Spring 2024: ME 312 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

Class: Days/Times - Wednesday (6:00 – 8:50 PM); Room – KUPF 118; Credits – 3.00

104	14036	W	6:00 PM - 8:50 PM	KUPF 118	Closed	35	35	Datta, Dibakar	Face-to-Face	3	Book

Prerequisites: ME 311, Math 211, and Physics 111

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.

Grading Policy:

(1) Three Mid-Term Examinations (3x20=60%)

TENTATIVE DATES:

- **Mid-Term Exam 1: Mid-February**
- **Mid-Term Exam 2: Mid-March**
- **Mid-Term Exam 3: Mid-April**

(2) Project Presentation (20%): Final Date to Be Announced

(3) Project Report (20%)

Practice Problems (NOT FOR GRADING): There will be no homework for grading. I will provide you practice problem sets. Tentatively, there will be four practice problem sets. I encourage you to work on the practice problems by yourself in preparation for the examinations. If you have any difficulty, please discuss with me. I will also explain the solution in detail in the class. Please feel free to ask questions in- and outside the class.

Final Grading:

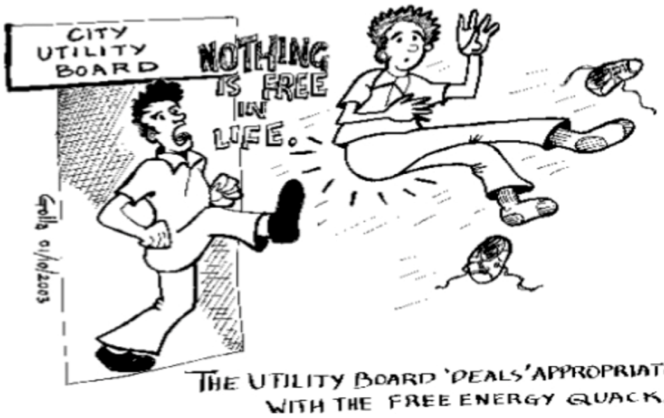
Grades	Significance	Overall Score
A	Superior	90 - 100
B+	Excellent	80 - 89
B	Very Good	70 - 79
C+	Good	60 - 69
C	Acceptable	50 - 59
D	Minimum	40 - 49
F	Fail/Inadequate	< 40

Tentative Timeline and Syllabus

Week	Topic
1&2	*Exergy; Reversible Work and Irreversibility; Second Law Efficiency; Exergy Change of a System; Exergy Transfer by Heat, Work, and Mass, Exergy Destruction*
3	*Exergy Balance: Closed System; Exergy Balance: Control Volumes; Gas Power Cycles: Basic Considerations, The Carnot Cycle*

4	*Air Standard Cycle; Otto Cycle; Diesel Cycle*
5	*Brayton Cycles; Brayton Cycle with Regeneration; Second Law Analysis of Gas Power Cycles; Rankine Vapor Cycles;*
6	*Parameters Affecting Efficiency, Reheat Cycle; Regenerative Rankine Cycle; Second-Law Analysis of Vapor Power Cycles*
7 8	*Refrigerators & Heat Pumps; Reversed Carnot Cycle; Ideal Refrigeration Cycle; Actual Vapor-Compression Refrigeration Cycle*
9	*Thermodynamic Property Relations, Composition of Gas Mixtures; P-v-T Behavior of Gas Mixtures; Properties of Gas-Vapor Mixture*
10	*Adiabatic Saturation and Wet-Bulb Temperatures; The Psychrometric Chart; Air-Conditioning; Air-Conditioning Process*
11	*Fuels and Combustion; Theoretical and Actual Combustion Processes; Enthalpy of Formation and Enthalpy of Combustion, First-Law Analysis of Reacting Systems;*
12	*Adiabatic Flame Temperature; Entropy* Change *of Reacting Systems; Second-Law Analysis of Reacting Systems*
13	*Chemical and Phase Equilibrium; Stagnation Properties; Speed of Sound and Mach number; One Dimensional Isentropic Flow*
14	Advanced Topics: Energy Storage Systems
15	Advanced Topics: Nanotechnology

What is Free Energy?



(Picture from Web)