Fall 2025: ME 312 S101 Thermodynamics II

Department of Mechanical and Industrial Engineering
New Jersey Institute of Technology (NJIT), Newark, NJ 07012, USA

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Class: Days/Times –Wednesdays (6 PM – 8:50 PM); Credits – 3.00

101	94477	W	6:00 PM - 8:50 PM	ME 221	Closed	43	45	Datta, Dibakar

TIMELINE: Lectures, Homework, Exam

DATE	LECTURE	Practice Set	EXAMINATION
September 03 (W)	Lecture 01	Practice Set **1**	
September 10 (W)	Lecture 02	Practice Set **1** Solution Practice Set **2**	
September 17 (W)		Practice Set **2** Solution	**Exam 01** Exam 01 Solution
September 24 (W)	Lecture 03	Practice Set **3**	Exam 01 GRADE
October 01 (W)	Lecture 04	Practice Set **3** Solution Practice Set **4**	
October 08 (W)	Lecture 05	Practice Set **4** Solution	
October 15 (W)			**Exam 02** Exam 02 Solution
October 22 (W)	Lecture 06	Practice Set **5**	Exam 02 GRADE
October 29 (W)	Lecture 07	Practice Set **5** Solution	
November 05(W)			**Exam 03** Exam 03 Solution

November 12(W)	Lecture 08		Exam 03 GRADE
November 19(W)	Lecture 09	Practice Set **6**	
December 03(W)		Practice Set **6** Solution	**Exam 04** Exam 04 Solution
December 10(W)	Lecture 10		Exam 04 GRADE
FINAL EXAM date and time will be announced by NJIT			

Prerequisites: Math 211- Calculus 111; Phys 111-Physics 1

Book: Yunus A. Cengel & Michael A. Boles; Thermodynamics - An Engineering Approach; 8th Edition; Published by McGraw-Hill Education

Method of Lectures: In-person.

Office Hours: There are no specific office hours. Please email me to schedule an appointment. We can meet in any day at our mutually convenient time.

Lecture Notes and Study Materials: We will NOT blindly follow this textbook. You will receive lecture notes/slides and additional study materials in every class. Moreover, you will be provided many videos for a clear understanding of the concept.

Academic Integrity:

"Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf.

NJIT's Perspective on AI Usage in Teaching/Learning:

https://www.njit.edu/emergingtech/njits-perspective-ai-usage-teachinglearning#tab-2

Course Description:

Thermodynamic fundamentals. Introduction to the basic concept of energy and the laws governing the transfer and transformation of energy. Thermodynamic properties and the application of the first and second laws of thermodynamics in the analysis of closed and open systems. Availability analysis is introduced. These concepts are then integrated into the analysis of simple cycles.

Outcome of the course:

1. Identify the properties of real substances, such as water from tabular data, ideal gases from tabular data or equation of state and other real gases P,v,T, data through the use of the compressibility charts.
2. Analyze processes involving real substances and ideal gases as working fluid in both the open and closed systems, apply the first law, the conservation of mass to perform both mass and energy balances, sketch process diagrams, and to determine work and heat transfers.
3. Analyze open and closed systems through the application of the second law of thermodynamics as well as applying the energy concept.
4. Analyze some simple thermodynamic cycles.

Grading Policy:

There will be NO generosity in grading. Your final grading will be EXACTLY based on your performance in the exams.

The final grading will be based on -

(1) Class Attendance & Quiz Performance (10%)

Attendance will be taken in every class, and there will be a quiz in each session. Attendance and quiz performance together will account for 10% of the total grade.

(2) Four Mid-Term Exams (4 x 16 = 64%)

(3) Final Exam (26%)

PRACTICE PROBLEM SET: Many practice problem sets will be provided. Solutions to these sets will also be posted, in addition to in-class discussions.

