

ME340 – Dynamics of Mechanical Systems

Course Term and Year:	Spring 2025
Course Duration:	Full semester
Course Format:	In-person
Lecture:	Sections AL1: MWF 2:00 – 2:50 PM, 114 Transportation Bldg Sections AL2: MWF 2:00 – 2:50 PM, 112 Transportation Bldg
Lab Location:	Electrical & Computer Eng. Bldg. 3070
Credit Hours:	3.5
Course webpage:	canvas.illinois.edu
All Communications:	https://campuswire.com/p/G6DEDD75F Code: 2693
Instructors:	Sections AL1: Prof. Tom Golecki, PhD, PE, SE tfg@illinois.edu Sections AL2: Prof. Nazanin Farjam, PhD nfarjam@illinois.edu
TAs:	Yagiz Olmez, solmez2@illinois.edu Matin Mohebalhojeh, matinm2@illinois.edu Anargyros Michaloliakos, am71@illinois.edu Karthik Manoj kmanoj2@illinois.edu Jialin Li jjalin13@illinois.edu Golam Sobahani, golams2@illinois.edu
Office Hours:	TBD (starting in wk. 3) Prof. Farjam & Prof. Golecki office hours by appt.
Assessments:	35% - Homework submitted via Gradescope (canvas.illinois.edu or gradescope.com) 15% - Prelab and lab reports 20% - (2) Midterms (3/5 & 4/9), during class time. 30% - Final exam, during finals week.
Grading:	The grades will be decided based on the relative performance. The average performance will get a B grade or better.
Textbook:	Course notes: Lecture notes will be made available here: Link . Optional Reference: R. Esfandiari and B. Lu, Modeling and Analysis of Dynamic Systems, full text available here (when on campus or VPN): https://www.taylorfrancis.com/books/mono/10.1201/b22138/modeling-analysis-dynamic-systems-ramin-esfandiari-bei-lu-bei-lu

Homework:

Assignments will be put on Canvas/Gradescope course each Wednesday and submissions will be due the following Wednesday. You are encouraged to collaborate with others in the course, but you should hand in only your own work. **No late homework will be accepted. The lowest homework grade will not be counted.** The assignments will be submitted and graded **via Gradescope** (<https://www.gradescope.com>).

Labs:

Labs are supervised by Dr. Daniel Block and the teaching assistants. You can find all the details about the labs at <http://coecsl.ece.illinois.edu/me340/>. You should be enrolled in one of the scheduled lab sections. Please direct your questions to TAs assigned to your lab sessions. The pre-lab must be completed and turned in at the beginning of the session. A laboratory report consisting of the original data sheets and written answers to the discussion questions is due one week after each laboratory session. A passing grade for each of the seven laboratories is required to receive a passing grade in the course.

Schedule:

	Mon	Tues	Wed	Thurs	Fri
8		AB3	AB7		
9					
10		AB4	AB8	ABB	
11					
12	AB1	AB5	AB9	ABC	
1					
Time	AL1 & AL2	AB6	AL1 & AL2	ABD	AL1 & AL2
2	AB2		ABA		
3				ABE	
4					
5					
6					
7					

Lab 1: Week 3 (Feb 3-7): Mathematical preliminaries, Matlab

Lab 2: Week 5 (Feb 17-21): Block diagrams and simulation, Simulink

Lab 3: Week 7 (Mar 3-7): First-order systems, leaking tank, hydraulic motor

Lab 4: Week 8 (Mar 10-14): Second-order systems, single-degree-of-freedom mass-spring-damper mechanisms

Lab 5: Week 11 (Mar 31-Apr 4): Mode shapes and resonance, two-degree-of-freedom mass-spring-damper mechanisms

Lab 6: Week 13 (Apr 14-18): Frequency response of continuous beam

Lab 7: Week 14 (Apr 21-25): Nonlinear systems, double pendulum Lagrange equations

Course Outline

Mathematical Background

01: Complex numbers (review)

02: Ordinary Differential Equations:

- characterization, first-order form, phase portraits
- numerical solutions,
- solution to linear time-invariant ordinary differential equations:
homogeneous and particular solutions

03: First and second-order ordinary differential equations & system identification

04: Laplace transforms

Input-Output Response

05: Convolution, Initial Value Theorem & Final Value Theorem

06: Transfer functions & Bode plots

07: Equivalent representations (State space, first-order form), stability

Mechanical Modeling

08: Modal analysis

09: Elements of physical systems, free-body diagrams & Newton's second law

10: Lagrangian mechanics

11: Equilibrium points & linearization

Academic Integrity:

