ME 366J MECHANICAL ENGINEERING DESIGN METHODOLOGY SYLLABUS

Instructor: Dr. Zhenghui Sha | **Email**: zsha@austin.utexas.edu | **Office:** ETC 4.142
Class Hours: MWF, 11:00 am – 12:00 pm | **Classroom:** UTC 3.134
Office Hours: Wednesday and Friday, 1:00 – 2:00 pm by appointment

Lab 1 (Section 18895): TTH, 8:30 – 9:30 am | **Classroom:** ETC 3.108
TA: Michael Fogg | **Email:** mfogg@utexas.edu
Office Hours: Tuesday and Thursday: 3:00 - 4:00 pm | **Location:** Zoom or ETC 3.130
Personal Zoom: https://utexas.zoom.us/j/91204217169

Lab 2 (Section 18900): MW, 12:00 – 1:00 pm | **Classroom:** ETC 3.108
TA: Daniel Weber | **Email:** danielhweber@utexas.edu
Office Hours: Monday and Wednesday: 1:00 - 2:00 pm | **Location:** Zoom or ETC 3.130
Personal Zoom: https://utexas.zoom.us/j/97271176471

Lab 3 (Section 18905): MW, 3:00 – 4:00 pm | **Classroom:** ETC 3.108
TA: David Zhang | **Email:** david_zhang@utexas.edu
Office Hours: Monday and Wednesday: 4:00 - 5:00 pm | **Location:** Zoom or ETC 3.130
Personal Zoom: https://utexas.zoom.us/j/93656494364

Hardware and Software Consultant: Hanyu Zhu | **Email:** zhuhanyu@utexas.edu
Office Hours: Monday 1 – 2 pm, Tuesday 3 – 4 pm, and Thursday 11 am -12 pm
Location: Zoom or ETC 3.130
Personal Zoom: https://utexas.zoom.us/j/4822319980

Course Overview

Course summary: An examination of structured methodologies for designing mechanical systems; reverse engineering/redesign projects and conceptual design projects. Three lecture hours and two laboratory hours a week for one semester.

Prerequisites: Prerequisites are strictly enforced. According to the *Undergraduate Catalog*, the prerequisites are: Mechanical Engineering 302, 330, 130L, 335, 338, 339, 139L, 340, and 140L and Mechanical Engineering 333H, 333T, or the equivalent. Please see the instructor if you have any questions about the requirements.

ME 366J is a prerequisite for ME 266K, Mechanical Engineering Design Project. In ME 266K, you will use much of the knowledge gained in this course, including the ability to formulate engineering design problems and the ability to solve them via effective use of needs analysis, solution generation techniques, engineering analysis and experimentation, systematic decision-making, prototyping, and speaking, writing, and collaborative team-building skills.

Course Materials:

Textbooks: Suggested readings are taken from two different textbooks. Two copies of each textbook are available on reserve at the Engineering library in EERC. Electronic copies are also available via the UT library website.

1) Otto, K.N. and K. L. Wood, 2001, *Product Design: Techniques in Reverse Engineering and New Product Development*, Prentice Hall, Upper Saddle River, NJ. (Abbreviated as O&W in the lecture schedule; available via physical access to reserves at the EERC library, which may be limited this semester, or electronically via the UT library website.)
2) Ulrich, K.T. and S.D. Eppinger, 2016, *Product Design and Development, 6th Edition*, McGraw Hill Education, New York, NY. (Abbreviated as U&E2016 in the lecture schedule; this book is only available via in-person access to UT library reserves, which may be limited.)

3) Ulrich, K.T. and S.D. Eppinger, 2004, *Product Design and Development, 3rd Edition*, McGraw Hill Education, New York, NY. (Abbreviated as U&E2004 in the lecture schedule; this book is a slightly older alternative to the 2016 6th edition, and it's available electronically via the UT library website. Use this book as an alternative to U&E2016 when U&E2016 is difficult to access.)

Handouts to be supplied in class:

1) Pahl, G. and W. Beitz, 1996, *Engineering Design: A Systematic Approach*, 2nd Edition, Springer-Verlag, NY.
2) Pugh, S., 1991, *Total Design: Integrated Methods for Successful Product Engineering*, Addison-Wesley, Boston.
3) Ullman, D. G., 1997, *The Mechanical Design Process*, 2nd Edition, McGraw-Hill, NY.

