



IT-360

Spring 2021

Instructor Info —



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Office Hrs: TBD



Virtual



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Programming for Computer Graphics

Computer graphics has become an important tool for both education and entertainment. Typically, computer graphics programming is concerned with the creation of virtual scenes, in a static and dynamic sense. For example, virtual characters move around, objects are manipulated or move due to physical constraints, entities are animated, and the camera moves through the scene.

The goal of the class is to learn about current techniques and foundational algorithms in graphics. During the course, we will first examine 2D graphics, color, images and image processing. Then, we will cover topics of interest in 3D graphics, including rendering technologies, ray tracing, rasterisation, opengl, physics-based simulation, animating virtual characters, and crowd simulation. Class includes several assignments and/or a final project. Students will also work with other students, connecting what they have read and heard with what they can see and implement in code, reinforcing the material.

Material

Recommended Text(s)

Gortler, Steven. *Foundations of 3D Computer Graphics* . 2012.

Marschner, Steve, and Peter Shirley. *Fundamentals of Computer Graphics* . 2015.

Other

Journal articles and book chapters will be provided as needed.

Grading Scheme

10% Class participation

90% Assignments and Projects

Grades will follow the following standard scale:

A = 89.5-100; B = 79.5-89.4; C = 69.5-79.4; D = 60-69.4; F <60.

Curving is at the discretion of the professor.

Learning Outcomes

- Understand images, color, and 2D graphics principles.
- Implement image processing algorithms.
- Get acquainted with the underlying geometry and mathematics for 2D and 3D graphics.
- Understand the rendering problem, and solutions.
- Be familiarized with ray tracing, and real-time rendering.
- Learn about game engine rendering, OpenGL and related visualization techniques.
- Understand the principles of particle and physics-based animation.
- Implement artificial intelligence algorithms for controlling the motion of virtual characters.
- Gain skills in programming and visualization of virtual scenes.
- Learn to critically review a paper and summarize it, as well as review and provide helpful criticism to your peers' work.

FAQs

? Do we get to create fancy animations in this course?

! Yes, but not exactly. You do get to learn and program the algorithms that create the underlying movement of the animation. More work is needed to then make such movement "look good".

? What is computer graphics?

! Computer graphics is a sub-field of computer science which studies methods for digitally synthesizing and manipulating visual content. Although the term often refers to the study of three-dimensional computer graphics, it also encompasses two-dimensional graphics and image processing. See [wikipedia \(hyperlink\)](#) for more details.

? What is your computer graphics area?

! Crowd simulation. They are incredible.

? I want to work in the computer graphics area. Can I work with you on research?

! Maybe! If you impress in the class that will help. Get in touch so we can discuss your interests in more details.

Late Policy

Assignments are due typically 11:55pm on deadline date. Submitting homework afterward such deadline will constitute a full day penalty. Submitting homework n days late will lead to a 2^{n-1} penalty in home work grade. For example, assuming a 100% grade, and 5 days late, the final grade will be: $100 - 2^{5-1} = 100 - 16 = 84$

Make-up Policy

Make-up exams or assignment will only be allowed for students who have a substantiated excuse approved by the instructor *before the due date*. Leaving a phone message, online forum posting, or sending an e-mail without confirmation is not acceptable. Typically, a makeup assignment will be a 1000 word essay on an instructor selected topic.

Diversity and Inclusivity Statement

I consider this classroom to be a place where you will be treated with respect, and I welcome individuals of all ages, backgrounds, beliefs, ethnicities, genders, gender identities, gender expressions, national origins, religious affiliations, sexual orientations, ability - and other visible and non-visible differences. All members of this class are expected to contribute to a respectful, welcoming and inclusive environment for every other member of the class.

Academic Integrity

The University Code of Academic Integrity is central to the ideals of this course. Students are expected to be independently familiar with the Code and to recognize that their work in the course is to be their own original work that truthfully represents the time and effort applied. Violations of the Code are most serious and will be handled in a manner that fully represents the extent of the Code and that befits the seriousness of its violation.

Tips to make sure you do not violate the academic integrity policy:

- Start on assignments right away so you do not find yourself in a desperate situation.
- If you are having trouble with an assignment, please email the professor and/or TAs.
- You may discuss the material with other students, the TAs, and the professor. Do not ask to see other students' code or solutions.
- Do not give your code or solutions to another student, even if the other student says they will not copy it.