Instructor Information

Students from any section may attend any professor's office hours for homework and lab help. For project help, contact the professor that supervises your lab section. Additional office hours can be arranged by appointment by emailing the appropriate instructor.

Lecture Section: BL1 (12:00-12:50 pm, MW)
Instructor: Professor Elizabeth Hsiao-Wecksler, PhD
Email: ethw@illinois.edu
Office: 2022 Sidney Lu Mechanical Engineering Building
Office Hours / One on One Support: Wednesdays & Thursdays 3-4 p.m.

Lecture Section: CL1 (1:00-1:50 pm, MW)
Instructor: Professor Jorge Correa, PhD
Email: jcorre20@illinois.edu
Office: 1027 Sidney Lu Mechanical Engineering Building
Office Hours / One on One Support: Mondays & Fridays, 3:30 – 4:30 p.m.

Lab Sections: BB1-BB6, CB1-CB6 (various times, W, R, F)
Instructor: Professor Kevin Wandke, PhD
Email: wandke2@illinois.edu
Office: 2136 Mechanical Engineering Laboratory
Office Hours / One on One Support: Tuesdays 11 a.m. – 12 p.m.

Teaching Assistant Information

Course Teaching Assistants (TAs): TAs are shared between all lab sections so students from any section may attend any TA office hours for homework and lab help. For project help, contact the TA that supervises your lab section. Additional office hours can be arranged by appointment by emailing the appropriate instructor.

Teaching Assistant: Subham Aggarwal
Email: sa57@illinois.edu
Lab Sections: CB3 (12:00-13:20 R), CB4 (13:30-14:50 R)
Office Hours / One on One Support: M 6-7

Teaching Assistant: Ethan Cho
Email: ethanec2@illinois.edu
Lab Sections: CB1 (14:30-15:50 W), CB2 (10:30-11:50 R), CB6 (15:00-16:20 F)
Office Hours / One on One Support: MW 5-6

Teaching Assistant: Tianyi (Tim) Han
Email: tianyih4@illinois.edu
Lab Sections: BB1 (13:00-14:20 W), CB5 (13:30-14:50 F)
Office Hours / One on One Support: TR 5-6

Teaching Assistant: Evelyn Ochoa Arias
Email: eochoa20@illinois.edu
Lab Sections: BB3 (15:00-16:20 R), BB4 (16:30-17:50 R)
Office Hours / One on One Support: T 3-4

Teaching Assistant: Marshall Tenzer
Email: mtenzer2@illinois.edu
Lab Sections: BB2 (09:00-10:20 R), BB5 (10:30-11:50 F), BB6 (12:00-13:20 F)
Office Hours / One on One Support: T 1-2, R 12-1

Where To Direct Course Questions

- **For questions and clarifications on quizzes, homework, lab assignments, projects,** either attend office hours for one of the instructors or post your question to the relevant Campuswire topic. A member of the teaching staff will respond to all questions during normal working hours.
- **For grading questions** request a regrade via Gradescope.
- **For personal requests** contact your instructor via email.

General Course Information

- **Prerequisites**: ME 270, TAM 212, and TAM 251.
- **Textbooks:** The primary textbook is Norton, R. L., Design of Machinery, 5th/6th edition, McGraw-Hill, New York, 2008/2012. TAM 212 (Dynamics) and TAM 251 (Solid Mechanics) textbooks may also be useful.
- **Course Material:** Compass, Straight Edge/Ruler, and other drawing tools.
- **Course Websites:** Notes from class, assignments, solutions, project handouts and labs will be available through the Illinois Canvas website. Homework assignments will be submitted through Gradescope.

Course Information

Course Overview and Objectives

Machines have led to multiple technological revolutions in the last few hundred years. From factories in the industrial age to automotive combustion engines, modern robotics and accelerometers in your smart phone, the ability to predictably and reproducibly automate the motion of mechanical components has affected nearly every aspect of our lives. This class delves into the underlying principles and considerations of working with mechanisms and applies those principles to design novel and useful machines.