Teaching Mode: Remotely for the first two weeks of the semester, with a target date of January 31, 2022 to return to the originally assigned teaching modality. That means after January 31, all classes will still be in-person unless further instructions. Things are very fluid at the moment and may change at any time. But all the classes will be recorded, and the recording can be accessed from your Canvas account.

Canvas: The teaching team will post lecture videos, lecture slides, assignments, and other handouts and interesting links on the Canvas web site. Please logon at canvas.utexas.edu. The web site is password-protected. Site activities may include exchanging email, engaging in class discussions and chats, and exchanging files. In addition, electronic class rosters will be a component of the site. Students who do not want their information included in these electronic class rosters must restrict their directory information in the Office of the Registrar.

Learning outcomes: You will learn how to solve open engineering design problems using systematic design thinking and practices. At the end of the course, you will be able to:

- Define an open engineering design problem, including gathering customer needs and formulating engineering requirements/specifications to address a need.
- Generate a variety of concepts that are both creative and useful.
- Make well-informed, well-justified design decisions in the early and later stages of design
- Design and analyze experiments, following statistical best practices in Design of Experiments (DoE), to inform the design process.
- Create and interrogate simulation models to evaluate and refine potential designs.
- Design and build low- and high-resolution prototypes to inform the design process.
- Embody solutions with "Design for X" considerations, where the X could represent manufacturing, assembly, environment, or modularity/flexibility.
- Communicate intermediate and final designs clearly and effectively in written, oral, and multimedia formats.

Grading

		Total
Semester Long Project**		55%
Project Proposal	10%	
Design Review	10%	
Milestone Reviews in Lab (3 x 3.33%)	10%	
Final Report	15%	
Final Presentation	5%	
Design Showcase Performance	5%	
Personal Notebook		20%
Peer Evaluation		5%
Exams (2 x 7.5%)		15%
Lab/Class Attendance		5%
		100%

** *The teaching team reserves the right to lower or raise project grades for individual students based on effort, participation, and lab/class attendance throughout the semester.*

Grading Scale and Policies

1) **Letter grades:** A > 93, A- > 90, B+ > 87, B > 83, B- > 80, C+ > 77, C > 73, C- > 70, D+ > 67, D > 63, D- >= 60, F <60
2) All grading concerns and issues must be addressed upon the completion of each activity.
3) **All assignments must be submitted on time.** Assignments are due at the times and places designated on the course schedule. Unless prior approval is obtained from the teaching team, late assignments will be penalized 10% or one letter grade *per day*.
4) In case of any disputes emerge, all efforts should be made to settle the disputes within the group. As a next-to-last resort, the instructor will attempt to mediate to reach a solution. All behavior within the groups must be professional and respectful. **Communication** is the most important factor in achieving efficient and productive group work.

Assessment

Project: As a member of **a team of approximately five students**, you will have the opportunity to design, fabricate, and test an engineering system, as described in your semester-long project assignment. The project is divided into three phases: (I) Task Clarification leading to your Project Proposal, (II) Conceptual Design leading to your mid-semester Design Review, and (III) Embodiment Design and Prototyping leading to your Final Project Report, Presentation, and Prototype. *Subsequent handouts will provide detailed guidelines for each of the project-related activities.*

Personal Design Notebook: Maintain a Personal Design Notebook to document your *individual* efforts for the project. It should include accounts of design activities, thoughts, analyses, calculations, sketches, intermediate results, refinements, and other information relevant to your *individual* contribution to the design project. Record all of your project-related work in your Personal Design Notebook and submit it on the dates Indicated in the course schedule on Canvas.

Exam: Two exams are scheduled in this course. Both exams will be take-home exams due on the dates indicated on the attached course schedule. Subsequent handouts will provide detailed guidance for each exam; those handouts will be distributed in lecture and via Canvas at least one week prior to the due date. There will **not** be a final exam in this course.

Attendance and Participation. Attendance in lab is mandatory and monitored with roll calls.[1] Notify the instructor **in advance** if you must be absent for a legitimate reason, which could include a religious holiday, a medical or family emergency, or other extenuating circumstances approved by the instructor. You are responsible for any work missed during your absence. More than 2 unexcused absences from lab will result in a grade reduction of up to 5 percentage points from your final grade. The teaching team also monitors your attendance and participation in lecture and lab and considers this assessment in your final grade, along with the results of peer and instructor evaluations of your participation in team project activities. *The teaching team reserves the right to lower or raise project grades for individual students based on instructor and peer evaluations, lab attendance, and other assessments of project participation.*

Peer evaluation: Each student's performance will be evaluated by their peers in the same group. An evaluation form will be submitted along with the final report.

