

**MENG 3401 – Thermodynamics**  
**Course Syllabus**

<b>Semester / Year</b>	Fall 2024
<b>Catalog Description</b>	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.
<b>Prerequisites</b>	C or better grade in ENGR 2302 Dynamics, PHYS 2325 Physics I, PHYS 2125 Physics I Lab
<b>Section Number</b>	001
<b>Instructor</b>	Dr. Muath Salim
<b>Contact info</b>	Email: <a href="mailto:msalim@uttyler.edu">msalim@uttyler.edu</a> Office: RBN 3011
<b>Class Type / Location</b>	Face to Face, RBN 3035
<b>Class Times</b>	Mon/Wed 11:15AM to 1:05PM
<b>Office Hours</b>	Mon: 10:00- 11:00, Tue: 11:30-12:30, Wed: 9:00-10:00, or by appointment
<b>Credits</b>	4
<b>Textbooks and Reference Materials</b>	Fundamentals of Engineering Thermodynamics, 8th ed., by Moran, Shapiro, et al., John Wiley and Sons, 2018 (ISBN 978-1-119-39138-8)
<b>Optional References</b>	1. Cengel, Y.A., Boles, M.A. and Kanoğlu, M., 8 <sup>th</sup> Edition, 2015, Thermodynamics: an engineering approach, New York: McGraw-hill. 2. Potter, M., Thermodynamics for Engineers (Schaum's Outlines) 3rd Edition, 2013. 3. Luettmmer-Strathmann, J., 2015. Thermodynamics: For Physicists, Chemists and Materials Scientists.
<b>Additional requirements</b>	UT Tyler is committed to exploring and using artificial intelligence (AI) tools as appropriate for the discipline and task undertaken. We encourage discussing AI tools' ethical, societal, philosophical, and disciplinary implications. All uses of AI should be acknowledged as this aligns with our commitment to honor and integrity, as noted in UT Tyler's Honor Code. Faculty and students must not use protected information, data, or copyrighted materials when using any AI tool. Additionally, users should be aware that AI tools rely on predictive models to generate content that may appear correct but is sometimes shown to be incomplete, inaccurate, taken without attribution from other sources, and/or biased. Consequently, an AI tool should not be considered a substitute for traditional approaches to research. You are ultimately responsible for the quality and content of the information you submit. Misusing AI tools that violate the guidelines specified for this course (see below) is considered a breach of academic integrity. The student will be subject to disciplinary actions as outlined in UT Tyler's Academic Integrity Policy.

	<p>For this course, during some class assignments, we may leverage AI tools to support your learning, allow you to explore how AI tools can be used, and/or better understand their benefits and limitation. Learning how to use AI is an emerging skill, and we will work through the limitations of these evolving systems together. However, AI will be limited to assignments where AI is a critical component of the learning activity. I will always indicate when and where the use of AI tools for this course is appropriate</p>
<b>Instruction / Evaluation Method/</b>	<ul style="list-style-type: none"> <li>• Quizzes 10%</li> <li>• Homework 25%</li> <li>• Exam1: 15% (October 2<sup>nd</sup>)</li> <li>• Exam2: 15% (November 6<sup>th</sup>)</li> <li>• Final Exam: 35%</li> </ul>
<b>Grading Policy / Scale</b>	<p>Grading in this course will be based on the following: Scale: A =&gt; 90, B =&gt; 80, C =&gt; 70, D =&gt; 60, F &lt; 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.</p>
<b>Important events/dates</b>	<p>See UT Tyler Academic Calendar: <a href="https://www.uttyler.edu/schedule/files/2024-2025/academic-calendar-2024-2025-main-20240222.pdf">https://www.uttyler.edu/schedule/files/2024-2025/academic-calendar-2024-2025-main-20240222.pdf</a></p>
<b>Attendance / Makeup policy</b>	<p>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.</p>
<b>Course Learning Objectives / ABET &amp; PEOs relation</b>	<p>By the end of this course students will be able to:</p> <ol style="list-style-type: none"> <li>1. Determine properties of substances (Applying appropriate physical models of state for a substance).</li> <li>2. Calculate the work done by and heat taken in by a system undergoing a change of state (reversibly and irreversibly).</li> <li>3. Perform first and second law analysis of steady-state flow systems (heat exchangers, turbines, pumps, condensers, boilers, and throttle valves).</li> <li>4. Perform analysis of thermodynamic cycles (e.g. Carnot, Rankine and Brayton cycles).</li> <li>5. Perform psychrometric analysis for heating/cooling processes.</li> </ol>
<b>Course Outline</b>	<ul style="list-style-type: none"> <li>• Equations of state and physical principles behind liquid/gas phase separation.</li> <li>• Relationship between pressure/volume, temperature/volume, and pressure/temperature spaces.</li> <li>• Computation of mechanical work and relation to pressure/volume space.</li> <li>• Designation of global/macroscopic kinetic and potential energy and internal energy as a property of state.</li> <li>• First law and computation of heat transfer.</li> <li>• Measurement of heat transfer and conversion to an “equivalent” work.</li> </ul>



	<ul style="list-style-type: none"><li>• First law analysis of steady state flow systems: turbines, pumps/compressors, throttles, boilers, nozzles, diffusers, single substance mixing chambers, and heat exchangers.</li><li>• Irreversibility and definition of entropy.</li><li>• Quantification of entropy.</li><li>• Forms of the second law: entropy statement and logical equivalence with Clausius and Kelvin-Planck statements.</li><li>• Definition of cycle efficiency and comparison with theoretical limit (Carnot).</li><li>• Second law analysis of steady state flow systems: turbines, pumps/compressors, throttles, boilers, nozzles, diffusers, single substance mixing chambers, and heat exchangers.</li><li>• Isentropic efficiency of turbines and pumps/compressors.</li><li>• Efficiency of Rankine and Brayton cycles.</li><li>• Vapor phase cycle/Refrigeration cycle and Heat Pump Systems.</li><li>• Psychrometry</li></ul>
<b>University Policies</b>	<a href="https://www.uttyler.edu/offices/academic-affairs/files/syllabus-information.pdf">https://www.uttyler.edu/offices/academic-affairs/files/syllabus-information.pdf</a>