AE3530 Syllabus

System Dynamics, Section A, 3 Credits

Fall 2026

Instructor Information

Instructor: Keegan Moore

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General Course Information

Description

Modeling and analysis of lumped- and distributed-parameter systems, free and forced vibration in mechanical systems, free vibration in structural systems.

Course Learning Outcomes

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

1. Identify and mathematically model mechanical elements and their corresponding forces and energies.
2. Derive governing equations of motion using Newton's second law and Lagrange's equation.
3. Analyze and compute the response of single-degree-of-freedom (SDOF) vibrating systems using the standard method and multi-degree-of-freedom vibrating systems using modal analysis.
4. Design and evaluate vibration mitigation strategies using damping, vibration isolators, and/or vibration absorbers.
5. Model, analyze, and compute dynamic responses of first, second, and higher-order dynamic systems using the Laplace transform to compute transfer functions.
6. Convert system equations into state-space form and compute their response using analytical and numerical techniques.
7. Interpret and modify system behavior and stability using frequency response, poles and zeros, and Bode diagrams.

Required Course Materials

K. Ogata, "System Dynamics," 4th Edition, Prentice Hall, 2004.

Grading Policy:

Homework: 30%; Classwork: 20%; Midterms: 15%, 15%; Final: 20%

A>90; B>80; C>70; D>60

Assignments:

Homework	30%
Classwork	20%
Midterm 1	15%
Midterm 2	15%
Final Exam	20%
Total	100%

Description of Graded Components

The classwork and exams are in class. One sheet (front and back) of notes plus the sheet from previous exams is allowed on each exam. Midterm 1: one sheet front and back. Midterm 2: one new sheet plus the sheet from Midterm 1. Final: one new sheet plus the two sheets from the two midterms.

Course Policies

Attendance and/or Participation

Attendance will not be taken every class period, but it is ***strongly recommended*** that you attend every scheduled class. ***You*** (not the instructor) are responsible for any missed information concerning quiz and exam dates and coverage, class notes and information regarding the homework assignments. You will be given a zero for any missed exam or classwork unless advance notice is given to the instructor and arrangements can be made for any make-up work. If you miss an exam or quiz without giving prior notice, you will have to document the reason for your absence (doctor's excuse, etc.) if you expect to make up the work.

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. Review Georgia Tech's Honor Code and the student Code of Conduct.

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

Core IMPACTS

Core IMPACTS is the University System of Georgia's General Education curriculum. If you are teaching a course that counts towards Core IMPACTS, you should include a syllabus statement about the Core area and associated career competencies. This resource developed by the Center for Excellence in Teaching and Learning and Online Education at Georgia State University includes template syllabus statements for each of the Core IMPACTS areas that you may adapt for your course.

Accommodations for Students with Disabilities

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services (404-894-2563) 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 in order to set up a time to discuss your learning needs.

Student-Faculty Expectations Agreement

At Georgia Tech, we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. The Student-Faculty Expectations articulate 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.

Optional Course Expectations, Policies, and Resources [Remove this heading in your final syllabus and eliminate the separation between the required and optional policies]

[While the following policies are not required, they include important expectations and resources that you may choose to share with your students. Visit our Course Policies page to find more sample policies, information about Georgia Tech specific rules and regulations, and suggestions for what to consider when setting each policy.

As you write this portion of your syllabus, use language that emphasizes your students' role in the process, and aim for a tone that communicates both authority and approachability. Each policy should make it clear what is and is not expected/permissible in this class, what the rationale or motivation behind the policy is, what students need to do in extenuating circumstances, and what the consequences will be if they fail to live up to the expectations laid out in the policy. Finally, your policy should represent something that you are comfortable implementing consistently throughout the course.]

Pre- &/or Co-Requisites

AE 2220 and MATH 2552

Extra Credit Opportunities

[If applicable, include a statement about opportunities for extra credit here. Views on extra credit opportunities vary among faculty. You might decide not to offer extra credit opportunities because you want your students to work hard in class and spend time working on actual assignments, or because you think extra credit lowers academic standards. However, extra credit can also be a good learning opportunity because it gives students an additional chance to learn the material (especially students who are struggling in the course). It also reduces student anxiety and builds their motivation and confidence.]

