

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

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| <b>Semester / Year</b>                          | Fall 2026                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |        |     |        |     |
| <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), and PHYS 2125 (Physics I Lab).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |        |     |        |     |
| <b>Section Number</b>                           | MENG 3401.001                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |        |     |        |     |
| <b>Instructor Name</b>                          | Dr. Nelson Fumo                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |        |     |        |     |
| <b>Contact Information</b>                      | Office: RBN 3009, Email: nfumo@uttyler.edu                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |        |     |        |     |
| <b>Class Type / Instruction Mode / Location</b> | Lecture/Face-to-Face/RBN 3038                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |        |     |        |     |
| <b>Class Time</b>                               | Mo and We 8:00 AM to 9:50 AM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |        |     |        |     |
| <b>Office Hours</b>                             | Mo, Tu, and Th 11:00 PM to 11:50 AM and by appointment, except on Fridays, which are reserved for the instructor's research.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |        |     |        |     |
| <b>No. of Credits</b>                           | 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |        |     |        |     |
| <b>Required Textbook</b>                        | Fundamentals of Engineering Thermodynamics, 9th Edition. Michael J. Moran, Howard N. Shapiro, Daisie D. Boettner, Margaret B. Bailey.<br>Wiley ISBN: 978-1-119-39138-8.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |     |        |     |
| <b>Optional References</b>                      | (1) Thermodynamics. Luscombe, James, 2018. (Online, free through the library's website) and (2) Schaums Outline of Thermodynamics for Engineers, 3rd Edition (Schaum's Outlines), 2013.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |     |        |     |
| <b>Additional Rules and Requirements</b>        | <p><b>Grading of Problems in Exams:</b></p> <ul style="list-style-type: none"> <li>Students are expected to provide complete and correct solutions to all assigned problems. Full credit will only be given for correct final answers that are supported by the proper procedure and reasoning. Problems with an incorrect final answer are not eligible for partial credit unless the submitted work clearly demonstrates a correct solution method with only a minor computational or algebraic error. Any partial credit awarded is at the instructor's sole discretion.</li> </ul> <p><b>Artificial Intelligence:</b></p> <ul style="list-style-type: none"> <li>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.</li> </ul> <p><b>Professional Quality of Submitted Work</b></p> <ul style="list-style-type: none"> <li>Since the mechanical engineering program is designed to prepare students for professional practice, all submitted work (e.g., homework, lab reports, projects, presentations) is expected to meet professional standards. Work that does not reflect professional quality may be subject to grade reductions, even if professionalism is not explicitly listed in the grading rubric.</li> </ul> |        |     |        |     |
| <b>Evaluation Method</b>                        | <table> <tr> <td>Exam 1</td> <td>20%</td> </tr> <tr> <td>Exam 2</td> <td>20%</td> </tr> </table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Exam 1 | 20% | Exam 2 | 20% |
| Exam 1                                          | 20%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |        |     |        |     |
| Exam 2                                          | 20%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |        |     |        |     |



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|                                                              | Exam 3 20%<br>Quizzes and HW 20%<br>Final exams 20%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Grading Policy / Scale</b>                                | Letter grades, scale:<br>A: 90 – 100; B: 80 – 89; C: 70 – 79; D: 60 – 69; F: < 60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Important Events / Dates</b>                              | Census date: September 8<br>Drop for non-payment: September 16<br>Last date to withdraw from one or more 15-week courses: October 30<br><a href="#">Academic Calendar 2026 - 2027</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Attendance / Makeup policy / other rules</b>              | <ol style="list-style-type: none"><li>1. <b>Attendance:</b> Attendance is not mandatory but is strongly recommended. Students are responsible for all material covered during any class they miss. Class time will not be used to provide individual make-up instruction for missed lectures. There will be no make-up quizzes; however, the lowest quiz grade will be dropped.</li><li>2. <b>Makeup exam:</b> A makeup exam may be offered only for an excused absence. Excused absences include participation in university-sponsored activities and religious observances, in accordance with university policy. Other makeup exams will be considered only under extraordinary circumstances and at the instructor's sole discretion. Absences due to illness must be supported by documentation of evaluation or treatment from a licensed medical provider or recognized medical facility. Makeup exams may be scheduled at the end of the semester.</li><li>3. <b>Grade Appeal:</b> Questions regarding the grading of an assignment or exam must be discussed with the instructor within one week of the grade being posted. After that period, the grade will be considered final unless required otherwise by university policy.</li><li>4. <b>Questions:</b> Students are encouraged to seek assistance when needed. However, questions should reflect a genuine effort to solve the problem independently before requesting help.</li><li>5. <b>Communication Policy:</b> Course-related communication must be sent directly to my university email (nfumo@uttyler.edu). Canvas messaging will not be used for course communication and may not receive a response.</li><li>6. <b>Syllabus Changes:</b> The instructor reserves the right to modify this syllabus as necessary. Any changes will be announced in class and/or through Canvas and will take effect as specified in the announcement.</li><li>7. <b>Professional Responsibility:</b> Students are responsible for monitoring their university email and Canvas announcements regularly. Information communicated through these official channels is considered received on the date it is posted or sent.</li></ol> |
| <b>Course Learning Objectives / ABET &amp; PEOs Relation</b> | By the end of this course, students will be able to: <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).</li></ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

