Department of Mechanical Engineering
Phone: +1.903.566.7003
Fax: +1.903.566.7148
Uttyler.edu/engineering

# MENG 3401 – Thermodynamics
## Course Syllabus

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| **Semester / Year** | Fall 2023 |
| **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, and PHYS 2125 Physics I Lab |
| **Section Number** | 001 |
| **Instructor Name** | Hamed Hosseinzadeh |
| **Contact Information** | Email: Hamed@uwalumni.com |
| **Class Type / Instruction Mode / Location** | Face-to-face/ BEP 0213 |
| **Class Time** | Monday/Wednesday 08:00 AM to 09:50 AM |
| **Office Hours** | Tuesday/Thursday 09:00 AM to 12:00 PM; By appointment |
| **No. of Credits** | 4 |
| **Required Textbook** | Fundamentals of Engineering Thermodynamics, 8th ed., by Moran, Shapiro, et al., John Wiley and Sons, 2018 (ISBN 978-1-119-39138-8) |
| **Optional References** | 1. Cengel, Y.A., Boles, M.A. and Kanoğlu, M., 8th Edition, 2015, Thermodynamics: an engineering approach, New York: McGraw-hill.<br>2. Potter, M., Thermodynamics for Engineers (Schaum's Outlines) 3rdEdition, 2013.<br>3. Luettmer-Strathmann, J., 2015. Thermodynamics: For Physicists, Chemists and Materials Scientists. |
| **Additional Rules and Requirements** | N/A |
| **Evaluation Method** | Homework 10%/Midterm 30%/Final Exam 45%/Project 15% |
| **Grading Policy / Scale** | Letter grades, scale:<br>A: 90 – 100; B: 80 – 89; C: 70 – 79; D: 60 – 69; F: < 60 |
| **Important Events / Dates** | Census date: 09/02/2023<br>Last day to withdraw from one or more classes: 10/30/2023<br>Exam date: TBD<br>Final date: Per published schedule by the register - TBD |
| **Attendance / Makeup** | Regular attendance is imperative if you want to do well on this course. Therefore, regular attendance is required. In case you must miss a class, it is your responsibility to |

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| **policy / other rules** | keep up with the class work and be informed of all announcements made in the class on homework, tests, etc. No makeup.<br>Therefore, will be no make-up exams. The percentage of any exams missed by a student will be added to his/her final comprehensive exam only if prior approval is granted. The student is responsible for contacting the instructor at least a week before the scheduled exam date to get an excuse from the exam. Final course grades will be determined based on the class evaluation method. If you miss any exam without getting prior approval from the instructor at least a week before the exam date, it will be counted as zero in the calculation of your final course grade. If you intend to be absent for a university-sponsored event or activity, you (or the event sponsor) must notify the instructor at least a week prior to the date of the planned absence.<br>Attendance at every meeting is strongly encouraged but not mandatory. There will be no makeup for missed in-class work. 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:<br>1. Determine properties of substances (Applying appropriate physical models of state for a substance).<br>2. Calculate the work done by and heat taken in by a system undergoing a change of state (reversibly and irreversibly).<br>3. Perform first and second law analysis of steady-state flow systems (heat exchangers, turbines, pumps, condensers, boilers, and throttle valves).<br>4. Perform analysis of thermodynamic cycles (e.g. Carnot, Rankine and Brayton cycles).<br>5. Perform psychrometric analysis for heating/cooling processes. |
| **Tentative Topics / Course Plans** | • Equations of state and physical principles behind liquid/gas phase separation.<br>• Relationship between pressure/volume, temperature/volume, and pressure/temperature spaces.<br>• Computation of mechanical work and relation to pressure/volume space.<br>• Designation of global/macroscopic kinetic and potential energy and internal energy as a property of state.<br>• First law and computation of heat transfer.<br>• Measurement of heat transfer and conversion to an “equivalent” work.<br>• First law analysis of steady state flow systems: turbines, pumps/compressors, throttles, boilers, nozzles, diffusers, single substance mixing chambers, and heat exchangers.<br>• Irreversibility and definition of entropy.<br>• Quantification of entropy.<br>• Forms of the second law: entropy statement and logical equivalence with Clausius and Kelvin<br>• Planck statements.<br>• Definition of cycle efficiency and comparison with theoretical limit (Carnot). |

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| | • Second law analysis of steady state flow systems: turbines, pumps/compressors, throttles, boilers, nozzles, diffusers, single substance mixing chambers, and heat exchangers.<br>• Isentropic efficiency of turbines and pumps/compressors.<br>• Efficiency of Rankine and Brayton cycles.<br>• Vapor phase cycle/Refrigeration cycle and Heat Pump Systems.<br>• Psychrometry |
| **University Policies** | https://www.uttyler.edu/academic-affairs/files/syllabus_information_2021.pdf |