

MEEN 4150 – Mechanical Energy Engineering Systems Design I Fall 2020, 3 Credit Hours

Instructor:

Mr. Robert P Smith

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(940) 315-0450

Office Hours: Fridays at 2:00 - 5:00 PM or by appointment (conducted via ZOOM)

Lecture Schedule:

Section 1: T/Th from 5:30 PM – 6:20 PM

Section 2: M/W from 8:00 AM – 8:50 AM

Prerequisites: Passed with a “C” or better:

- EENG 2610 or ENGR 2405: Circuit Analysis
- MEEN 3130: Machine Element Design
- MEEN 3210: Heat Transfer
- MEEN 3230: System Dynamics and Control
- MEEN 3242: Mechanical & Energy Engineering Laboratory II

Co-requisites:

- MEEN 4150.3XX: Senior Design Laboratory
- MEEN 3100: Manufacturing Processes

Catalog Course Description:

Advanced treatment of engineering design principles with an emphasis on product and systems design, development and manufacture. Mimics “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.

Course Topics:

1. Conceptual Design Process
2. Teamwork
3. Voice of the Customer
4. Product Specification
5. Mechanical Design (solid modeling using SolidWorks)
6. Public Speaking Skills
7. Ethics

Labs:

The laboratory component of this course is satisfied by a combination of guided exercises in the utilization of SolidWorks as well as student team meetings outside of class to execute specific requirements for their design project. Students are expected to attend the lab section that they enrolled in. Due to limitations on the number of students that may occupy the Senior Design Lab at any given time, it may not be possible to change to a different time. Email me if any special considerations need to be made. Attendance in the labs is required.

ABET Student Learning Outcomes (SO):

- An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
- An ability to apply engineering design to produce solutions to meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
- An ability to communicate effectively with a range of audiences
- An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
- An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
- An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgement to draw conclusions

Advisors and their roles:

- Course Instructor
 - General advisor for all teams
 - Provides common, consistent syllabus interpretation and lectures
 - Arbiter for team member disputes and issues
- Faculty Advisor
 - Provides guidance related to specific design and technical mentoring
 - Acts as a customer advisor if team does not otherwise have one
- Customer Advisor (if applicable)
 - Sets general goals for the team's design project
 - Provides regular feedback on performance and decision making
 - Approves team progress reports

Design Project Requirements:

- 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 the primary discipline. Project solutions must involve three or more of the following mechanical engineering disciplines:
 - Solid mechanics
 - Fluid mechanics
 - Machine design / Robotics
 - Energy systems / HV
 - Thermal systems / Heat transfer
 - Decision sciences / Systems modeling and feedback controls
 - Manufacturing Processes

- 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.
- 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.
- Projects and solutions must require background research to be done. If the solution has already been published, the project is not acceptable.
- Projects and solutions require proof that the 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.
- Projects and solutions must be able to be completed within 2 semesters.
- Projects must be complex enough to require at least 3 students to form a team.
- 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 an acceptable project. Simple solutions require additional scope to provide all students equal opportunity to lead design of major design element or assembly (collection of parts) that requires:
 - Preliminary Design: research and concept development
 - Detailed Design: computer engineering analysis using solid modeling FEA
 - Fabrication: construct using generally accepted engineering fabrication methods and materials
 - Test: instrument, test, and evaluate design and compare to analysis
 - Drawings: create detailed part and assembly drawing of component(s)

Disability Policy:

All reasonable accommodations will be made to facilitate special needs. If special accommodations are required, the student must first meet with the staff of the Office of Disability Accommodation (ODA), (940) 565-4323. After meeting with that office, please contact me to discuss what accommodations will be necessary. For more information, see <http://www.unt.edu/oda>.

Attendance:

Responsibility for course attendance rests with the student. Attendance at all class meetings is expected. This includes both the lecture and lab components. Lectures will occur remotely via ZOOM and a recurring link will be available in Canvas. The lab component will be in person instruction delivered by assigned TAs in the Senior Design Lab (F102D). The expectation also extends to independently scheduled group meetings. It is the responsibility of each team to coordinate their meeting times with their faculty and/or their customer advisor. A team cannot succeed if a team member is absent. Student attendance and active participation are “essential”, per UNT policy 06.039 because lack of participation affects the entire team. The instructor reserves the right to reduce grades and/or drop student from the course (grade “WF”) upon

accumulation of three unexcused absences from combined total of lectures and labs. Upon accumulating three un-excused absences, a team conference with the instructor is required.