Collaboration and Group Work

This course will emphasize ***cooperative learning*.** Teamwork will be required throughout the semester and will be used to develop communication skills. A team will consist of **three to four** people (adjusted based on class size). The general rules regarding the "team" are

1. Teams will be formed using a research-based tool called CATME, which has proven repeatedly to create teams that are well-balanced and work well together. Once formed, teams will be expected to submit a name for their team. Changes will only be made due to schedule conflicts, etc. and can only be made upon petition of the instructor.

2. Each Team will get their own channel on the course Microsoft Teams to help with course discussion, coordination, etc. These channels are also an excellent way to reach the instructors.
3. If an individual is dissatisfied with the team and wants to quit, he/she must petition the instructor for permission; if you do quit, you will have to link up with another group or work on your own.
4. If the group decides that one of the members is not pulling his/her weight in the process, that group may petition the instructor to "fire" that member; if that person is fired, they must join another team, or they will have to work alone.
5. Teams ***will*** be evaluated at the end of the semester, i.e., there will be a penalty if your team must carry you! At the end of the semester, bonus points (up to 5% added to your homework grade) will be given to those teams that are effective.

The homework assignments will be distributed through Canvas and will be due on specified dates as determined by the instructor. **Each team will submit a single copy of the homework assignment uploaded to Canvas as a PDF.**

For each assignment, please include a cover page with a paragraph summarizing the contributions of each team member and the approach used to complete the assignment (e.g., divide and conquer, each person attempts a problem before meeting as a team, etc.). The best way to learn in this class is for each person to attempt each problem before meeting as a team to work on them together.

You should always complete a symbolic solution first and then substitute the numerical values for each variable to obtain the numerical solution. Details are **required** for full credit, including schematics where applicable.

Solutions to the homework problems will be distributed by the instructor through Canvas after the specified due date.

Use of Generative AI

You are likely to use generative AI such as ChatGPT this semester. As with other any other tool or resource, remember two important things:

1) You are ultimately responsible for what you submit.

2) In order to facilitate review of your work, provide appropriate references. For generative AI, this may include prompts used, the specific AI used, and a short description of your methodology (how did you use it).

Uncited use of generative AI will be considered a violation of academic honesty and reported through appropriate channels.

Extensions, Late Assignments, & Re-Scheduled/Missed Exams

Homework will be accepted up to 24 hours after the deadline without penalty. Homework will not be accepted after those 24 hours. Make-up exams are given for illness, approved Institute activities or religious observances.

Inclement Weather and Digital Learning Days

If a weather-related event affects campus operations, we will pivot to either pre-recorded lectures or virtual class through MS Teams.

Student Use of Mobile Devices in the Classroom

Electronic devices used for taking notes are permitted in this class, but mobile devices (e.g., smartphones) not used for note taking are not permitted. Please reframe from using your smartphones during class.

Food and Drink in the Classroom

I encourage you to eat before or after class too minimize distractions in class; but if this is the only time you have to eat, it's fine to do so if you minimize the noise you create.

Campus Resources for Students

Undergraduate Student Academic Success Resources:

- Academic Support: Academic Success and Advising (a unit in the Office of Undergraduate Education & Student Success) provides free support for your courses. Students can attend scheduled supplemental review (PLUS) sessions, stop by Drop-In Tutoring, or schedule a one-on-one appointment through Knack. To explore what options work best for you, please visit us online at success.gatech.edu/tutoring, email us at tutoring@gatech.edu, or come see us at Clough Undergraduate Learning Commons, Suite 283.

Student Well-Being:

At Georgia Tech, we are concerned about your overall physical, social, and mental well-being. A comprehensive list of wellness related resources has been compiled and maintained by the Office of the Vice President for Student Engagement and Well-being (student-resource-guide (gatech.edu)