Assigned Reading: Exams and other assignments will draw upon only the material presented in lecture and lab. The assigned readings are designed to enhance your understanding of the material presented in

[1] Students who are enrolled in a web-based section or self-isolating for health reasons can attend lab via Zoom at the designated lab time, and Zoom presence will substitute for in-person attendance.

lecture, and help you cover lecture materials in the event of an absence from class. The assigned readings are available in textbooks on reserve and available electronically at the Engineering library.

Writing Flag Requirement

This course fulfills three hours of the communication component of the university core curriculum and addresses the following four core objectives established by the Texas Higher Education Coordinating Board: communication skills, critical thinking skills, teamwork, and personal responsibility.

Changes to the Syllabus or the Course

Changes to the syllabus or the schedule may be made at the instructor's discretion and in response to changing circumstances on campus, e.g., due to COVID-19 and its variants. If changes to the syllabus are made, they will be announced via Canvas to the entire class, and an updated copy of the syllabus will be posted to Canvas. **It is your responsibility to note these changes when announced**.

Inclusiveness

Professional courtesy and sensitivity are especially important with respect to differences of race, culture, religion, politics, sexual orientation, gender, gender variance, and nationality. In this class, we will strive to create a culture of respect and appreciation for our individual differences. The teaching team will gladly honor your request to address you by a name that is different from what appears on the official roster, and by the gender pronouns you prefer. Please advise us of any changes early in the semester, so that we can update our records.

ABET Program Outcomes

- An ability to apply knowledge of mathematics, science, and engineering.
- An ability to design and conduct experiments, as well as to analyze and interpret data.
- An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
- An ability to function on multi-disciplinary teams.
- An ability to identify, formulate, and solve engineering problems.
- An understanding of professional and ethical responsibility.
- An ability to communicate effectively.
- The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
- A recognition of the need for, and an ability to engage in life-long learning.
- A knowledge of contemporary issues.
- An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Academic Honesty

Each student in the course is expected to abide by the University of Texas Honor Code: "As a student of The University of Texas at Austin, I shall abide by the core values of the University and uphold academic integrity." **Plagiarism is taken very seriously at UT.** Therefore, if you use words or ideas that are not your own (or that you have used in previous classes), you must cite your sources. Otherwise, you will be guilty of plagiarism and subject to academic disciplinary action, including failure of the course. You are responsible for understanding UT's Academic Honesty and the University Honor Code, which can be found at the following web address:
https://deanofstudents.utexas.edu/conduct/standardsofconduct.php
For more information about academic integrity, please visit:
https://deanofstudents.utexas.edu/conduct/academicintegrity.php

Q Drop Policy: If you want to drop a class after the 12th class day, you'll need to execute a Q drop before the Q-drop deadline, which typically occurs near the middle of the semester. Under Texas law, you are only allowed six Q drops while you are in college at any public Texas institution. For more information, see: http://www.utexas.edu/ugs/csacc/academic/adddrop/qdrop

Rules of Civilized Behavior

1) Mute your cell phones and put them away before class.
2) If you are going to miss class, send an email before class explaining why you will not be there. Do not just tell the instructor; send an email.
3) If you must leave class early, inform the instructor before class begins.

University Resources

Services for Students with Disabilities: The university is committed to creating an accessible and inclusive learning environment consistent with university policy and federal and state law. Please let me know if you experience any barriers to learning so I can work with you to ensure you have equal opportunity to participate fully in this course. If you are a student with a disability, or think you may have a disability, and need accommodations please contact Services for Students with Disabilities (SSD). Please refer to SSD's website for contact and more information: http://diversity.utexas.edu/disability/. If you are already registered with SSD, please deliver your Accommodation Letter to me as early as possible in the semester so we can discuss your approved accommodations and needs in this course.

Counseling and Mental Health Center: Do your best to maintain a healthy lifestyle this semester by eating well, exercising, avoiding drugs and alcohol, getting enough sleep, and taking some time to relax. This will help you achieve your goals and cope with stress. All of us benefit from support during times of struggle. You are not alone. There are many helpful resources available on campus, and an important part of the college experience is learning how to ask for help. Asking for support sooner rather than later is often helpful. If you or anyone you know experiences any academic stress, difficult life events, or feelings like anxiety or depression, we strongly encourage you to seek support.
http://www.cmhc.utexas.edu/individualcounseling.html

The Sanger Learning Center: Did you know that more than one-third of UT undergraduate students use the Sanger Learning Center each year to improve their academic performance? All students are welcome to take advantage of Sanger Center's classes and workshops, private learning specialist appointments, peer academic coaching, and tutoring for more than 70 courses in 15 different subject areas. For more information, please visit http://www.utexas.edu/ugs/slc or call 512-471-3614 (JES A332).

