Course Title/Number/Section: MEEN 4150- Mechanical Energy Engineering Systems Design I

Instructor Information:

Name: Armita Hamidi, PhD
Email: armita.hamidi@unt.edu
Office #: F115U

Office Hours:
Monday & Wednesdays: 2:30 PM to 4:30 PM
or by appointment
NOTE:

1. If, for unavoidable reasons, I am unable to hold office hours, I will do my best to notify you in advance and arrange an alternative meeting time.
2. If you cannot attend during scheduled times, feel free to email me to arrange an appointment.
3. **Open Door Policy**: If my door is open and I'm not in a meeting, feel free to stop by no appointment needed.
4. Office hours are a great opportunity to ask questions, clarify course material, and seek support. You are strongly encouraged to take advantage of office hours. Come visit me! I'm here to support you and your success is our goal!

TA:
Name: TBD
Email: TBD

Course Description:
Advanced treatment of engineering design principles with an emphasis on product and systems design, development and manufacture. The class will mimic "real world" environment with students working in teams to prepare product specification, develop several concepts, perform detailed design and construct prototypes subject to engineering, performance and economic constraints.

Credit Hours: 3 credit hours

Prerequisites: NOT be pre-engineering major. Pass with C or better:

1. EENG 2610 Circuit Analysis
2. MEEN 3130 Machine Elements
3. MEEN 3210 Heat Transfer
4. MEEN 3230 System Dynamics and Control
5. MEEN 3242 Mechanical and Energy Engineering Laboratory II

Corequisite:

1. MEEN 4150.3XX: Laboratory. 3-hour lab section. Each team selects meeting times.
2. MEEN 3100: Manufacturing Processes

Course Delivery:

This is a face-to-face course with learning resources and supplemental materials posted on Canvas. Lesson materials will be organized on the Canvas website for the course. You are expected to have access to the lesson handouts during class by either printing the handouts or having them available for modification on your computer/tablet. The handouts only outline the material for a given class and will need to be completed during class for the student to have the relevant information.

Class Schedule:

Mon WED 11:30 AM to 12:20 PM in Room: NTDP F185
Lab Schedule: FRI 10:00 AM to 12:50 PM NTDP F116

Texts and Materials:

- **Textbook:**
  "Engineering Design", George Dieter, Linda Schmidt. McGraw Hill (ISBN: 1260113299), 2021.

- **Technology requirements for courses with digital materials:**

Make sure to have the following items before the first day of class.

- Computer
- Reliable internet access
- Speakers
- Microphone
- Plug-ins
- Microsoft Office Suite
- Canvas Technical Requirements (https://clear.unt.edu/supportedtechnologies/canvas/requirements)

Class Materials for Digital Learning language **must** include the following: This course has digital components. To fully participate in this class, students will need internet access to reference content on the Canvas Learning Management System. If circumstances change, you will be informed of other technical needs to access course content. Information on how to be successful in a digital learning environment can be found at Learn Anywhere (https://online.unt.edu/learn). Make sure you are familiar with Using Canvas, email with attachments, downloading and installing software, spreadsheet programs, presentation and graphics programs.

Technical Assistance:
UIT Help Desk: UIT Student Help Desk site (http://www.unt.edu/helpdesk/index.htm)
Email: helpdesk@unt.edu
Phone: 940-565-2324
In Person: Sage Hall, Room 130
Walk-In Availability: 8am-9pm
Telephone Availability:

- Sunday: noon-midnight
- Monday-Thursday: 8am-midnight
- Friday: 8am-8pm
- Saturday: 9am-5pm

Laptop Checkout: 8am-7pm
For additional support, visit Canvas Technical Help (https://community.canvaslms.com/docs/DOC-10554-4212710328)

- **Calculators:**
  The use of a calculator is required and allowed on all homework, exams and quizzes. Calculators with graphing capabilities will be allowed in the course for homework and quizzes.