Grade Evaluation:

Generic Mechanical Design (individual)	
Lab SolidWorks Assignments (10 Total @ 2 points each)	20 pts
SolidWorks Associate Exam	10 pts
Project Specific Team Assignments (team)	
Team Contract	2 pts
Literature Review	2 pts
SWOT Analysis	2 pts
Voice of the Customer	2 pts
Brainstorming (3 Total @ 2 points each)	6 pts
Ethical Assessment	4 pts
Customer Focus (team)	
Progress Reports (3 Total @ 4 points each)	12 pts
Deliverables	
Peer Evaluations (2 Total @ 5 points each)	10 pts
4250 Design Day Attendance	5 pts
Team Final Presentation	10 pts
Team Binder / Meetings	5 pts
Systems Specifications (Final Report)	10 pts
Total	100 pts

Peer Evaluations can also determine course pass/fail

Teamwork:

- Teamwork is a major objective of senior design. Each team member is expected to contribute to project equally. At various points, team members will evaluate each other's participation. Evaluations play a role in final course grades. If at an time a team feels a certain member is not support the team appropriately, the instructor should be notified immediately. The following activities would be considered detrimental to the teamwork aspect of this course:
 - Lack of participation in team activities
 - Lack of contribution to the design process
 - Not meeting deadlines
 - Unethical behavior such as plagiarism or fabricating test results
 - Poor working relationships with team members, advisors, and/or staff members
 - Misuse of project materials
 - Actions with jeopardize team progress and/or safety
- It should be noted that missing meetings and not assisting your teammates because of work, etc. is not excusable per UNT policy. Students should expect to spend a significant amount of time working on this project. Students must adjust schedules accordingly. Your team must find times to meet that are acceptable to everyone in the group.

- Instructor reserves the right to reduce student grade based on lack of team work. This includes dropping the student, even if all individual grades are otherwise passing.

Academic Integrity Standards and Consequences:

According to UNT Policy 06.003, Student Academic Integrity, academic dishonesty occurs when students engage in behaviors including, but not limited to cheating, fabrication, facilitating academic dishonesty, forgery, plagiarism, and sabotage. A finding of academic dishonesty may result in a range of academic penalties or sanctions ranging from admonition to expulsion from the University. [Insert specific sanction or academic penalty for specific academic integrity violation].

Course Safety Procedures:

Students enrolled in Senior Design are required to use proper safety procedures and guidelines as outlined in UNT Policy 06.038 Safety in Instructional Activities. While working in laboratory sessions, students are expected and required to identify and use proper safety guidelines in all activities requiring lifting, climbing, walking on slippery surfaces, using equipment and tools, handling chemical solutions and hot and cold products. Students should be aware that the UNT is not liable for injuries incurred while students are participating in class activities. All students are encouraged to secure adequate insurance coverage in the event of accidental injury. Students who do not have insurance coverage should consider Standard Syllabus Statements Related Policy 06.049 Course Syllabi Requirements obtaining Student Health Insurance. Brochures for student insurance are available in the UNT Student Health and Wellness Center. Students who are injured during class activities may seek medical attention at the Student Health and Wellness Center at rates that are reduced compared to other medical facilities. If students have an insurance plan other than Student Health Insurance at UNT, they should be sure that the plan covers treatment at this facility. If students choose not to go to the UNT Student Health and Wellness Center, they may be transported to an emergency room at a local hospital. Students are responsible for expenses incurred there.

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 Canvas for contingency plans for covering course materials.

Student Perceptions of Teaching Effectiveness (SPOT):

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 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 IASystem 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 at <http://spot.unt.edu/> or email spot@unt.edu. SPOT evaluations performed in class during last couple weeks of the semester.

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 CONVAS 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.

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 based on 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.

Syllabus Changes:

The instructor reserves the right change the syllabus. Any changes will be announced in class and posted to Canvas with an accompanying email to the student's UNT email address.

Schedule:

A course schedule will be uploaded to Canvas and updated as necessary.