- **Guiding principle:** The work that you submit must represent your understanding of the course materials.
- **Integrity violations:**
 - This course has a zero-tolerance policy with regards to academic integrity violations. This includes cheating, plagiarism, fabrication, and facilitating infractions by others.
 - You are expected to adhere to all of the rules pertaining to academic integrity outlined in the UIUC Student Code. Use the following links to familiarize yourself with what constitutes an integrity violation and the campus policies.
 - <http://www.admin.uiuc.edu/policy/code>
 - http://studentcode.illinois.edu/article1_part4_1-401.html
 - Integrity violations will be prosecuted to the maximum possible extent. Depending on severity, recommended sanctions can range from zero on the assignment, to failure of the course, and even dismissal from the university.
- **Acceptable sources for assistance**
 - We will have adequate office hours distributed throughout the week, with the professor and with the TAs. You are free to make use of this time for assistance on the homework assignments.
 - You are also free to work in partnership with other students, as long as you adhere to the guiding principle (above). Your work must be your own and must represent your understanding.
 - Feel free to use other textbooks as aids.
- **Unacceptable sources of assistance**
 - Example 1 - A student performs an online search to seek help on a homework problem and found that someone had posted previous years' solutions to a website. Thinking that this is public domain information, the student copies the solution. This is considered cheating under the Student Code 1-402(a) (i.e. use of unauthorized materials) and potentially plagiarism under Student Code 1-402(b) (i.e. representing the work of others as your own).
 - Example 2 - A different student decided not to copy since that would obviously be cheating. However, this person read through this solution and then paraphrased the answer. This is still a violation under Student Code 1-402(b) as it amounts to plagiarism. Crediting the source material will not absolve the student in this case since it is unauthorized material.
- **Generative AI**
 - You may use generative AI programs e.g. ChatGPT, Gemini etc. **as a tool to aid in your work** (not as a substitute for your own understanding). However, you should note that the material generated by these programs may be inaccurate, incomplete, or otherwise problematic. You may **not** submit any work generated by an AI program as your own. If you include material generated by an AI program, it should be cited like any other reference material.
- **Copyrights:**

- **All materials that the instructors provide during the course are copyrighted** (even if not explicitly stated on the materials). This copyright will apply to all course notes, homework problem sets, exams, Matlab code, solutions of any kind, etc.
- You are not permitted to share the materials outside of the course (e.g. homework sharing websites). That is a copyright violation and may be prosecuted under the “facilitating infractions” clause of the academic integrity code.
- Please remember that the course materials are the intellectual property of the instructors and TAs. We hope that you will act respectfully in this regard.
- Do inform the instructor if you become aware of unauthorized materials on any website.

Mental Health:

Diminished mental health, including significant stress, mood changes, excessive worry, substance/alcohol abuse, or problems with eating and/or sleeping can interfere with optimal academic performance, social development, and emotional wellbeing. The University of Illinois offers a variety of confidential services including individual and group counseling, crisis intervention, psychiatric services, and specialized screenings at no additional cost. If you or someone you know experiences any of the above mental health concerns, it is strongly encouraged to contact or visit any of the University's resources provided below. Getting help is a smart and courageous thing to do -- for yourself and for those who care about you.

Counseling Center: 217-333-3704, 610 East John Street Champaign, IL 61820

McKinley Health Center: 217-333-2700, 1109 South Lincoln Avenue, Urbana, Illinois 61801

Sexual Misconduct Reporting Obligation:

The University of Illinois is committed to combating sexual misconduct. Faculty and staff members are required to report any instances of sexual misconduct to the University's Title IX Office. In turn, an individual with the Title IX Office will provide information about rights and options, including accommodations, support services, the campus disciplinary process, and law enforcement options.

A list of the designated University employees who, as counselors, confidential advisors, and medical professionals, do not have this reporting responsibility and can maintain confidentiality, can be found at: <https://wecare.illinois.edu/resources/students/#confidential>. Other information about resources and reporting is available here: <https://wecare.illinois.edu/>.

Religious Observances:

Illinois law requires the University to reasonably accommodate its students' religious beliefs, observances, and practices in regard to admissions, class attendance, and the scheduling of examinations and work requirements. You should examine this syllabus at the beginning of the semester for potential conflicts between course deadlines and any of your religious observances. If a conflict exists, you should notify your instructor of the conflict and follow the procedure at <https://odos.illinois.edu/community-of->

[care/resources/students/religious-observances/](#) to request appropriate accommodations. This should be done in the first two weeks of classes.

Disability-Related Accommodations:

To obtain disability-related academic adjustments and/or auxiliary aids, students with disabilities must contact the course instructor and the Disability Resources and Educational Services (DRES) as soon as possible. To contact DRES, you may visit 1207 S. Oak St., Champaign, call 333-4603, e-mail disability@illinois.edu or go to <https://www.disability.illinois.edu>. If you are concerned you have a disability-related condition that is impacting your academic progress, there are academic screening appointments available that can help diagnosis a previously undiagnosed disability. You may access these by visiting the DRES website and selecting "Request an Academic Screening" at the bottom of the page.

Anti-Racism and Inclusivity Statement:

The Grainger College of Engineering is committed to the creation of an anti-racist, inclusive community that welcomes diversity along a number of dimensions, including, but not limited to, race, ethnicity and national origins, gender and gender identity, sexuality, disability status, class, age, or religious beliefs. The College recognizes that we are learning together in the midst of the Black Lives Matter movement, that Black, Hispanic, and Indigenous voices and contributions have largely either been excluded from, or not recognized in, science and engineering, and that both overt racism and micro-aggressions threaten the well-being of our students and our university community.

The effectiveness of this course is dependent upon each of us to create a safe and encouraging learning environment that allows for the open exchange of ideas while also ensuring equitable opportunities and respect for all of us. Everyone is expected to help establish and maintain an environment where students, staff, and faculty can contribute without fear of personal ridicule, or intolerant or offensive language. If you witness or experience racism, discrimination, micro-aggressions, or other offensive behavior, you are encouraged to bring this to the attention of the course director if you feel comfortable. You can also report these behaviors to the Bias Assessment and Response Team (BART) (<https://bart.illinois.edu/>). Based on your report, BART members will follow up and reach out to students to make sure they have the support they need to be healthy and safe. If the reported behavior also violates university policy, staff in the Office for Student Conflict Resolution may respond as well and will take appropriate action.