Use of Artificial Intelligence in this class:
Generative Artificial Intelligence (GenAI) describes tools, such as ChatGPT, Gemini, and GitHub Copilot, that are trained to generate responses to user-defined prompts or questions. Such tools are a major milestone in machine learning and an impressive application of data science in the real world. Their use can be helpful to your learning but cannot be used to demonstrate mastery of any course objectives.
In this course, I want you to engage deeply with the materials and develop your own critical thinking and writing skills. For this reason, the use of Generative AI (GenAI) tools is not permitted. While these tools can be helpful in some contexts, they do not align with our goal of fostering the development of your independent thinking. Using GenAI to complete any part of an assignment, exam, or coursework will be considered a violation of academic integrity, as it prevents the development of your own skills, and will be addressed according to the Student Academic Integrity policy (https://policy.unt.edu/policy/06-003).

Course Objectives:
GAINING MAJOR DESIGN EXPERIENCE: This course satisfies an ABET accreditation requirement for major design experience. "Engineering design is a process of devising a system, component, or process to meet desired needs and specifications within constraints. It is an iterative, creative, decision-making process in which the basic sciences, mathematics, and engineering sciences are applied to convert resources into solutions. Engineering design involves identifying opportunities, developing requirements, performing analysis and synthesis, generating multiple solutions, evaluating solutions against requirements, considering risks, and making trade-offs, for purpose of obtaining a high-quality solution under given circumstances. For illustrative purposes only, examples of possible constraints include accessibility, aesthetics, codes, constructability, cost, ergonomics, extensibility, functionality, interoperability, legal considerations, maintainability, manufacturability, marketability, policy, regulations, schedule, standards, sustainability, or usability"

SOLVING SCOMPLEX ENGINEERING PROBLEM: Complex engineering problems include one or more of the following characteristics: involving wide-ranging or conflicting technical issues, having no obvious solution, addressing problems not encompassed by current standards

and codes, including many component parts or sub-problems, involving multiple disciplines, or having significant consequences in a range of contexts.

Course Learning Outcomes:

ABET STUDENT OUTCOMES:

1. Identify, formulate, and solve complex engineering problems by applying principles of engineering science and mathematics.
2. Apply engineering design to produce solutions to meet specified needs with consideration of public health, safety, welfare, global, cultural, social, environmental, economic factors
3. Communicate effectively with a range of audiences.
4. Recognize ethical/professional responsibilities in engineering situations and make informed judgements, which must consider impact of engineering solutions in global, economic, environmental, and societal contexts.
5. Function effectively on team whose members together provide leadership, create a collaborative/inclusive environment, establish goals, plan tasks, meet objectives.
6. Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgement to draw conclusions.
7. Acquire and apply knowledge as needed, using appropriate learning strategies.

ABET CURRICULUM REQUIRMENTS:

The curriculum must include a culminating major engineering design experience that 1) incorporates appropriate engineering standards and multiple constraints, and 2) is based on the knowledge and skills acquired in earlier course work.

Topics to Be Covered:

The instructor reserves the right to substitute other relevant material at any point throughout the course. Tentative course topics include engineering design process, project requirements identification, marketing, proposal writing, product development, lifecycle management, teams and team dynamics, communications, public speaking, risk management, requirements analysis, component sourcing and vendor selection, report writing, safety, quality, sustainability, reliability, ethics, intellectual property, professional ethics, design for manufacturing (DFM), design for assembly (DFA), and economics.

S No	Topic
1	Course Introduction, Scope, Requirements
2	Project requirements & Identification
3	Product Development and Lifecycle Management
4	Teams and Team Dynamics; Communication Management
5	Project and Risk Management Methodologies
6	Requirement Analysis and Management; Stake holder analysis
7	Documentation and its importance
8	Component sourcing, vendor selection and vendor management.
9	Report writing and presentation
10	Safety, Quality and Reliability
11	Intellectual Property and its protection
12	Professional and Ethical Responsibilities
13	Design for X (Reliability, Manufacturability, Assembly, Sustainability)
14	Economic Decision Making

Tentative Course Schedule:

(Due: Green=Team Submission, *Purple=Individual Submission*)

