display of simple text involves surprisingly advanced graphics processing. As a result, computer graphics is one of the most practical and broadly useful topics in computer science. It is also one of the most fun! Using modern scene definition and rendering technologies such as OpenGL, one can create a realistic or abstract virtual world with relatively little code. These worlds can support exploration, entertainment, education, and often a combination of all three. The availability and quality of computer graphics continues to increase rapidly thanks both to increasing hardware performance and ongoing research on rendering techniques.

This course provides a broad introduction to the theory and practice of computer graphics. We will cover both 2-D and 3-D techniques. Our main goals are to build substantial understanding and experience with the fundamentals of 2-D graphical data processing that support modern data visualization and simple, popular mobile games like platformers. Topics include coordinate systems and transformations, drawing, rendering, procedural and object-oriented graphical programming, interactive navigation, and applications to data visualization. You will learn about a popular graphics programming standard, OpenGL 4.5, as well as some of its more useful extensions that allow for easier development and cross-platform deployment. Individual homework assignments will focus on programming and will be done in Java using the JogAmp JOGL library. You will also complete a semester-long team project, which can involve OpenGL (WebGL, C++, Java), Unity, or other graphics technologies. Students enrolled in CS 5053 will also implement and analyze a graphics technique from a research paper as part of their additional course workload.

Prerequisites: CS 2413, CS 2813 or MATH 2513, and MATH 3333.

General Information

Place: 130 Devon Energy Hall
Days: Tuesday+Thursday
Time: 4:30pm–5:45pm

Instructor: Chris Weaver
Office: 241 Devon Energy Hall (DEH)
Email: weaver {at} cs {dot} ou {dot} edu
Phone: 405.325.3380 (email preferred)
Office Hours: Tuesday 3:15pm–4:15pm, Friday 11:00am–12:00pm, and by appointment.

Materials

Class Web Pages:

• [http://learn.ou.edu](http://learn.ou.edu) (Desire2Learn)

Required Textbooks:

Recommended Resources:

- The OpenGL “Red” Book: http://www.glprogramming.com/red/
- The OpenGL SDK: http://www.opengl.org/sdk/
- Java Binding for the OpenGL API (JOGL): http://jogamp.org/jogl/www/

Evaluation

In this course you will be learning and applying computer graphics theory and practice. Learning computer graphics involves progressive layers of practical knowledge and experience. This makes it essential that you attend class consistently and participate actively. What you get out of this course will depend on what you put into it. The contributions to your grade are as follows:

- Team project: 40%, consisting of the following components ([1.00] total)
  - [0.05] Proposal (0.5–1.0 pages, in a format TBD)
  - [0.10] Plan (2–3 pages, in a format TBD)
  - [0.15] Progress report (3–4 pages, in a format TBD)
  - [0.20] Presentation (approximately 10 minutes + 5 minutes Q&A, depending on number of teams)
  - [0.30] Final report (6–8 pages, in a format TBD, not including appropriate appendices/attachments)
  - [0.20] Individual participation (based on input from your teammates on a peer evaluation form)
- Individual homework: 20% (divided evenly among N assignments, N to be determined)
- Midterm exam: 15% (tentatively scheduled for the last class meeting before spring break)
- Final exam: 15% (see below for details)
- In-class participation: 10% (based on quality and quantity of participation in class)

The additional workload for students enrolled in CS 5053 will include an additional homework assignment, additional requirements for other homeworks, and inclusion of a related work section in project reports.

Grade Questions: To maintain fairness in grading, I prefer that any disagreement be brought to me within a week of the item being returned.

Grade Summary: I will store all of your grades in the Desire2Learn online grade book. It is your responsibility to verify that the grades on Desire2Learn are correct. If an error is found, bring the graded item to me and I will correct the online entry.

Borderline Grades: Borderline final grades will be decided by your in-class participation. This means that being an active participant in class can push you over a grade boundary.

Final Examination: The final examination is Tuesday, May 10, 2015 from 04:30pm–06:30pm. No final examinations can be given early, except as required by University policy.

Due Dates: Unless otherwise specified in writing, homeworks and projects are due at the exact beginning of class regardless of whether you hand them in electronically in Desire2Learn or physically on paper. The grade of any late assignment will be lowered by 10% per day late. No assignment will be accepted more than 72 hours after the original due date and time.

Course Policies

The following set of rules will help keep us all on the same page all semester and help to ensure fair treatment for all students.

Academic Misconduct: All work submitted for an individual grade (or group grade), such as a homework or project assignment, should be the work of that single individual (or group), not their friends or a tutor.
Students who fail to do their own work not only violate the Code of Conduct for the University of Oklahoma, but also may fail to learn critical learning objectives for the class.

1. Do not show another student (or group) a copy of your homework before the submission deadline.
2. Do not email your project to another student (or group), even if they promise they will not copy it.
3. Make sure that your computer account is properly protected. Use a good password, and do not give your friends access to your account or your computer system.
4. Do not leave thumb drives around a laboratory where others might access them.
5. The penalties for knowingly permitting your work to be copied are the same as the penalties for copying someone else’s work.

