

COMP 3009: Computer Graphics

Winter, 2021

Instructor: Rosa Azami

E-mail: rosaazami@cunet.carleton.ca

Class place: Online (Zoom links in cuLearn)

Class Hours: T/Th 4:05 pm - 5:25 pm

Office Hours: TBA

Tutorial hour : F 1:35 pm - 2:25 pm

Teaching Assistants:

TA hour: TBA

Sivakumaran Gowthaman

Zixun Xiang

Course Description

An overview of computer graphics covering rendering, modeling, and animation. Topics include geometric primitives and modeling; image formation algorithms such as ray tracing and the Z-buffer; lighting, shading, and texture; and introduction to physics-based animation and character animation.

Prerequisites/Corequisites

Prerequisite(s): COMP 2401, COMP 2402, MATH 1007, and MATH 1104. Basic linear algebra and calculus, programming in C/C++ .

Course Delivery Method

Most lectures will be prerecorded and live-streamed during class time. The instructor will be available during the live streaming and would answer the questions and provide extra explanations if needed.

You are expected to attend every class. Class recordings will be posted afterwards, but you may miss out on important in-class activities and discussions. You are not required to be on camera during lectures, however you must have a working microphone to interact with each other.

Tutorial participation will be graded, so students must be available to be online during their tutorial time.

Resources

- Course notes will be available on cuLearn. You would have some weekly reading, that would be posted on cuLearn.
- Text books:
Fundamentals of Computer Graphics, 4th Edition. By Steve Marschner and Peter Shirley; 2018 (Available online in MacOdrum Library)

Software

Visual Studio 2017 or later versions and OpenGL.

Topics Covered

We will try to cover the following topics, although some material may be omitted due to time constraints:

1. Introduction to computer graphics and its applications
2. Basics of scan conversion (line drawing)
3. Graphics Pipeline
4. 2D Transformation
5. Projections
6. Graphics primitives
7. 3D viewing (camera)
8. Lighting models (Gouraud and Phong)
9. Shaders
10. Textures
11. Ray tracing
12. Interpolating curves (Geometric modeling) curves and surfaces
13. Computer animation
14. OpenGL (During tutorials)

The environment is Visual C++ and OpenGL

Course Objectives

- Explain basic concepts of computer graphics
- Demonstrate computer graphics techniques used in generating graphics images
- Include mathematical background used in computer graphics

Learning Outcomes

At the end of this course, students will be able to:

- Describe and explain the graphics pipeline.
- Create computer graphics in C/C++ using OpenGL.
- Create computer graphics models.
- Use matrices and vector geometry to create computer graphics images.
- Acquire knowledge of lighting models.
- Understand the different coordinate system used in computer graphics (model, view, projection, and screen).
- Be able analyse a computer graphics image and determine components that were used in generating it.

Evaluation

Grading scheme:

- 30% Assignments (approximately every three weeks)
- 10% Tutorials (every week)
- 15% Midterm: around February
- 25% Final exam
- 20% Course project: due to the end of classes (exact time will be announce)

Note: In order to pass the course, the student "**must pass the final exam**".

Late assignments policy

Assignment deadlines are usually strict. However, you can have a total of 3 days for late submissions, including the final course project. You can use this time at once or throughout the semester. An individual can not ask for extra time unless the instructor extends a deadline for a specific assignment.

CS Undergraduate Academic Advisor

The undergraduate advisor for the School of Computer Science is available in Room 5302C HP, by telephone at 520-2600, ext. 4364 or by email at undergraduate_advisor@scs.carleton.ca. The advisor can assist with information about prerequisites and preclusions, course substitutions/equivalencies, understanding your academic audit and the remaining requirements for graduation. The undergraduate advisor will also refer students to appropriate resources such as the Science Student Success Centre, Learning Support Services and the Writing Tutorial Services.

Centre for Student Academic Support (CSAS)

The Centre for Student Academic Support (CSAS) is a centralized collection of learning support services designed to help students achieve their goals and improve their learning both inside and outside the classroom. CSAS offers academic assistance with course content, academic writing and skills development. Visit CSAS on the 4th floor of MacOdrum Library or online at: <https://carleton.ca/csas/>.

University Policies

Student Academic Integrity Policy

Every student should be familiar with the Carleton University student academic integrity policy. A student found in violation of academic integrity standards may be awarded penalties which range from a reprimand to receiving a grade of F in the course or even being expelled from the program or University. Some examples of offences are: plagiarism and unauthorized co-operation or collaboration. Information on this policy may be found in the Undergraduate Calendar.

Plagiarism

As defined by Senate, "plagiarism is presenting, whether intentional or not, the ideas, expression of ideas or work of others as one's own". Such reported offences will be reviewed by the office of the Dean of Science. The Dean of Science now has the following **minimum penalties**:

- First offence, first-year students (< 4.0 cr): Final grade reduction of one full grade (e.g., A- becomes a B-, if that results in an F, so be it)
- First offence (everyone else): F in the course
- Second offence: One-year suspension from program
- Third offence: Expulsion from the University

Note: these are minimum penalties. More-severe penalties will be applied in cases of egregious offences (e.g., a first-year student accessing CULearn from their phone during an exam will be given an F in the course; bribing a faculty member for a better grade would be grounds for suspension, etc.)

Unauthorized Co-operation or Collaboration

Senate policy states that "to ensure fairness and equity in assessment of term work, students shall not co-operate or collaborate in the completion of an academic assignment, in whole or in part, when the instructor has indicated that the assignment is to be completed on an individual basis". Please refer to the course outline statement or the instructor concerning this issue.

Requests for Academic Accommodation

You may need special arrangements to meet your academic obligations during the term. For an accommodation request, the processes are as follows:

Pregnancy obligation

Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit the Equity Services website: <https://carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf>

Religious obligation

Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit the Equity Services website: <https://carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf>

Academic Accommodations for Students with Disabilities

If you have a documented disability requiring academic accommodations in this course, please contact the Paul Menton Centre for Students with Disabilities (PMC) at 613-520-6608 or pmc@carleton.ca for a formal evaluation or contact your PMC coordinator to send your instructor your Letter of Accommodation at the beginning of the term. You must also contact the PMC no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with your instructor as soon as possible to ensure accommodation arrangements are made. <https://carleton.ca/pmc/>

Survivors of Sexual Violence

As a community, Carleton University is committed to maintaining a positive learning, working and living environment where sexual violence will not be tolerated, and its survivors are supported through academic accommodations as per Carleton's Sexual Violence Policy. For more information about the services available at the university and to obtain information about sexual violence and/or support, visit: <https://carleton.ca/sexual-violence-support/>

Accommodation for Student Activities

Carleton University recognizes the substantial benefits, both to the individual student and for the university, that result from a student participating in activities beyond the classroom experience. Reasonable accommodation must be provided to students who compete or perform at the national or international level. Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. <https://carleton.ca/senate/wp-content/uploads/Accommodation-for-Student-Activities-1.pdf>

For more information on academic accommodation, please contact the departmental administrator or visit: students.carleton.ca/course-outline