Week	Dates	Mondays	Wednesdays	Lab Due	Project Due	Other Due
1	Jan. 12th – Jan. 16th	Intro / Engineering Design	Product-Development Process / Think-tank			
2	Jan. 19th – Jan. 23th	**MLK Day – No Class**	**Pitch Day**			*Survey*
3	Jan. 26th – Jan. 30th	Team member announcement (Meet and Greet)	Team Behavior and Tools / GANTT Chart			*Team Schedule*
4	Feb. 2nd – Feb. 6th	Gathering Information	Concept Generation & Selection		CD-1	
5	Feb. 9th – Feb. 13th	Problem Definition and Need Identification	Embodiment Design-1		CD-2	
6	Feb. 16th – Feb. 20th	**Preliminary Design Review (PDR) – Discussion-1**	Embodiment Design-2		CD-3	
7	Feb. 23th – Feb. 27th	Risk Management & Safety Planning Session	Public Speaking		CD-4+5	
8	Mar. 2rd – Mar. 6th	**Drop-In Help Session**	**Team Leader Meeting**		CD-6	
9	Mar. 9th – Mar. 12th	**NO CLASS – Spring Break**				
10	Mar. 16th – Mar. 20th	**(Midterm Presentations)**			PD-7	
11	Mar. 23th – Mar. 27th	3D Printing/ Virtual Reality **(Training Session)**	**Drop-In Help Session**		PD-8	
12	Mar. 30th – Apr. 3th	3D Printing Preb Time at the Pettinger Center	**Team leader Meeting**			
13	Apr. 6th – Apr. 10th	Arduino/ Raspberry Pi Intro **(Training Session)**	**Preliminary Design Review (PDR) – Discussion-2**		PD-9	*Risk & Safety*
14	Apr. 13th – Apr. 17th	**Drop-In Help Session**	**Team leader Meeting**			
15	Apr. 20st – Apr. 24th	**(Final Presentations + 3D Printed Concept)**			Final Report	*Peer Rev.*
16	Apr. 27th – May. 1st	**NO CLASS – FINALs Prep**				

Grading Criteria:

Overall Course Grading (100%)

Category	Mode	Percentage
Class Attendance & Peer Review	Individual	5%
Knowledge Checks (Safety, Ethics, Design Process,)	Individual	5%
Individual Assignments	Individual	10%
Individual Portfolio	Individual	15%
Conceptual & Preliminary Design Deliverables	Team	15%
Project Reports	Team	20%
Final Design Status (CAD, CAE, Prototype / Validation)	Team	15%
Team Presentations	Team	15%
Total		**100%**

Individual Graded Components (35%)

Item	Description
Class Attendance & Peer Review	Attendance at scheduled classes, design reviews, and completion of peer evaluation activities
Knowledge Checks	Short, low-stakes checks covering safety, ethics, capstone expectations, and design process fundamentals
Individual Assignments / Reflections	Short written reflections, professional practice activities, and individual submissions
Individual Portfolio	Documentation of individual technical contributions, analysis, design decisions, and reflection

Team Graded Components (65%)

Item	Description
Conceptual & Preliminary Design Deliverables	Team contract, project definition, customer needs, literature/patent search, product design specifications (PDS), concept generation and selection
Project Reports	Written reports documenting the engineering design process
Final Design Status	CAD models, CAE analysis, prototype development, testing, and validation
Team Presentations	Oral presentations evaluated on technical content and professional communication

Letter Grade Assignment

A: ≥90%, B: 80-89%, C: 70-79%, D: 60-69%, F: <60%; Your grade will not be based on a curve. The instructor reserves the right to change this grade distribution at the end of the semester.
Final grades reflect both team performance and individual contribution, as assessed through individual portfolios, peer evaluations, and instructor observation. Industry sponsors and external reviewers may provide feedback but do not assign grades.

