Georgia Institute of Technology

CS 7496 Computer Animation Syllabus

Fall, 2025

Delivery: 100% Web-Based, Asynchronous

Dates course will run: Aug 18 – Dec 8, 2025

Instructor Information

Sehoon Ha, Assistant Professor, sehoonha@gatech.edu

Office Hours: Weekly office hours via Zoom at 9 AM, Monday.
General Course Information

Description

This course aims to understand the basic principles behind modern kinematic and physics-based animation techniques. This course requires basic knowledge of linear algebra, vector calculus, computer graphics, and object-oriented programming. Python experience is also encouraged since homework materials will be distributed in Python. It focuses on the math and algorithms behind computer animation techniques instead of the practical use of animation tools, such as Maya, Blender, and/or Unity. Course topics include keyframe animation, differential equations, particle dynamics, 3D orientation, rigid body simulation, collision and contact, character animation, inverse kinematics, motion capture, motion control, and reinforcement learning.

Pre- &/or Co-Requisites

Not mandatory, but it is better if you understand:

- Computer Graphics (3451)
- Thorough understanding of linear algebra
- Vector calculus
- Good working knowledge of Python programming

Course Goals and Learning Outcomes

By the end of the course, students will be able to:

1. Practice mathematical concepts and algorithms for kinematics and physics-based animations.
2. Implement interactive animation tools in Python.
3. Describe the pipeline of character animation, from motion capture to inverse kinematics.
4. Outline general concepts of control and learning algorithms.

Course Materials

- No textbook needed – only lecture notes
- Physically Based Modeling: Principles and Practice (Online Siggraph '97 Course notes)
    - https://www.cs.cmu.edu/~baraff/sigcourse/

Course Text

N/A

Additional Materials/Resources
N/A

Course Website and Other Classroom Management Tools
- Canvas: Syllabus, lecture slides, additional reading materials, project instructions, grades can all be found on Canvas.
- Ed: Q&A and discussions led by students.

Course Requirements, Assignments & Grading

Assignment Distribution and Grading Scale
Assignment Weight Distribution and Due Dates

Assignment	Release Date	Due Date	Weight (Percentage, points, etc.)
Project 0: Introduction	Aug 18, 2025	Sep 1, 2025	**10%**
Project 1: Keyframe animation	Sep 1, 2025	Sep 15, 2025	**10%**
Project 2: Integrators	Sep 15, 2025	Sep 29, 2025	**10%**
Project 3: Tinker toys	Sep 29, 2025	Oct 13, 2025	**10%**
Project 4: Rigid body Simulation	Oct 27, 2025	Nov 10, 2025	**10%**
Project 5: Inverse Kinematics	Nov 3, 2025	Nov 17, 2025	**10%**
Project 6: Reinforcement Learning	Nov 17, 2025	Dec 1, 2025	**5%**
Quizzes:	Weekly on Monday starting Aug 18, 2025	Weekly on Sunday ending Dec 7, 2025*	**20%**
Midterm Exam	Oct 6, 2025	Oct 12, 2025	**5%**
Final Exam	Dec 1, 2025	Dec 8, 2025	**10%**

Grading Scale
Your final grade will be assigned as a letter grade according to the following scale:
A 90-100%
B 80-89%
C 70-79%
D 60-69%
F 0-59%

Description of Graded Components
Programming Projects

Each student will complete six medium-sized programming projects in Python. Each project is sent out to Vocareum in the form of a Jupyter Notebook. The students may talk with one another about any of the concepts required for the programming projects, but each student must perform the actual programming of these assignments on their own. Students must write all the code for each assignment themselves without any form of code sharing by electronic, written, verbal, or any other means. Modifying the code found online is not allowed. Pair programming of any kind is not allowed. The only code from others that may be used in these assignments is that which is given by the instructor. Posting your code on any public repository, such as GitHub, is not allowed. Note that it is impossible to get a good grade in this course without completing all six programming assignments.

Quizzes and Exams
At the end of each module, students will be tasked to solve a few quiz questions on Canvas to reiterate their understanding. At the end of the semester, students will also take an exam based on previous lectures and quizzes.