BeVocal: BeVocal is a university-wide initiative to promote the idea that individual Longhorns have the power to prevent high-risk behavior and harm. At UT Austin, all Longhorns have the power to intervene and reduce harm. To learn more about BeVocal and how you can help to build a culture of care on campus, go to: https://wellnessnetwork.utexas.edu/BeVocal.

Undergraduate Writing Center: http://uwc.utexas.edu/
Libraries: http://www.lib.utexas.edu/
ITS: http://www.utexas.edu/its/
Student Emergency Services: http://deanofstudents.utexas.edu/emergency/

Safety Information

If you have concerns about the safety or behavior of fellow students, TAs or Professors, call BCAL (the Behavior Concerns Advice Line): 512-232-5050. Your call can be anonymous. If something doesn't feel right – it probably isn't. Trust your instincts and share your concerns.

Emergency Evacuation Procedures: The following recommendations regarding emergency evacuation from the Office of Campus Safety and Security, 512-471-5767,

http://www.utexas.edu/safet. Occupants of buildings on The University of Texas at Austin campus are required to evacuate buildings when a fire alarm is activated. Alarm activation or announcement requires exiting and assembling outside.

1) Familiarize yourself with all exit doors of each classroom and building you may occupy. Remember that the nearest exit door may not be the one you used when entering the building.
2) Students requiring assistance in evacuation shall inform their instructor in writing during the first week of class.
3) In the event of an evacuation, follow the instruction of faculty or class instructors. Do not re-enter a building unless given instructions by the following: Austin Fire Department, The University of Texas at Austin Police Department, or Fire Prevention Services office.
4) Link to information regarding emergency evacuation routes and emergency procedures can be found at: www.utexas.edu/emergency

Violence / Active Shooter (CADD): **CALL**- 9-1-1. **AVOID**- If possible, self-evacuate to a safe area outside the building. Follow the directions of police officers. **DENY**- Barricade the door with desk, chairs, bookcases, or any items. Move to a place inside the room where you are not visible. Turn off the lights and remain quiet. Remain there until told by police it's safe. **DEFEND**- Use chairs, desks, cell phones, or whatever is immediately available to distract and/or defend yourself and others from attack.

Title IX Reporting: Title IX is a federal law that protects against sex and gender-based discrimination, sexual harassment, sexual assault, sexual misconduct, dating/domestic violence and stalking at federally funded educational institutions. UT Austin is committed to fostering a learning and working environment free from discrimination in all its forms. When sexual misconduct occurs in our community, the university can:

1) Intervene to prevent harmful behavior from continuing or escalating.
2) Provide support and remedies to students and employees who have experienced harm or have become involved in a Title IX investigation.
3) Investigate and discipline violations of the university's relevant policies (https://titleix.utexas.edu/relevant-polices/).

Beginning January 1, 2020, Texas Senate Bill 212 requires all employees of Texas universities, including faculty, to report any information to the Title IX Office regarding sexual harassment, sexual assault, dating violence, and stalking that is disclosed to them. Texas law requires that all employees who witness or receive any information of this type (including, but not limited to, writing assignments, class discussions, or one-on-one conversations) must be reported. **I am a Responsible Employee and must report any Title IX-related incidents** that are disclosed in writing, discussion, or one-on-one. Before talking with me or with any faculty or staff member about a Title IX-related incident, be sure to ask whether they are a responsible employee. If you would like to speak with someone who can provide support or remedies without making an official report to the university, please email advocate@austin.utexas.edu. For more information about reporting options and resources, visit http://www.titleix.utexas.edu/, contact the Title IX Office via Email at titleix@austin.utexas.edu, or call 512-471-0419.

Although graduate teaching and research assistants are not subject to Texas Senate Bill 212, they are still mandatory reporters under Federal Title IX laws and are required to report a wide range of behaviors we refer to as sexual misconduct, including the types of sexual misconduct covered under Texas Senate Bill 212. The Title IX office has developed supportive ways to respond to a survivor and compiled campus resources to support survivors.