Course Expectations:

- **Attendance**
  Regular attendance is essential for your success in this course. You are expected to attend every class unless you have a university-excused absence, such as active military service, a religious holy day, or an official university function, as outlined in the Student Attendance and Authorized Absences Policy (PDF) (https://policy.unt.edu/policy/06-039).
  Please arrive on time and prepared for each class. Attendance will be recorded. If you must miss class due to an emergency, notify me as soon as possible, preferably before the absence. It is important that you communicate with the professor and the instructional team prior to being absent, so you, the professor, and the instructional team can discuss and mitigate the impact of the absence on your attainment of course learning goals. To receive an excused absence, you must provide satisfactory evidence.

- **Assignments**

Assignments will be done individually. Assignments will be posted on Canvas and are due on the date and time given. All assignments should be turned in Canvas. A hard copy should be maintained in your portfolio. It is the student's responsibility to check and see what assignment is available and to turn them in a timely manner.
NO LATE SUBMISSIONS ALLOWED except for students with UNT-approved excuse (please follow UNT Policy 06.039). ALL late/missed assignments earn 0 grade. If you have an emergency and need an authorized absence as per UNT Policy 06.039, please connect with the Dean of Students' office requesting an excused absence in writing (studentaffairs.unt.edu/dean-of-students).

- **Teamwork:**

Teamwork is a major objective of this course, and every student is expected to contribute equitably to their team's success. Peer evaluations will be conducted and factored into individual grades. If a team member is not meeting expectations, it is the responsibility of the team to notify the instructor promptly. Examples of unacceptable team behavior include but are not limited to:

- Failure to participate in team activities or contribute meaningfully to the design process
- Engaging in unethical conduct such as plagiarism or falsification of data/results
- Poor collaboration with teammates, faculty advisors, or staff
- Repeatedly missing deadlines or misusing project materials
- Any actions that hinder or compromise the team's progress

Missing team meetings or failing to contribute to team activities due to employment or personal scheduling conflicts is not considered an excusable absence under UNT policy. Students are responsible for adjusting their schedules to meet course and team obligations. Teams are expected to identify meeting times that are reasonable and acceptable to all members.

The instructor reserves the right to reduce an individual student's grade based on inadequate teamwork, lack of participation, or failure to meet team responsibilities. In severe cases, this may include removal of a student from a team or assignment of a failing grade for the course, even if the student's individual work is otherwise passing.

- **Design Project Requirements**

1) Design projects must be related to mechanical engineering. Project should be the design of a device, machine or system that implements mechanics, thermal, fluids, energy, and control systems modeling. Project must have broad enough scope that it demonstrates a student's knowledge of mechanical fundamentals. Projects may include non-mechanical portions such as electronics and instrumentation, but they may not be primary discipline. Project solutions must involve three or more of the following mechanical engineering disciplines:

a. Solid mechanics / Fluid mechanics
b. Machine design
c. Energy Systems, HV
d. Thermal systems / heat transfer
e. Decision Sciences - Systems modeling and feedback controls
f. Manufacturing Processes

2) Projects and solutions must be open-ended that require an engineer to solve a problem. A problem with one obvious solution is not acceptable. Having many workable solutions allows teams to determine the "best" solution and provide reasoning behind their selection. Multiple alternatives are presented and evaluated, with a decision process which assesses how to determine final design configuration.
3) Projects and solutions are required to have specific constraints which are measurable, i.e., weight, size, cost, performance, efficiency, etc. Measurable goals and constraints are developed and documented in a system specification.
4) Projects and solutions must require background research to be done. If the solution has already been published, the project is not acceptable.
5) Projects and solutions require proof that design is feasible to manufacture, functional, and safe. Analysis helps reduce risk of failure before fabrication but is not proof. Fabrication and tests are required.
6) Projects and solutions must be able to be completed within 2 semesters.
7) Projects must be complex enough to require at least 3 students, but not more than 6
8) Projects and solutions should be complex enough to allow each team member to have responsibility for a major design element. If a team can implement a solution, buy materials and build it without any engineering analysis to reduce risk or assess capability versus safety or performance requirements - it is not acceptable. Simple solutions require additional scope to provide all students equal opportunity to accomplish degree requirements. Each student must be provided opportunity to lead design of major design element or assembly (collection of parts) that requires:

a. Requirements Analysis: Identification and breakdown of requirements into specifications.
b. Preliminary Design: problem identification, research and concept development
c. Embodiment Design: the main concept is selected and further analyzed
d. Detailed Design: computer engineering analysis using solid modeling FEA
e. Fabrication: construct using generally accepted engineering fabrication methods and materials. 3-d printing is, in general, specifically excluded.
f. Test: Instrument, test, and evaluate design and compare to analysis.
g. System Acceptance: Verify & validate that system meets requirements