Extra Credit Opportunities [optional]
Most projects contain extra credit opportunities, up to 10% per project.

Submitting Assignments
All assignments (homework, knowledge checks, exams, etc.) must be completed and submitted within Canvas. Sending assignments (homework, knowledge checks, exams, etc.), whether early, on time, or late, to the instructor is not permitted and will not be accepted. If there are technical issues, please notify the help desk, as well as the instructor, immediately.

Assignment Due Dates
All assignments will be due at the times listed above. These times are subject to change, so please check back often. Please convert from Eastern Time to your local time zone using a Time Zone Converter.

Late and Make-up Work Policy
Late policy: 5% reduction per day. No assignment will be accepted four days or later after the due date.

Grading and Feedback
The projects are hosted on a cloud-based platform called Vocareum. Students are expected to complete and submit their projects through Vocareum, which includes an autograder. Each student will receive feedback that is automatically generated based on their project submission. Each student must ensure that their work runs correctly on Vocareum and passes the autograder by the specified deadline.

Quizzes and exams will also be auto-graded. In special cases or problems, it will be graded within a week by TAs.

Technology Requirements and Skills

Computer Hardware and Software

- High-speed Internet connection
- Laptop or desktop computer with a **minimum** of a 2 GHz processor and 2 GB of RAM

- Windows for PC computers OR Mac iOS for Apple computers.
- Complete Microsoft Office Suite or comparable and ability to use Adobe PDF software (install, download, open and convert)
- Latest versions of Mozilla Firefox, Chrome and/or Safari browsers

Technology Skills
Python programming is required; knowledge on Jupyter Notebook (https://jupyter.org/) will also be useful.

Onboarding Quiz and Proctoring Information
All Georgia Tech online degree and certificate students are required to complete the Onboarding Quiz with Honorlock in the first week of the course. Honorlock is utilized for student identity verification and to ensure academic integrity. Honorlock provides student identity verification via facial and ID photos. You may also be asked to scan the room around you. The Onboarding Quiz is needed to help make sure that your identity is verified and that your system is set up to work with Honorlock online proctoring tool. You are required to complete this quiz early in the semester to avoid problems when taking proctored exams.

Technology Help Guidelines
30-Minute Rule: When you encounter struggles with technology, give yourself 30 minutes to 'figure it out.' If you cannot, then post a message to the discussion board; your peers may have suggestions to assist you. You are also directed to contact the Helpdesk 24/7.

When posting or sending email requesting help with technology issues, whether to the Helpdesk, message board, or me use the following guidelines:

- Include a descriptive title for the subject field that includes 1) the name of course 2) the issue. Do NOT just simply type "Help" into the subject field or leave it blank.
- List the steps or describe the circumstance that preceded the technical issue or error. Include the exact wording of the error message.
- When possible, always include a screenshot(s) demonstrating the technical issue or error message.
- Also include what you have already tried to remedy the issue (rebooting, trying a different browser, etc.).

Course Policies, Expectations & Guidelines

Communication Policy
- Email course questions and personal concerns, including grading questions, via email. Do NOT submit posts of a personal nature to the discussion board unless it is a private post on Ed Discussions.
- Email will be checked at least twice per day Monday through Friday; Saturday and Sunday, email is checked once per day. During the week, I will respond to all emails within 24 hours; on weekends and holidays, allow up to 48 hours. If there are special circumstances that will delay my response, I will make an announcement to the class.
- Student Forum/Q&A discussion boards will be checked twice per day Monday through Friday; Saturday and Sunday, these discussion boards will be checked once per day.
- The Discord channel will be used as the primary chat channel for students, teaching assistants, and instructors.Virtual office hours will be held using Zoom. I will hold Virtual

Office Hours every Monday, 9 AM ET, as well as special office hours for dedicated topics, such as a large, upcoming assignment. Special topic hours will be announced in advance.
- For questions related to technology, the Digital Learning Support team at https://b.gatech.edu/digitallearningsupport for assistance. You can also reach the Canvas Hotline by phone at 1(877) 259-8498 or by email at support@instructure.com.

