Summer 5-15-2020

MET 303-450: Applied Thermodynamics

Sahidur Rahman

MET 303 Section 450 **Summer 2020**

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Text: Thermodynamics, An Engineering Approach, 9th Ed., by Yunus A. Cengel and Michael A. Boles, McGraw-Hill 2019, ISBN 978-1-259-82267-4

Reference: Schaum's Outlines – Thermodynamics for Engineers by Potter and Somerton, McGraw-Hill, 2008, ISBN 0-07-146306-2

Course Description: This course provides students with a clear understanding and a firm grasp of the basic principles of Thermodynamics that deals with energy. Topics are the first and the second laws of thermodynamics, physical properties of pure substances, energy analysis of closed system, and mass and energy analysis of control volumes.

COURSE STRUCTURE (3-0-3) (lecture hr/wk - lab hr/wk – course credits)

COURSE LEARNING OUTCOMES

By the end of the course students should be able to:

1. Determine pressure within a tank or pressure drop across a flow section or a flow device by using a manometer.
2. Apply Pascal's law to lift large weight by a small force.
3. Apply the first law of thermodynamics to derive Energy Balance for various systems.
4. Use Property Table to evaluate properties of different pure substances at different phases.
5. Evaluate Internal Energy, Enthalpy, and Specific Heats of Ideal Gases, solids and liquids and then calculate work done and amount of heat transfer during a process in a closed system.
6. Use conservation of energy and mass principles for different steady flow devices: Nozzles and Diffusers, Turbine and Compressors, Throttling Valves, Mixing Chambers, Heat Exchangers etc and analyze the thermodynamic aspects of the flow through them.
7. Determine coefficient of performance of Heat Pumps and Refrigerators, thermal efficiency of Carnot Heat Engine and understand that energy has quantity as well as quality.

CLASS TOPICS Thermodynamics and Energy Systems and Control Volumes, Process and Cycles, Pressure and Measurement, Forms of Energy, First Law of Thermodynamics, Properties of Pure Substance, Property Tables, Energy Analysis of Closed Systems, Mass and Energy Analysis of Control Volumes, Second Law of Thermodynamics

STUDENT OUTCOMES

The Course Learning Outcomes support the achievement of the following MET Student Outcomes and TAC of ABET Criterion 9 requirements.

Student Outcome a - an ability to select and apply the knowledge, techniques, skills, and modern tools of the discipline to broadly-defined engineering technology activities
Related CLO – 4

Student Outcome b - an ability to select and apply a knowledge of mathematics, science, engineering, and technology to engineering technology problems that require the application of principles and applied procedures or methodologies;
Related CLO – 1

Student Outcome f - an ability to identify, analyze, and solve broadly-defined engineering technology problems
Related CLO – 3

Student outcome l - technical expertise in dynamics, fluid mechanics, and thermodynamics;
Related CLO – 5

GRADING POLICY

Homework	20 %
Tests (2x20%)	40 %
Final Exam	40 %

NOTE: GRADING POLICY MAY BE MODIFIED BY INSTRUCTOR FOR EACH SECTION IN THE COURSE)

Note: You may not pass the course if you are having failing grades (<60%) on the tests and final exam.
There are two tests and a final exam during the semester.

ACADEMIC INTEGRITY

NJIT has a zero-tolerance policy regarding cheating of any kind and student behavior that is disruptive to a learning environment. Any incidents will be immediately reported to the Dean of Students. In the cases the Honor Code violations are detected, the punishments range from a minimum of failure in the course plus disciplinary probation up to expulsion from NJIT with notations on students' permanent record. Avoid situations where honorable behavior could be misinterpreted. For more information on the honor code, go to http://www.njit.edu/academics/honorcode.php

MODIFICATION TO COURSE

The Course Outline may be modified at the discretion of the instructor or in the event of extenuating circumstances. Students will be notified in class of any changes to the Course outline.

PREPARED BY
Dr. S. Rahman

COURSE COORDINATED BY
Dr. T. Juliano

Class	DATE	TOPICS	SECTIONS	ASSIGNMENTS (posted in Canvas)
1	5/18	Thermodynamics and Energy Systems and Control Volumes	1.1-1.6	
2	5/20	Process and Cycles Pressure and Measurement	1.7-1.12	
3	5/27	Forms of Energy First Law of Thermodynamics	2.1-2.4	
4	6/1	First Law of Thermodynamics	2.5-2.8	
5	6/3	Properties of Pure Substance	3.1-3.4	
6	**6/8**	Property Tables **Midterm Exam I** (Tentative)	3.5-3.8 **Chapters 1 & 2**	
7	6/10	Energy Analysis of Closed Systems	4.1-4.3	
8	6/15	Energy Analysis of Closed Systems		
9	6/17	Energy Analysis of Closed Systems	4.4-4.5	
10	6/22	Mass and Energy Analysis of Control Volumes	5.1-5.3	
11	6/24	Mass and Energy Analysis of Control Volumes	5.4-5.5	
12	**6/29**	Second Law of Thermodynamics **Midterm Exam II** (Tentative)	6.1-6.6 **Chapters 3 & 4**	
13	7/1	Second Law of Thermodynamics	6.7-6.11	
14	7/6	Second Law of Thermodynamics (continued)		
15	7/8	Review	Chapters 1 thru 6	
16	**7/13**	**FINAL EXAM (cumulative)**	Chapters 1 thru 6	

Office hours: Flexible availability, students need to email me for additional help

Homework - Important

Homework is **due the week following the date they are assigned, and must be submitted to the instructor through Canvas.**

Course Rules and Regulations

Synchronous Online Information
The instructor will discuss these requirements on the first day of the course and/or post on their Learning Management System (LMS). Please become familiar

- Webex: http://ist.njit.edu/webex
- Online Proctoring: https://ist.njit.edu/online-proctoring/