- **Integrity**
  Every student in my class can improve by doing their own work and trying their hardest with access to appropriate resources. Students who use other people's work without citations will be violating UNT's Academic Integrity Policy. Please read and follow this important set of guidelines for your academic success (https://policy.unt.edu/policy/06-003). If you have questions about this, or any UNT policy, please email me or come discuss this with me during my office hours.

- **Communication**
  Faculty will respond to email and/or telephone messages within 48 hours during working hours Monday through Friday. Weekend messages may not be returned until Monday.

All private communication will be done through your UNTemail address. Check frequently for announcements and course updates. In your emails to faculty, include the course name and section number in your subject line.

- **Professionalism**
  Professional engineering standards apply in this class. You are expected to demonstrate a behavior consistent with the conduct of an individual practicing in the engineering profession. You are expected to:
  - Come prepared for class
  - Respect faculty and peers
  - Demonstrate responsibility and accountability for your own actions
  - Demonstrate sensitivity and appreciation for diverse cultures, backgrounds, and life experiences
  - Offer and accept constructive criticism in a productive manner
  - Demonstrate an attitude that fosters professional behavior among peers and faculty
  - Be punctual to class meetings
  - Maintain a good work ethic and integrity
  - Recognize the classroom as a professional workplace

  I value the many perspectives students bring to our campus. Please work with me to create a classroom culture of open communication, mutual respect, and belonging. All discussions should be respectful and civil. Although disagreements and debates are encouraged, personal attacks are unacceptable. Together, we can ensure a safe and welcoming classroom for all. If you ever feel like this is not the case, please stop by my office and let me know. We are all learning together.

- **Syllabus Update**
  This syllabus is subject to change during the semester with changes to be announced in class and provided on Canvas.

Academic Support & Student Services:
Mental Health
UNT strives to offer a high-quality education in a supportive environment where you can learn, grow, and thrive. As a faculty member, I am committed to supporting you, and I want to remind you that UNT offers a range of mental health and wellness services to help maintain balance and well-being. Utilizing these resources is a proactive way to support your academic and personal success. To explore campus resources designed to support you, check out mental health services (https://clear.unt.edu/student-support-services-policies), visit unt.edu/success, and explore unt.edu/wellness. To get all your enrollment and student financial-related questions answered, go to scrappysays.unt.edu.

UNT Policies:

- **ADA Policy**

The University of North Texas makes reasonable accommodations for students with disabilities. To request accommodations, you must first register with the Office of Disability Access (ODA) by completing an application for services and providing documentation to verify your eligibility

each semester. Once your eligibility is confirmed, you may request your letter of accommodation. ODA will then email your faculty a letter of reasonable accommodation, initiating a private discussion about your specific needs in the course.
You can request accommodations at any time, but it's important to provide ODA notice to your faculty as early as possible in the semester to avoid delays in implementation. Keep in mind that you must obtain a new letter of accommodation for each semester and meet with each faculty member before accommodations can be implemented in each class. You are strongly encouraged to meet with faculty regarding your accommodations during office hours or by appointment. Faculty have the authority to ask you to discuss your letter during their designated office hours to protect your privacy. For more information and to access resources that can support your needs, refer to the Office of Disability Access website (https://studentaffairs.unt.edu/office-disability-access).

- **Emergency Notification & Procedures**

UNT uses a system called Eagle Alert to quickly notify students with critical information in the event of an emergency (i.e., severe weather, campus closing, and health and public safety emergencies like chemical spills, fires, or violence). In the event of a university closure, please refer to Blackboard for contingency plans for covering course materials.