Upon the first documented occurrence of collaborative work, I will report the academic misconduct to the Campus Judicial Coordinator. The procedure to be followed is documented in the University of Oklahoma Academic Misconduct Code. In the unlikely event that I elect to admonish the student, the appeals process is described here: http://integrity.ou.edu/summary_of_the_process.html.

**Project Code:** Your project code and writeups must be written exclusively by you or your group. Use of any downloaded code or code taken from a book (whether documented or undocumented) is considered academic misconduct and will be treated as such. Exceptions from this policy (such as a course project that builds on an existing open-source project) may be granted but you **MUST** obtain approval from me first.

**Classroom Conduct:** Disruptions of class will not be permitted. I **STRONGLY** prefer that no electronic devices be used during class except to take notes or as a direct part of class exercises. Examples of disruptive behavior include:

- Allowing a cell phone or pager to repeatedly beep audibly.
- Browsing, listening to music, or playing computer games during class, regardless of whether they are visible or audible to other class members. (Such activities disrupt YOUR ability to pay attention and participate.)
- Exhibiting erratic or irrational behavior.
- Behavior that distracts the class from the subject matter or discussion.
- Making physical or verbal threats to a faculty member, teaching assistant, or class member.
- Refusal to comply with faculty direction.

In the case of disruptive behavior, I may ask that you leave the classroom and may charge you with a violation of the Student Code of Responsibilities and Conduct.

**Class Web Page:** Login to the Desire2Learn website using your 4+4 (first four letters of your last name followed by the last four digits of your student number), using your standard OU password. If you have difficulty logging in, call 325-HELP. This software provides a number of useful features, including a list of assignments and announcements, an electronic mailing list, newsgroups, and grade book. All handouts are available from Desire2Learn. You should check the site daily. When I update the site, I will post an announcement telling you what has been added and where it is located. You are responsible for things posted on the site after a 24 hour delay or the end of the first following class meeting, whichever occurs first.

**Class Email Alias:** Urgent announcements will be sent through email. It is your responsibility to:

- Have your university supplied email account properly forwarded to the location where you read email.
- Make sure that your email address in Desire2Learn is correct, and forwards email to the place where you read it. I’ll send out a test message during the first week of class. If you do not receive this message, it is your responsibility to get the problem resolved immediately.
Have your email program set up properly so that replying to your email will work correctly the first time. You can send email to yourself and reply to yourself to test this.

If you need assistance in accomplishing any of these tasks, contact 325-HELP.

**Newsgroups and Email:** The newsgroup on Desire2Learn should be the primary method of communication, outside of class. This allows everyone in the class to benefit from the answer to your question. If you email me a question of general interest, I may post your question and my answer to the newsgroup. Matters of personal interest should be directed to email instead of to the newsgroup, e.g. informing me of an extended personal illness. Posting guidelines for the newsgroup are available on Desire2Learn.

**Religious Holidays:** It is the policy of the University to excuse the absences of students that result from religious observances and to provide without penalty for the rescheduling of examinations and additional required classwork that may fall on religious holidays.

**Incompletes:** The grade of I is intended for the rare circumstance when a student who has been successful in a course has an unexpected event occur shortly before the end of the course. I will not consider giving a student a grade of I unless all three of the following conditions have been met: (1) it is within two weeks of the end of the semester; (2) the student has a grade of C or better in the class; (3) the reason that the student cannot complete the class is properly documented and compelling.

**Accommodation of Disabilities:** The University of Oklahoma is committed to providing reasonable accommodation for all students with disabilities. Students with disabilities who require accommodations in this course are requested to speak with the professor as early in the semester as possible. Students with disabilities must be registered with the Office of Disability Services prior to receiving accommodations in this course. The Office of Disability Services is located in Goddard Health Center, Suite 166, phone 405-325-3852 or TDD only 405-325-4173.

**Adjustments for Pregnancy/Childbirth Related Issues:** Should you need modifications or adjustments to your course requirements because of documented pregnancy-related or childbirth-related issues, please contact me as soon as possible to discuss. Generally, modifications will be made where medically necessary and similar in scope to accommodations based on temporary disability. Please see [http://www.ou.edu/eoo/faqs/pregnancy-faqs.html](http://www.ou.edu/eoo/faqs/pregnancy-faqs.html) for commonly asked questions.

**Title IX Resources:** For any concerns regarding gender-based discrimination, sexual harassment, sexual misconduct, stalking, or intimate partner violence, the University offers a variety of resources, including advocates on-call 24.7, counseling services, mutual no contact orders, scheduling adjustments and disciplinary sanctions against the perpetrator. Please contact the Sexual Misconduct Office 405-325-2215 (8-5) or the Sexual Assault Response Team 405-615-0013 (24.7) to learn more or to report an incident.

**Evaluating the Course:** The College of Engineering utilizes student ratings as one of the bases for evaluating the teaching effectiveness of each of its faculty members. The results of these forms are important data used in the process of awarding tenure, making promotions, and giving salary increases. In addition, the faculty uses these forms to improve their own teaching effectiveness. The original request for the use of these forms came from students, and it is students who eventually benefit most from their use. Please take this task seriously and respond as honestly and precisely as possible, both to the machine-scored items and to the open-ended questions.

I reserve the right to add, remove, or change any element or policy of this course, including evaluation percentages, at any time and for any reason, within the limits of University policy.