Online Student Conduct and (N)etiquette
Although it is not expected to be a problem in a graduate-level class, students are asked to behave in the discussions and other class interactions professionally and civilly. If you are in doubt, do not post it! Instructors reserve the right to remove any postings deemed inappropriate, unprofessional, or otherwise distracting from the course.

University Use of Electronic Email
A university-assigned student e-mail account is the official university means of communication with all students at Georgia Institute of Technology. Students are responsible for all information sent to them via their university-assigned e-mail account. If a student chooses to forward information to their university e-mail account, he or she is responsible for all information, including attachments, sent to any other e-mail account. To stay current with university information, students are expected to check their official university e-mail account and other electronic communications on a frequent and consistent basis. Recognizing that some communications may be time-critical, the university recommends that electronic communications be checked minimally twice a week.

Plagiarism & Academic Integrity
Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. All students enrolled at Georgia Tech, and all its campuses, are to perform their academic work according to standards set by faculty members, departments, schools, and colleges of the university; and cheating and plagiarism constitute fraudulent misrepresentation for which no credit can be given and for which appropriate sanctions are warranted and will be applied. For information on Georgia Tech's Academic Honor Code, please visit http://www.catalog.gatech.edu/policies/honor-code/.

Any student suspected of cheating or plagiarizing on a quiz, exam, or assignment will be reported to the Office of Student Integrity, which will investigate the incident and identify the appropriate penalty for violations.

Collaboration & Group Work
Discussions are allowed for the projects, but students must write their answers independently.

Accommodations for Students with Disabilities
If you are a student with learning needs that require special accommodation, contact the Office of Disability Services at (404)894-2563 or http://disabilityservices.gatech.edu/, as soon as possible, to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible to set up a time to discuss your learning needs.

Copyright
Among the materials that may be protected by copyright law are the lectures, notes, and other material presented in class or as part of the course. Always assume the materials presented by an instructor are protected by copyright unless the instructor has stated otherwise.

Student-Faculty Expectations Agreement

At Georgia Tech we believe that it is important to strive for an atmosphere of mutual respect, acknowledgment, and responsibility between faculty members and the student body. See https://catalog.gatech.edu/rules/21/ for an articulation of some basic expectations that you can have of me and that I have of you. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.

Subject to Change Statement

The syllabus and course schedule may be subject to change. Changes will be communicated via Canvas and Ed Discussion. It is the responsibility of students to check email messages and course announcements to stay current in their online courses.

Course Schedule

Week	Week Date	Module Unlocking	Projects Unlocking	Projects Due	Notes
1	Aug 18	Module 1: Course Introduction	Project 0		P0 window: Aug 18 – Sep 1
2	Aug 25	Module 2: Keyframe Animation			
3	Sep 1	Module 3: Splines	Project 1	P0 due Sep1	P1 window: Sep 1 – Sep 15
4	Sep 8	Module 4: Differential Equations			
5	Sep 15	Module 5: Particle Dynamics	Project 2	P1 due Sep 15	P2 window: Sep 15 – Sep 29
6	Sep 22	Module 6: Constrained Dynamics			
7	Sep 29	Module 7: Orientation	Project 3	P2 due Sep 29	P3 window: Sep 29 – Oct 13
8	Oct 6	Midterm Week			
9	Oct 13	Module 8: Rigid Body Simulation		P3 due Oct 13	
10	Oct 20	Module 9: Collision			
11	Oct 27	Module 10: Collision Handling	Project 4		P4 window: Oct 27 – Nov 10
12	Nov 3	Module 11: Motion Capture	Project 5		P5 window: Nov 3 – Nov 17

Week	Week Date	Module Unlocking	Projects Unlocking	Projects Due	Notes
13	Nov 10	Module 12: Dynamic Controllers		P4 due Nov 10	
14	Nov 17	Module 13: Reinforcement Learning	Project 6	P5 due Nov 17	P6 window: Nov 17 – Dec 1
15	Nov 24	Live Mocap / Project 6 RL Week			
16	Dec 1 2025	Final Exam Week	Final Exam	P6 due Dec 1	Exam window runs through Dec 5-8 (term end)