IT-360 Programming for Computer Graphics Spring 2023

In-person class: at GITC 3200

Lecture Day/Time: Wednesdays 6pm to 8:45pm. Bring your own laptop, headphones, microphone, webcam, pens, notebooks, coffee etc.

Instructor: Tomer Weiss, PhD | **Email**: tomer.weiss@njit.edu |

Office Hours: TBA or by appointment.

TA: Bilas Talkudar | **Email**: bt26@njit.edu |

TA Hours: On canvas.

OVERVIEW
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, rasterization, 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.

COURSE STRUCTURE
Each week has three hours of class time, with ~3 hours of live instruction (on-campus attendance), which include in-class student activities. Instructions are accompanied by homework, projects and presentations to practice the new knowledge. Other graded items may include class participation, and quizzes throughout the semester. There is no final exam.

LEARNING OUTCOMES

- Understand images, color, and 2D graphics principles.

- Implement image processing algorithms.

- Practice geometry and mathematics for 2D/3D operations.

- Understand the rendering problems and solutions.

- Understand game engine visualization APIs such as OpenGL.

- Understand the principles of particle and physics-based animation.

- Implement AI algorithms for controlling the virtual characters.

- Understand how to visualize of virtual settings.

- Learn to critically review, summarize, and present graphics techniques.

- Understand how breadth and depth of computer graphics domain.

PEER MENTORING

Problem solving/troubleshooting/impediments: ask other students first, check out documentation and then ask the TA first, then ask the instructor. There will be help forums on canvas, and students get credit by helping other students in those forums. Feel free to email students for help in the class as well or meet outside of class.

ACADEMIC INTEGRITY

The NJIT Honor Code will always be upheld. The work you do and submit is expected to be the result of your effort only. CREDIT ALL WORK YOU USED FROM ANOTHER SOURCE.

Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf (Links to an external site.).

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu

ATTENDANCE and PARTICIPATION POLICY

This is an in-person class which may use online resources to be announced in canvas. You need to attend the live classes to maximize your participation opportunities. Do your best in the online part of the class, get feedback on your projects, and ask questions anytime. Your active participation in class is expected and may be graded. Participation can take the form of asking questions, providing answers, sharing helpful tips, volunteering for demonstrations, and anything that can help your peers understand the material.

CLASSROOM CONDUCT POLICY

Constructive involvement includes regular posting in all forums, constructive discussion, helping other students, and volunteering for demonstrations. Non-constructive involvement specifically includes non-participation in the forums, negative comments, and not offering a way to improve another student's project if you point out a criticism. Be respectful and a good class citizen, but make sure to give to student some useful advice.

Class Recordings: Class sessions may be recorded by the instructor. These recordings shall only be used as an educational resource and are not to be distributed or used outside of this class. Information on how to access recorded lectures will be made available by your instructor. Any recordings that contain identifiable information about students will not be used beyond this semester.

Class Recording Etiquette: Students are expected to respect their fellow students' privacy and freedom to learn without disruption. Students are not allowed to capture or reproduce anyone's name, image, or voice without permission. They must be polite and respectful in the online chat. Informal chat is okay, but typing is restricted to things that one would say out loud in front of the entire class. Students must always conduct themselves on their webcam video as they would in person in a classroom.

ACCOMODATIONS

If you need an accommodation please request those through the Office of Accessibility Resources and Services (OARS) at NJIT and inform the instructor at the beginning of the semester or at least one week before any deadline (which ever occurs first).

If you feel sick, please do NOT attend the in person class and join the online class instead or watch the video recording as soon as you can. If you need a medical or emergency excuse, please contact the dean of student with your documentation.

GRADING POLICY

Final grade is calculated from homework, presentations and projects. Grading percentage may change at the discretion of the instructor:

Homework, class assignments and participation 45%

Final project 30%

Mid-term presentation 25%

Late Policy: Homework 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 homework grade. For

example, assuming a 100% grade, and 5 days late, the final grade will be: 100 − 25−1 = 100 − 16 = 84

Grading rubric: A 90-100 | B+ 86-89 | B 80-85 | C+ 76-79 | C 70-75 | D 60-69 | F < 59 Please note that a D is still a passing grade for IT students. It means the student did minimal work in the class, but still counts towards graduation as long as the total GPA is over 2.0.

Weekly Breakdown (TENTATIVE. Some of the topics and **task may be modified or shifted to different weeks** depending on the class dynamics.)

Week 1 (17 Jan. 2024): Introduction, color, images

Week 2 (24 Jan. 2024): Image processing and related algorithms

Week 3 (31 Jan. 2024): Advanced image processing, Rendering for CG

Week 4 (7 Feb. 2024): OpenGL

Week 5 (14 Feb. 2024): Introduction to Animation

Week 6 (7 Feb. 2024): Methods in physics-based simulation

Week 7 (21 Feb. 2024): Data Structures in CG

Week 8 (6 Mar. 2024): Advanced techniques in simulation

Week 9 (13 Mar. 2024): ***No class, Spring Recess ***

Week 10 (20 Mar. 2024): Path planning for artificial life

Week 11 (27 Mar. 2024): Midterm presentations

[1 April *is the Last Day to Withdraw*]

Week 12 (3 Apr. 2024): Midterm presentations cont.

Week 13 (10 Apr. 2024): Project office hours.

Week 14 (17 Apr. 2024): Final class: Project presentations

Week 15 (24 Apr. 2024): Final class: Project presentations cont.

Week 16 (1 May. 2024): ***No class ***

Final Exam Week: no final exam for this class.

Final Project **Due (1 May 2024)** *No late submissions after the deadline.*