Alanya Alaaddin Keykubat University | Rafet Kayış Faculty of Engineering
Mechanical Engineering Department

**SYLLABUS**

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|---|---|
| **Code/Name** | MCE 205 / Thermodynamics I |
| **Type** | Required |
| **Credit/ECTS** | 3/5 |
| **Hour per Week** | 3 (3+0+0) |
| **Level/Year** | Undergraduate/2 |
| **Semester** | Fall |
| **Classroom** | A203 |
| **Content** | Basic concepts of thermodynamics. Properties of pure substances, ideal gases and compressibility factor. Energy, energy transfer and the first law of thermodynamics. Energy analysis for closed systems and control volumes. The second law of thermodynamics. Heat engines and refrigerators. Carnot cycle. Entropy, entropy generation, and entropy balance. Isentropic efficiencies of steady-flow devices. Exergy analysis. |
| **Prerequisites** | NA |
| **Textbooks** | *Primary*<br>Y A Cengel, M A Boles, M Kanoglu, *Thermodynamics: An Engineering Approach*, 10th edition, McGraw-Hill, 2024.<br>*Supplementary*<br>M J Moran, H N Shapiro, D D Borttner, M B Bailey, *Fundamentals of Engineering Thermodynamics*, 9th edition, Wiley, 2020. |
| **Objectives** | • To analyze energy systems using the first law of thermodynamics<br>• To analyze energy systems using the second law of thermodynamics<br>• To assess performance of energy conversion devices |
| **Course Outcomes** | In this course you will be able to:<br>CO1 Identify different forms of energy and energy conversion processes<br>CO2 Use energy balance on closed systems to formulate and solve different thermodynamic problems<br>CO3 Use mass and energy balance to solve steady-flow and unsteady flow problems<br>CO4 Describe operation and principles of heat engines, steam cycle, refrigerators, and heat pumps<br>CO5 Perform entropy and exergy balance on closed systems and control volumes<br>C06 Calculate isentropic efficiencies of turbines, compressors, nozzles, and pumps |

**Weekly Schedule of Topics**

| W | Topic |
|---|---|
| 1 | Basic concepts of thermodynamics, temperature |
| 2 | Energy and the first law of thermodynamics |
| 3 | Properties of pure substances, ideal gases, compressibility factor |
| 4 | Closed system energy analysis for real substances |
| 5 | Closed system energy analysis for ideal gases and incompressible substances |
| 6 | Mass balance, energy analysis for steady-flow devices |
| 7 | Energy analysis for steady-flow devices and unsteady systems |
| 8 | The second law of thermodynamics, irreversibility |
| 9 | Heat engines, refrigerators, Carnot cycle |
| 10 | Entropy, entropy transfer, entropy generation |

| 11 | Isentropic efficiencies |
| --- | --- |
| 12 | Entropy balance |
| 13 | Exergy, exergy destruction, second-law efficiency |
| 14 | Exergy balance |

| **Professional Contribution** | Ability to understand, analyze, and improve energy systems |
| --- | --- |

**Contribution to Program Outcomes***

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CO1 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 |
| CO2 | 5 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 5 | 3 |
| CO3 | 5 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 5 | 3 |
| CO4 | 4 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 5 | 0 |
| CO5 | 5 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 5 | 3 |
| CO6 | 5 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 5 | 3 |

* Contribution Level | 0: None | 1: Very Low | 2: Low | 3: Medium | 4: High | 5: Very High

| **Special Conditions** | • Students work in groups for project and presentations. |
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| **Requirements** | NA |
| **Evaluation** | Midterm Exam 40%<br>Quiz 20%<br>Final Exam 40%<br>Total 100% |
| **Rubric** | NA |
| **Course Policy** | 1. Students are required to attend at least 70% of the theoretical courses and 80% of the courses with lab/application sessions including add-drop period. Otherwise, you will receive a grade of DZ. Health reports and other official or nonofficial excuses are not accepted.<br>2. Be in the class on time. Late attendance may result in grade deductions.<br>3. English should always be used to communicate with one another.<br>4. Mobile phone should be switched off and put away during the class.<br>5. Illegal copies of the textbooks and other illegal course materials cannot be used for the classwork and exams. |
| **Cheating & Plagiarism** | • Copying or letting someone to copy your work on exams, assignments, or reports is cheating.<br>• Cutting and pasting text, figures and tables from the web sources or any other electronic source is plagiarism.<br>• A consequence of academic dishonesty is to receive a grade of FF for the course. |

**Instructor**

| Name/Surname | Mehmet Kanoglu | Email | mehmet.kanoglu@alanya.edu.tr |
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| Room | 228 | Office Hours | |

Prepared by Mehmet Kanoğlu