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MENG 3401 – Thermodynamics
Course Syllabus

Semester / Year	Spring 2025
Catalog Description	Thermodynamic properties of pure substances. Definitions of work, heat, and energy. First and second laws of thermodynamics and its application to fixed mass systems and control volumes. Analysis of thermodynamic cycles and their components.
Prerequisites	C or better grade in ENGR 2302 Dynamics, PHYS 2325 Physics I, PHYS 2125 Physics I Lab
Section Number	060
Instructor	Dr. Hayder Abdul-Razzak
Contact info	Email: habdulrazzak@uttyler.edu
Class Type / Instruction Mode / Location	Zoom/Lecture/TBA
Class Times	MW: 14:00 pm to 15:50 pm
Office Hours	TuTh: 5:00 pm to 6:30 pm or by appointment
Credits	4
Required Textbook	Fundamentals of Engineering Thermodynamics, 8th ed., by Moran, Shapiro, et al., John Wiley and Sons, zyBook ISBN: 979-8-203-18310-1
Optional References	N/A
Additional Rules and requirements	Students can use AI programs (ChatGPT, Copilot, etc.) in this course. If you utilize an AI tool to help create content for an assignment, you must acknowledge and cite the tool's contribution to your work.
Instruction / Evaluation Method/	Homework and Quizzes 20 % Two Mid-term Exams 50% Final Exam 30%
Grading Policy / Scale	Grading in this course will be based on the following: Scale: A = > 90, B = > 80, C = > 70, D = > 60, F < 60.
Important events/dates	Census date: 01/27/2025 Last date to withdraw from one or more 15-week courses: 03/31/2025 Final Exam: TBD See UT Tyler Academic Calendar: https://www.uttyler.edu/schedule/files/2024-2025/academic-calendar-2024-2025-main-20240222.pdf
Attendance / Makeup policy / other rules	Regular attendance is required. In case you have to miss a class, it is your responsibility to keep up with the class work and be informed of all announcements made in the class. **Homework Assignments:** homework will be assigned according with the topics covered in lectures. Assignments are considered very important for the understanding of the course material. Completing your homework independently is an absolute necessity to do well in this course. **Canvas:** Course syllabus, course material such as handouts and example problems with solutions, homework, assignments, homework solutions,

	review material, exam solutions will all be posted on Canvas. Please review all the material posted on Canvas on a regular basis.
Course Learning Objectives / ABET & PEOs relation	By the end of this course students will be able to: 1. Determine properties of substances (Applying appropriate physical models of state for a substance). 2. Calculate the work done by and heat taken in by a system undergoing a change of state (reversibly and irreversibly). 3. Perform first and second law analysis of steady-state flow systems (heat exchangers, turbines, pumps, condensers, boilers, and throttle valves). 4. Perform analysis of thermodynamic cycles (e.g. Carnot, Rankine and Brayton cycles).
Tentative Topics / Course Plans	• Equations of state and physical principles behind liquid/gas phase separation. • Relationship between pressure/volume, temperature/volume, and pressure/temperature spaces. • Computation of mechanical work and relation to pressure/volume space. • Designation of global/macroscopic kinetic and potential energy and internal energy as a property of state. • First law and computation of heat transfer. • Measurement of heat transfer and conversion to an “equivalent” work. • First law analysis of steady state flow systems: turbines, pumps/compressors, throttles, boilers, nozzles, diffusers, single substance mixing chambers, and heat exchangers. • Irreversibility and definition of entropy. • Quantification of entropy. • Forms of the second law: entropy statement and logical equivalence with Clausius and Kelvin-Planck statements. • Definition of cycle efficiency and comparison with theoretical limit (Carnot). • Second law analysis of steady state flow systems: turbines, pumps/compressors, throttles, boilers, nozzles, diffusers, single substance mixing chambers, and heat exchangers. • Isentropic efficiency of turbines and pumps/compressors. • Efficiency of Rankine and Brayton cycles. • Vapor phase cycle/Refrigeration cycle and Heat Pump Systems.
University Policies	https://www.uttyler.edu/offices/academic-affairs/files/syllabus-information.pdf