

Western Michigan University
Engineering Design, Manufacturing and Management Systems EDMM
2830 (Thermodynamics)

Catalog description: Fundamentals of thermodynamics, first and second laws for open and closed systems, basics of heat transfer. Laboratory practices on thermodynamic system behavior.

Objectives:

1. Learn fundamentals of the first and second laws of thermodynamics
2. Learn applications of the ideal gas law
3. Learn to utilize tables and charts of thermodynamic properties to solve problems
4. Understand how to apply thermodynamic principles to solve problems
5. Apply thermodynamic principles to verify behavior of practical applications

Prerequisite by topics:

1. Basic understanding of mechanics and heat - PHYS 1130 and PHYS 1140
2. Basic understanding of exponential function, differential and integral calculus - MATH 1220 or MATH 1700 or MATH 2000

Textbook (required):

Kurt C. Rolle, **Thermodynamics and heat power**, 6th Edition, Pearson Prentice Hall, 2005.

References (optional):

Cengel, Y. and Boles, M.; **Thermodynamics an Engineering Approach**; McGraw Hill Companies, 2011.

Evaluations:

Grade will be based on a modified class average with a minimum grade of 60% is required to receive a passing grade (D).

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| 1. Midterm | 20% |
| 2. Final | 30% |
| 3. Quizzes | 10% |
| 4. Attendance and class participation | 5% |
| 5. Homework and Lab assignment | 35% |

For the purpose of assigning final letter grades, the following scale will be used.

<u>Grade</u>	<u>Range</u>
A	90 – 100
BA	88 – 89.9
B	80 – 87.9
CB	78-79.9
C	70 – 77.9
DC	68 – 69.9
D	60 – 67.9
E	Below 60

Performance Criteria: Student should be;

1. Able to use proper units to calculate thermodynamic properties of substances (1,2,3,4)
2. Know how the ideal gas law can be applied to calculate state of substances and work in multi-step thermodynamic processes (1,2,3,4)
3. Demonstrate proficiency in using the principles of first and second laws to solve problems in thermodynamic applications (1,2,3,4)
4. Know how to use tables and charts to determine substance properties in saturated, unsaturated and superheated conditions (2,3,4)
5. Demonstrate an understanding of the concepts of heat transfer (2,4)
6. Demonstrate skill in measurement of heat, work, temperature and heat transfer (4)
7. Demonstrate understanding of available energy sources and energy conversion devices (1,2,3,4)

(Numbers in brackets are the evaluation methods listed in previous section)

Lecture class: Attendance and punctuality are essential for success in this course. Student participation discussion of concepts, applications and problems in both lecture and lab sessions are expected. There will be a quiz each week which may be solution of a problem or answer of descriptive questions. Homework is due at the beginning of next class. Late homework will be penalized by 10% per day. No late work will be accepted after the assignment is already graded and returned. Quiz and exam makeups are no allowed.

Laboratory class: Laboratory sessions will be on detailed problem solving in groups. Each student will be assigned to a group of 3 or 4 students for this purpose. Details of the problems and solution format will be provided in the lab handouts.

Academic Honesty: You are responsible for making yourself aware of and understanding the policies and procedures in the Undergraduate and Graduate Catalogs that pertain to Academic Honesty. These policies include cheating, fabrication, falsification and forgery, multiple submission, plagiarism, complicity and computer misuse. [The policies can be found at <http://catalog.wmich.edu> under Academic Policies, Student Rights and Responsibilities.] If there is reason to believe you have been involved in academic dishonesty, you will be referred to the Office of Student Conduct. You will be given the opportunity to review the charge(s). If you believe you are not responsible, you will have the opportunity for a hearing. You should consult with your instructor if you are uncertain about an issue of academic honesty prior to the submission of an assignment or test.

<u>Week</u>	<u>Topic</u>	<u>Chapter</u>
1.	<i>Lab#1 – Thermodynamic systems</i> Introduction, thermodynamic system and fundamental concepts	1
2.	<i>Lab#2 – Units and thermodynamic quantities</i> Thermodynamics quantities, symbols and units	1
3.	<i>Lab#3 – Thermodynamic quantities</i> Thermodynamic processes	2, 6
4.	<i>Lab4 – Work – energy - power</i> Thermodynamic processes	2, 6
5.	<i>Lab#5 – Work in thermodynamic processes</i> Work, energy, power and Ideal gas law	6
6.	<i>Lab#6 – Work, energy and power in thermodynamic processes</i> Work and energy in thermodynamic processes	3, 6
7.	Midterm (Ch 1, 2, 3, 6) Work and energy in thermodynamic processes	3, 6
8.	<i>Lab#7 – First law of thermodynamics for closed system</i> First law of thermodynamics	4
9.	<i>Lab#8 – Steady flow system</i> First law of thermodynamics for open system	4
10.	<i>Lab#9 – First law of thermodynamics for open system</i> Thermodynamic properties	5
11.	<i>Lab#10 – Efficiency of heat engines</i> Second law of thermodynamics and heat engines	7
12.	<i>Lab#11 – Heat transfer due to conduction</i> Heat engines and heat transfer	9, 10, 11
13.	<i>Makeup lab</i> Heat transfer	15
14.	<i>Senior design presentation - no lab</i> Review for final	
15.	<i>Finals week</i> Final Exam (Chapter1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 15)	