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| <b>Tentative Topics<br/>/ Course Plans</b> | <ul style="list-style-type: none"> <li>• Systems definition, description, behavior, and its properties.</li> <li>• Computation of mechanical work and relation to pressure/volume space.</li> <li>• Kinetic and potential energy and internal energy as a property of state.</li> <li>• First law and computation of heat transfer and its “equivalent” work.</li> <li>• First law analysis of steady state flow systems.</li> <li>• Irreversibility and definition and quantification of entropy.</li> <li>• Forms of the second law.</li> <li>• Definition of cycle efficiency and comparison with theoretical limit (Carnot).</li> <li>• Second law analysis of steady state flow systems.</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> </ul> |
| <b>University<br/>Policies</b>             | <a href="https://www.uttlyer.edu/offices/academic-affairs/faculty-resources/syllabus-information/">https://www.uttlyer.edu/offices/academic-affairs/faculty-resources/syllabus-information/</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

MENG 3401 Thermodynamics Class Schedule

| Lec                 | Day | Date   | Topic                                                  | Reading      | Assessment      |
|---------------------|-----|--------|--------------------------------------------------------|--------------|-----------------|
| 1                   | Mo  | 24-Aug | Introduction, Systems, Units, Properties               | Chapter 1    |                 |
| 2                   | We  | 26-Aug | Work, Power, Kinetic and Potential Energy              | 2.1 & 2.2    |                 |
| 3                   | Mo  | 31-Aug | Understanding Energy                                   | 2.3 to 2.6   | Q(2.1 & 2.2)    |
| 4                   | We  | 2-Sep  | Evaluating Properties and use of property tables       | 3.1 to 3.6   |                 |
|                     | Mo  | 7-Sep  | Labor Day holiday: all offices closed; no classes held |              |                 |
| 5                   | We  | 9-Sep  | Evaluating Properties and use of property tables       | 3.8 to 3.10  | HW(3.1 to 3.10) |
| 6                   | Mo  | 14-Sep | Review for Exam 1                                      |              | Q(3.1 to 3.10)  |
| 7                   | We  | 16-Sep | Exam 1                                                 |              |                 |
| 8                   | Mo  | 21-Sep | Ideal Gas Model                                        | 3.11 to 3.13 | HW(3.15)        |
| 9                   | We  | 23-Sep | Conservation of Mass                                   | 4.1 to 4.3   |                 |
| 10                  | Mo  | 28-Sep | Conservation of Mass                                   | 4.1 to 4.3   | Q(4.1 to 4.3)   |
| 11                  | We  | 30-Sep | Conservation of Energy                                 | 4.4 to 4.12  |                 |
| 12                  | Mo  | 5-Oct  | Conservation of Energy                                 | 4.4 to 4.12  |                 |
| 13                  | We  | 7-Oct  | Review for Exam 2                                      |              | Q(4.4 to 4.12)  |
| 14                  | Mo  | 12-Oct | Exam 2                                                 |              |                 |
| 15                  | We  | 14-Oct | Second Law of Thermodynamics                           | 5.1 to 5.4   |                 |
| 16                  | Mo  | 19-Oct | Second Law of Thermodynamics                           | 5.5 to 5.11  |                 |
| 17                  | We  | 21-Oct | Using Entropy                                          | 6.1 to 6.7   | Q(5.1 to 5.11)  |
| 18                  | Mo  | 26-Oct | Using Entropy                                          | 6.8 to 6.12  |                 |
| 19                  | We  | 28-Oct | Ranking Cycle                                          | 8.1 & 8.2    |                 |
| 20                  | Mo  | 2-Nov  | Ranking Cycle                                          | 8.3 & 8.4    | Q(8.2)          |
| 21                  | We  | 4-Nov  | Gas Power Systems                                      | 9.1 to 9.6   | HW(9.1 to 9.6)  |
| 22                  | Mo  | 9-Nov  | Vapor Refrigeration Systems                            | 10.1 & 10.2  |                 |
| 23                  | We  | 11-Nov | Heat Pumps Systems                                     | 10.6         |                 |
| 24                  | Mo  | 16-Nov | Review for Exam 3                                      |              | Q(10.1 & 10.2)  |
| 25                  | We  | 18-Nov | Exam 3                                                 |              |                 |
|                     | Mo  | 23-Nov | Thanksgiving - No class                                |              |                 |
|                     | We  | 25-Nov |                                                        |              |                 |
| 26                  | Mo  | 30-Nov | Applying Thermodynamics                                |              |                 |
| 27                  | We  | 2-Dec  | Applying Thermodynamics                                |              |                 |
| University Calendar |     |        | Final Exam - Comprehensive                             |              |                 |