ME 370 covers three main topics: kinematics (getting the geometry and motion right); machine dynamics (understanding the forces associated with a rapidly moving mechanism); and rotating machinery (understanding balancing, gears, cams). By the end of the course, you should be able to do a variety of design tasks, including:

- Be able to recognize and assess the underlying functionality of everyday mechanisms.
- Synthesize and prototype a mechanism to perform a specified task.
- Analyze mechanisms for position, velocity, acceleration, and dynamic forces in 2-D, using both analytical and computational tools.
- Understand issues of dynamic forces, balancing, gears, cams, and motion control.
- Apply knowledge of basic part and assembly design (engineering drawings, fits, tolerance).

In addition, you should learn some general engineering communication skills such as:

- Synthesizing user design requirements
- Low fidelity prototyping, sketching and execution of ideas
- Giving and receiving feedback
- Effectively work in a team
- Write an effective report and clearly visualize and present data.

Course Topics

Course Topics	Reading
1: Engineering design; Planar mechanisms	Ch 1, 2
2: Graphical linkage synthesis	Ch 3
3: Position Velocity Acceleration (PVA) analysis	Ch 4,6,7
4: Instant Centers, Kennedy's Theorem	Ch 6.3-6.4
5: Gears and Motors	Ch 9, Ch 2.19
6: Cams and motion control	Ch 8
7: Dynamic force analysis (DFA)	Ch 10.1-10.8, 11
8: Principle of virtual work	Ch 10.14-10.15, 11.10
9: Balancing of rotating machinery	Ch 11.8, 11.11, 12

Grading, Scoring, Attendance

- **Grade distribution**
  Project 1: 15%
  Project 2: 20%
  Labs (7 labs, 4% each): 28%
  Homework (2% each, with a total of 16 weekly assignments- drop the lowest): 30%
  Evaluative assessments (CATME peer evaluations completion): 2%
  Class participation (based on lectures and labs, project review sessions, overall effort): 2%
  Class attendance (based on in-class worksheet completion): 3%
- **Final grades**:
  The total score *s* corresponds to final grades as follows.

97% ≤ s < 100%	A+	93% ≤ s < 97%	A	90% ≤ s < 93%	A-	s < 60% F
87% ≤ s < 90%	B+	83% ≤ s < 87%	B	80% ≤ s < 83%	B-	
77% ≤ s < 80%	C+	73% ≤ s < 77%	C	70% ≤ s < 73%	C-	
67% ≤ s < 70%	D+	63% ≤ s < 67%	D	60% ≤ s < 63%	D-	

- **Re-Grading:** If you believe that a project, homework, or lab has been graded incorrectly, see the instructor within ***one week*** after the assignment has been handed back.
- **Late Assignments:**
  - **Projects -** Project assignments cannot be turned in late.
  - **Homework / labs -** Any homework or lab assignment turned in after the deadline will receive a 10% grade penalty for each day it is late, up to a maximum penalty of -50%. Assignments that are more than 5 days late might be accepted pending instructor's discretion. Only instructors, not TAs can approve extensions.
  - **Illness policy** – If you are sick, contact your instructor as soon as possible if you wish to apply for accommodations to submission deadlines. Requests must be emailed any time before the submission deadline.
- **Missed lectures:** It is your personal responsibility to make up materials for any missed lectures. You can use the lectures notes available on Canvas and/or ask your classmates. Specific questions can be addressed during office hours. No credit will be given for missed in-class exercises.

