Georgia Institute of Technology

CS 7496 Computer Animation Syllabus
Summer, 2025

Delivery: 100% Web-Based, Asynchronous

Dates course will run: [Month Day - Month Day, Year]

Instructor Information

Sehoon Ha, Assistant Professor, sehoonha@gatech.edu

Office Hours: Weekly office hours via Zoom at 11AM, Monday. Attendance is optional but highly encouraged.

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

 - A good working knowledge of Python programming

Course Goals and Learning Outcomes

Course Learning Outcomes
By the end of the course, students will be able to:
1. Learn mathematical concepts and algorithms for kinematics and physics-based animations.
2. Implement interactive animation tools in Python.
3. Understand the pipeline of character animation, from motion capture to inverse kinematics.
4. Understand general concepts of control and learning algorithms.
5. (Important note) 3D Animation tools, such as Maya, 3D Max, and Blender, are out of the scope of this class.

Course Materials

List all required, recommended or supplemental 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

[This section of the syllabus should provide information to help your students quickly answer their most pressing questions on the first day of class: What's the workload like? How do I get an A in this course? In general, it is good practice to give students multiple low stakes opportunities for performance assessment, prior to larger, high stakes events in your course. You should aim for alignment between your assessments (e.g., homework assignments and exams) and the specific knowledge or skills you want students to be able to demonstrate.]

Assignment Distribution and Grading Scale
[The table below is a sample only. Be sure to include all graded assignments and weights in this section.]

Assignment Weight Distribution and Due Dates

Assignment	Release Date	Due Date	Weight (Percentage, points, etc.)
Project 0: Introduction	?	?	10%
Project 1: Keyframe animation			10%
Project 2: Integrators			10%
Project 3: Tinker toys			10%
Project 4: Rigid body Simulation			10%
Project 5: Inverse Kinematics			10%
Quizzes:			20%
Exams:			20%

Grading Scale
Your final grade will be assigned as a letter grade according to the following scale:

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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 in the form of Google Colab (note: maybe Python this year). 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 of 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 those that are 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 seven 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 the previous lectures and quizzes.

Extra Credit Opportunities [optional]
Most projects contain extra credit opportunities, up to 1% per project.

Submitting Assignments
All assignments (homework, knowledge checks, exams etc.) must be completed and submitted within the Canvas. Sending assignments (homework, knowledge checks, exams etc.), whether early, on time, or late to the professors is not permitted and will not be accepted. If there are technical issues, please notify the help desk, as well as the professor 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
Each 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 autograded. 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, to me privately using… 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.
- Virtual office hours will be held using Zoom. I will hold Virtual Office Hours every [day, time], as well as special office hours for dedicated topics, such as a large, upcoming assignment. Special topic hours will be announced in advance. I am also happy to schedule one-on-one office hours in person, via...
- 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 indepedantly.

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

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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 [email, Piazza, the Canvas announcement tool, and/edX bulk email.] It is the responsibility of students to check email messages and course announcements to stay current in their online courses.

Course Schedule

Week/Dates	Topic	Readings	Assignments
1 August 20	Excel tasks and tools Part I		
2 August 27	Excel tasks and tools Part II		
3 September 3	Balance sheets, income statements, cash flow statements		
4 September 10	Time value of money concepts		
5 September 17	Bond valuation and stock valuation		
6 September 24	Capital budgeting model and valuation model		
7 October 1	Sensitivity analysis		
8 October 8	Three statement model, build into a free cash flow model		
9 October 15	Comparable analysis and Football field		
10 October 22	Weighted average cost of capital		
11	Excel tips		

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Week/Dates	Topic	Readings	Assignments
October 29			
12 November 5	Portfolio Optimization		
13 November 12	Black Scholes Option Pricing Model		
14 November 19	**VBA**		
15 November 26	**VBA**		
16 December 3			