Final Grading

Grades	Significance	Overall Score
A	**Superior**	**90 - 100**
B+	**Excellent**	**80 - 89**
B	**Very Good**	**70 - 79**
C+	**Good**	**60 - 69**
C	**Acceptable**	**50 - 59**
D	**Minimum**	**40 - 49**
F	**Fail/Inadequate**	**< 40**

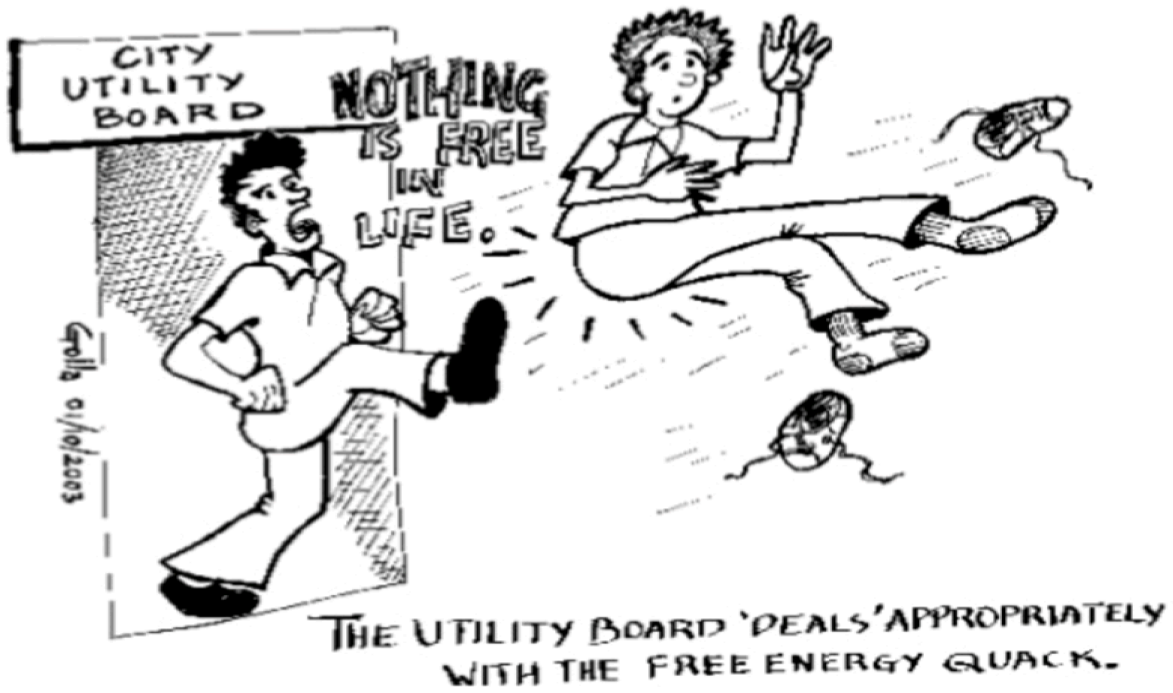
Timeline and Syllabus

Lecture	Topic
1	*Exergy; Reversible Work and Irreversibility; Second Law Efficiency; Exergy Change of a System; Exergy Transfer by Heat, Work, and Mass, Exergy Destruction*
2	*Exergy Balance: Closed System; Exergy Balance: Control Volumes; Gas Power Cycles: Basic Considerations, The Carnot Cycle*
3	*Air Standard Cycle; Otto Cycle; Diesel Cycle*
4	*Brayton Cycles; Brayton Cycle with Regeneration; Second Law Analysis of Gas Power Cycles; Rankine Vapor Cycles;*
5	*Parameters Affecting Efficiency, Reheat Cycle; Regenerative Rankine Cycle; Second-Law Analysis of Vapor Power Cycles*
6	*Refrigerators & Heat Pumps; Reversed Carnot Cycle; Ideal Refrigeration Cycle; Actual Vapor-Compression Refrigeration Cycle*
7	*Thermodynamic Property Relations, Composition of Gas Mixtures; P-v-T Behavior of Gas Mixtures; Properties of Gas-Vapor Mixture*
8	*Adiabatic Saturation and Wet-Bulb Temperatures; The Psychrometric Chart; Air-Conditioning; Air-Conditioning Process*

9	*Fuels and Combustion; Theoretical and Actual Combustion Processes; Enthalpy of Formation and Enthalpy of Combustion, First-Law Analysis of Reacting Systems;*
10	*Adiabatic Flame Temperature: Entropy* Change *of Reacting Systems; Second-Law Analysis of Reacting Systems*

Nothing is free in life! You must work hard to shine in your life.

What is Free Energy?



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