- **Retention of Student Records**

Student records pertaining to this course are maintained in a secure location by the instructor of record. All records such as exams, answer sheets (with keys), and written papers submitted during the duration of the course are kept for at least one calendar year after course completion. Course work completed via the Canvas online system, including grading information and comments, is also stored in a safe electronic environment for one year. Students have the right to view their individual record; however, information about student's records will not be divulged to other individuals without proper written consent. Students are encouraged to review the Public Information Policy and the Family Educational Rights and Privacy Act (FERPA) laws and the University's policy. See UNT Policy 10.10, Records Management and Retention for additional information.

- **Acceptable Student Behavior**

Student behavior that interferes with an instructor's ability to conduct a class or other students' opportunity to learn is unacceptable and disruptive and will not be tolerated in any instructional forum at UNT. Students engaging in unacceptable behavior will be directed to leave the classroom and the instructor may refer the student to the Dean of Students to consider whether the student's conduct violated the Code of Student Conduct. The University's expectations for student conduct apply to all instructional forums, including University and electronic classroom, labs, discussion groups, field trips, etc. Visit UNT's Code of Student Conduct (https://deanofstudents.unt.edu/conduct) to learn more.
Access to Information - Eagle Connect
Students' access point for business and academic services at UNT is located at: my.unt.edu. All official communication from the University will be delivered to a student's Eagle Connect account. For more information, please visit the website that explains Eagle Connect and how to forward e-mail Eagle Connect (https://it.unt.edu/eagleconnect).

- **Student Evaluation Administration Dates**

Student feedback is important and an essential part of participation in this course. The student evaluation of instruction is a requirement for all organized classes at UNT. The survey will be made available during weeks 13, 14 and 15 [insert administration dates] of the long semesters to

provide students with an opportunity to evaluate how this course is taught. Students will receive an email from "UNT SPOT Course Evaluations via IA System Notification" (no-reply@iasystem.org) with the survey link. Students should look for the email in their UNT email inbox. Simply click on the link and complete the survey. Once students complete the survey they will receive a confirmation email that the survey has been submitted. For additional information, please visit the SPOT website (http://spot.unt.edu/) or email spot@unt.edu.

- **Sexual Assault Prevention**

UNT is committed to providing a safe learning environment free of all forms of sexual misconduct, including sexual harassment sexual assault, domestic violence, dating violence, and stalking. Federal laws (Title IX and the Violence Against Women Act) and UNT policies prohibit discrimination on the basis of sex, and therefore prohibit sexual misconduct. If you or someone you know is experiencing sexual harassment, relationship violence, stalking, and/or sexual assault, there are campus resources available to provide support and assistance. UNT's Survivor Advocates can assist a student who has been impacted by violence by filing protective orders, completing crime victim's compensation applications, contacting professors for absences related to an assault, working with housing to facilitate a room change where appropriate, and connecting students to other resources available both on and off campus. The Survivor Advocates can be reached at SurvivorAdvocate@unt.edu or by calling the Dean of Students Office at 940-565- 2648. Additionally, alleged sexual misconduct can be non-confidentially reported to the Title IX Coordinator at oeo@unt.edu or at (940) 565 2759.

Additional Student Support Services

- Registrar (https://registrar.unt.edu/registration)
- Financial Aid (https://financialaid.unt.edu/)
- Student Legal Services (https://studentaffairs.unt.edu/student-legal-services)
- Career Center (https://studentaffairs.unt.edu/career-center)
- Multicultural Center (https://edo.unt.edu/multicultural-center)
- Counseling and Testing Services (https://studentaffairs.unt.edu/counseling-and-testing-services)
- Pride Alliance (https://edo.unt.edu/pridealliance)
- UNT Food Pantry (https://deanofstudents.unt.edu/resources/food-pantry)

Academic Support Services

- Academic Resource Center (https://clear.unt.edu/canvas/student-resources)
- Academic Success Center (https://success.unt.edu/asc)
- UNT Libraries (https://library.unt.edu/)
- Writing Lab (http://writingcenter.unt.edu/)