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Uttyler.edu/engineering

MENG 3401 – Thermodynamics
Course Syllabus

Semester / Year	Fall 2024
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	030
Instructor	Hayder Abdul-Razzak, PhD, PE
Contact info	habdulrazzak@uttyler.edu
Class Type / Location	Face to Face, HEC 0C204
Class Times	Mon/Wed 11:15AM to 1:05PM
Office Hours	Mon: 1:30PM to 2:00PM, Wed 1:30PM to 4:00PM or by appointment
Credits	4
Textbooks and Reference Materials	1. Fundamentals of Engineering Thermodynamics, 8th ed., by Moran, Shapiro, et al., John Wiley and Sons, zyBook ISBN: 979-8-203-18310-1 2. Instruction to subscribe to Thermodynamics zyBook will be provided in Canvas
Optional References	N/A
Additional 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/	Quizzes, 10 points 3 Exams, 90 points
Homework	Practice questions shall be assigned but not graded.
Grading Policy / Scale	Grading in this course will be based on the following: Scale: A = > 90, B = > 80, C = > 70, D = > 60, F < 60. Grade appeal: grades can be appealed by meeting the instructor during office hours, but no later than a week after the grade has been given.
Important events/dates	See UT Tyler Academic Calendar: https://www.uttyler.edu/schedule/files/2024-2025/academic-calendar-2024-2025-main-20240222.pdf
Attendance / Makeup policy	Attendance at every meeting is strongly encouraged but not mandatory. There will be no makeup for missed in-class work or quiz. An opportunity to make up a missed exam may be available to students with an excused absence. Be advised that makeup exams maybe more challenging. Excused absences include absences for University- sponsored events and for religious observances (see the University policy link above for the procedures to follow). Other makeups are granted only in extreme cases and at the

	discretion of the instructor. Excused absence due to illness will require evidence of treatment by medical personnel or at a medical facility.
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). 5. Perform psychrometric analysis for heating/cooling processes.
Course Outline	• 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. • Psychrometry
University Policies	https://www.uttyler.edu/offices/academic-affairs/files/syllabus-information.pdf