Fall 2025 Course Components

- **Lectures:** Unless otherwise specified, lectures will meet in person. Partially filled slides will be provided ahead of lecture for note taking. Filled slides will be provided 1-2 days after lecture. In-class worksheets will assess student learning. Students must come to class prepared to participate in these exercises through preview of material on Canvas and the textbook, and engagement during class time.
- **Design projects:** Two design projects will be assigned during the semester. Each project will have a project description with specific scope, deadlines, and requirements. Projects will be performed in teams of 3-4 people within your laboratory section.
- **Homework:** A homework assignment will be assigned each week, which will cover that week's topic. These homework assignments will need to be turned in to Gradescope on the specified deadline.
- **Labs**: There will be weekly labs in this course. Weeks without a lab exercise will be used to address project milestones. Weekly lab materials will be available on Canvas. Every week the lab format, assignments and deadlines will be clearly indicated on Canvas. TAs will be available for support to answer lab-related questions during assigned lab section times. Labs may have both pre-lab and post-lab materials. Prelab assignments will be the same for all students and will be due the night before the day their lab section meets. You must read the assigned lab materials (pre-lab, lab manuals, post-lab) and complete the pre-lab assignments before your assigned lab section. There will not be time during these assigned time-slots for students to read lab materials for the first time. Over the course of the semester, we will have design focused labs, computational labs, and mechanism labs. Instructions on lab location and format will be specified on the Canvas page each week.
  - Design Labs: We will exercise *Design Thinking*, a framework for creative resolution of a problems and generation of solutions which is widely applied in designing new products. The two design thinking labs

were developed in collaboration with the Siebel Center for Design to continue enhancing student experiences with more user-centered design tools.
    - Mechanisms Labs: We will gain experience examining mechanisms, measuring behavior, and practical considerations for building functional components.
    - Computational Labs: We will use Python to computationally model the motion of a mechanism and predict its behavior. For CAD drawings, we will use Autodesk Fusion 360. These programs will also be used for mechanism analysis in projects and lab assignments.
        - You are expected to be familiar with Fusion 360 from ME 170 and Python from CS101. For refresher tutorials on Fusion 360, see online resources: https://help.autodesk.com/view/fusion360/ENU/courses/ https://www.youtube.com/@AutodeskFusion360/videos
        - Fusion 360 and Python are available on the workstations in the College of Engineering Workstation Labs (EWS labs), for more usage information, locations, hours of operation, etc., see http://it.engineering.illinois.edu/ews/ Students enrolled in the College of Engineering should have a login for these workstations. *If you do not have a workstation login, please see the instructor*.
- **Evaluative Assessments:** CATME peer evaluation will reflect on lab and project activities and teamwork (discussed below).

Class Participation and Attendance

Students are expected to participate regularly in class discussion and activities. If you have a question, ask – someone else probably has the same question. You can only participate in the class and lab section times that you are registered. Furthermore, a portion of the semester's grade will depend on completion of in-lecture activities.

Remote access to software resources

Recommended: Free Downloads

For several of the computational labs we will be using Python. You can download Python for free if you do not already have it on your personal computer and use an IDE of your choosing. Professor Wandke uses the free version of PyCharm. Another good option is Google Colab.

Fusion 360 is the recommended CAD program for this course. It is available for installation on a personal computer using an educational license for students: https://www.autodesk.com/campaigns/education/fusion-360

Alternative: UIUC AnyWare

Python and the CAD program PTC Creo are available remotely through UIUC AnyWare virtual apps and desktop service.

1. Go to https://techservices.illinois.edu/uiuc-anyware/
2. Select "Log In to UIUC AnyWare" and log in with your credentials
3. Select the "Graphics Enabled Desktop" session and wait for the virtual desktop session to open
4. Open your software (Python or Creo) in the remote desktop session

Team Formation, Contract, and Peer Evaluations

The design projects and some labs will have a team component. Teams will be formed of about 4 students within your *LAB* section. **We will use CATME to identify groups based on experience and availability.** We will complete at least four peer evaluations of team members over the course of the semester. The evaluations will provide anonymous feedback and be used to judge each member's contribution to the team effort. These evaluations will affect the individual project grades and final class grade and can be different from your team score. Be a good teammate by being respectful and helpful, by showing up on time, by communicating needs and ideas clearly, by listening to and including others, by completing your tasks, and being **proactive** in contributing to the team goals. *Make sure that your teammates are aware of your contributions!*

Policies:

Academic Integrity Statement

a) Guiding principles

The work that you submit must represent your understanding of the course materials. Each student must submit their own write-up for any individual assignment (unless specified as a team activity), including separate computer programs and output. For team assignments, be sure to include the names of all team members.

