Spring 2025: ME 312 102 Thermodynamics II

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

Instructor: Dr. Dibakar Datta
Website: www.dibakardatta.net ; Email - ddlab@njit.edu; Office: MEC 307

102	14218	W	6:00 PM - 8:50 PM	FMH 307	Closed	35	36	Datta, Dibakar	Face-to-Face	3	Book

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

Prerequisites: ME 311, Math 211, and Physics 111

TIMELINE: Lectures, Homework, Exam

DATE	LECTURE	HOMEWORK	EXAMINATION
January 22	Lecture 01	Homework **01** given	
January 29	Lecture 02		
February 05	Lecture 03	**Homework 01 DUE** Homework 01 solution given	
February 12		Homework 01 GRADE given	**Exam 01** Exam 01 solution given
February 19	Lecture 04	Homework **02** given	Exam 01 GRADE given
February 26	Lecture 05		
March 05	Lecture 06		
March 12	Lecture 07	**Homework 02 DUE** Homework 02 solution given	
March 26		Homework 02 GRADE given	**Exam 02** Exam 02 solution given
April 02	Lecture 08	Homework **03** given	Exam 02 GRADE given
April 09	Lecture 09		

April 16	Lecture 10	**Homework 03 DUE** Homework 03 solution given	
April 23		Homework 03 GRADE given	**Exam 03** Exam 03 solution given
April 30	Lecture 11		Exam 03 GRADE given
FINAL EXAM DATE AND TIME WILL BE ANNOUNCED			

Grading Policy:

(1) Three Mid-Term Exams (3x15=45%)

(2) Three Homework (3x10 = 30%)

(3) Final Exam (25%)

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

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

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.

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.

Outcome of the course: A strong foundation of Thermodynamics; Strong fundamental knowledge; The conceptual and analytical skill required to solve the real-life problem; Ability to work in a group; Presentation skill on real-life projects; Report writing skill.

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:

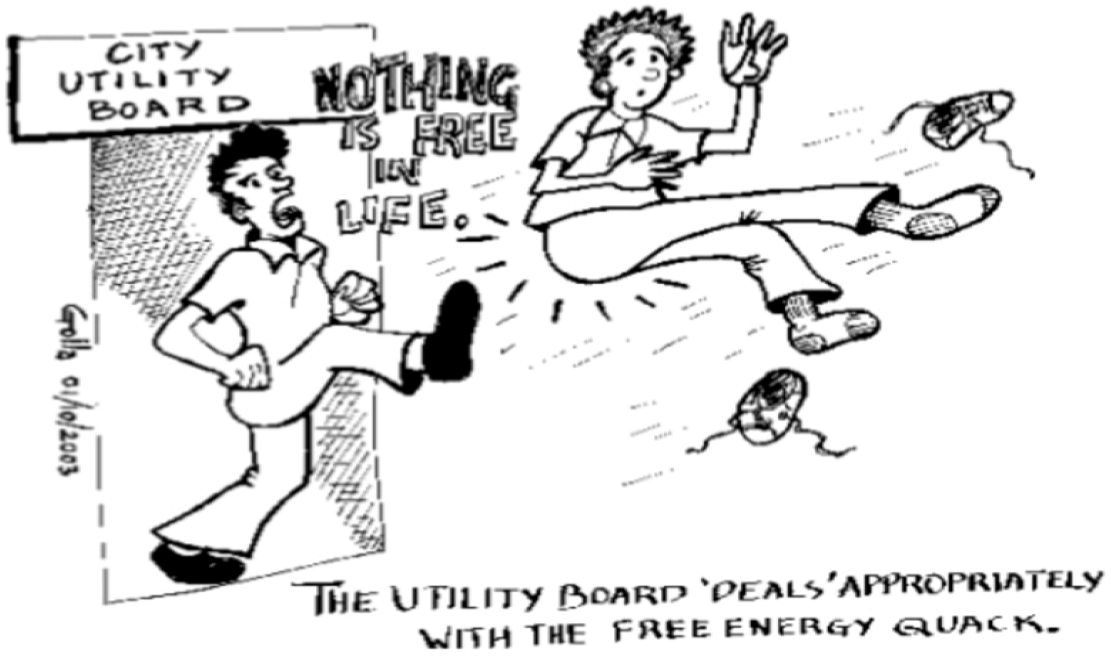
https://www.njit.edu/emergingtech/njits-perspective-ai-usage-teachinglearning#tab-2

Tentative 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*
11	*Chemical and Phase Equilibrium; Stagnation Properties; Speed of Sound and Mach number; One Dimensional Isentropic Flow* *Advanced Topics: Energy Science, Nanotechnology*

What is Free Energy?



(Picture from Web)