b) Integrity violations

This course has a zero-tolerance policy with regard 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. Students should pay particular attention to Article 1, Part 4: Academic Integrity Policy and Procedure. Use the following link to familiarize yourself with what constitutes an integrity violation and the campus policies. https://studentcode.illinois.edu/article1/part4/1-401/ Ignorance is not an excuse for any academic dishonesty. It is your responsibility to read this policy to avoid any misunderstanding. Do not hesitate to ask the instructor(s) if you are ever in doubt about what constitutes plagiarism, cheating, or any other breach of academic integrity. 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.

c) Acceptable sources for assistance

You are welcome to use any available resources (library, faculty, TA, computers, etc.) to complete your design projects and homework. You are also free to work in partnership with other students, as long as you adhere to the guiding principles above. Your work must be your own and must represent your understanding. We will have adequate office contact hours distributed throughout the week, with the instructors and TAs. You are free to make use of these times for assistance on the homework assignments.

d) 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 – Continuing from the above example, 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.

e) Generative AI use

There are a variety of generative AI algorithms, such as ChatGPT. Gen AI algorithms are not a replacement for critical thinking, analysis, creativity, and originality. Be aware that using current Gen AI algorithms for engineering work (homework, project design and analysis) may not be developed enough to provide accurate answers. Writing, and engineering analysis and design are crafts that you must develop over time to develop your own individual voice. Generative AI tools can be used in this class, provided that you cite when and how you use the tool. You will need to provide answers to the following statements, which will be repeated on your assignments. (a) My answer was created by a Gen AI algorithm, and I have not modified it. (b) My answer was created by a Gen AI algorithm, and I have made some minor changes. (c) My answer was created by a Gen AI algorithm, and I have made major changes. (d) My answer was created solely by myself. (e) If I used Gen AI, I used ___ (name of program).

Accommodations Statement

If you have any condition (e.g. illness, physical or learning disability) that might make it difficult for you to keep pace with the class and/or carry out the assigned work, or if any other special accommodation is needed, please notify the instructor during the first week of class with appropriate written documentation. 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 217-333-4603, e-mail disability@illinois.edu or go to https://dres.illinois.edu/.

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 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 instructor if you feel comfortable. You can also report these behaviors to (https://diversity.illinois.edu/diversity-campus-culture/belonging-resources/). Based on your report, staff 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.

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**.

Sexual Misconduct Policy and Reporting Statement

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 and Disability Office. In turn, an individual with the Title IX and Disability 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 here: https://wecare.illinois.edu/resources/students/#confidential
Other information about resources and reporting is available here: wecare.illinois.edu

Netiquette Statement

In any social interaction, certain rules of etiquette are expected and contribute to more enjoyable and productive communication. The following are tips for interacting online via e-mail or discussion board messages, adapted from guidelines originally compiled by Chuq Von Rospach and Gene Spafford (1995):

- Remember that the person receiving your message is someone like you, deserving and appreciating courtesy and respect
- Avoid typing whole sentences or phrases in Caps Lock
- Be brief; succinct, thoughtful messages have the greatest effect
- Your messages reflect on you personally; take time to make sure that you are proud of their form and content
- Use descriptive subject headings in your e-mails

- Think about your audience and the relevance of your messages
- Be careful when you use humor and sarcasm; absent the voice inflections and body language that aid face-to-face communication, Internet messages are easy to misinterpret
- When making follow-up comments, summarize the parts of the message to which you are responding
- Avoid repeating what has already been said; needless repetition is ineffective communication
- Cite appropriate references whenever using someone else's ideas, thoughts, or words

Family Educational Rights and Privacy Act (FERPA)

Any student who has suppressed their directory information pursuant to Family Educational Rights and Privacy Act (FERPA) should self-identify to the instructor to ensure protection of the privacy of their attendance in this course. See https://registrar.illinois.edu/academic-records/ferpa/ for more information on FERPA.

Emergency Response Statement

Emergency response recommendations can be found at the following website: https://police.illinois.edu/em/. We encourage you to review this website and the campus building floor plans website within the first 10 days of class https://police.illinois.edu/em/building-emergency-action-plans/.