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Fall 2024

ME 312-101: Thermodynamics II

Dibakar Datta

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Fall 2024: ME 312 S101 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 – Wednesdays (6 PM – 8:50 PM); Credits – 3.00

| 101 | 94331 | W | 6:00 PM - 8:50 PM | ME 224 | **Closed** | 43 | 43 | 👤Datta, Dibakar | Face-to-Face | 3 | 📕 Book |

TIMELINE: Lectures, Homework, Exam

DATE	LECTURE	HOMEWORK	EXAMINATION
September 04	Lecture 01	Homework **01** given	
September 11	Lecture 02		
September 18	Lecture 03	**Homework 01 DUE** Homework 01 solution given	
September 25		Homework 01 GRADE given	**Exam 01** Exam 01 solution given
October 02	Lecture 04	Homework **02** given	Exam 01 GRADE given
October 09	Lecture 05		
October 16	Lecture 06	**Homework 02 DUE** Homework 02 solution given	
October 23	Lecture 07	Homework 02 GRADE given	
October 30		Homework **03** given	**Exam 02** Exam 02 solution given
November 06	Lecture 08		Exam 02 GRADE given
November 13	Lecture 09	**Homework 03 DUE** Homework 03 solution given	

November 20	Lecture 10	Homework 03 GRADE given	
December 04			**Exam 03** Exam 03 solution given
December 11	Lecture 11		Exam 03 GRADE given
FINAL EXAM DATE AND TIME WILL BE ANNOUNCED SOON			

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.

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

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

Grading Policy:

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

(2) **Three HomeWorks (3x10 = 30%)**

(3) **Project Presentation (15%)**

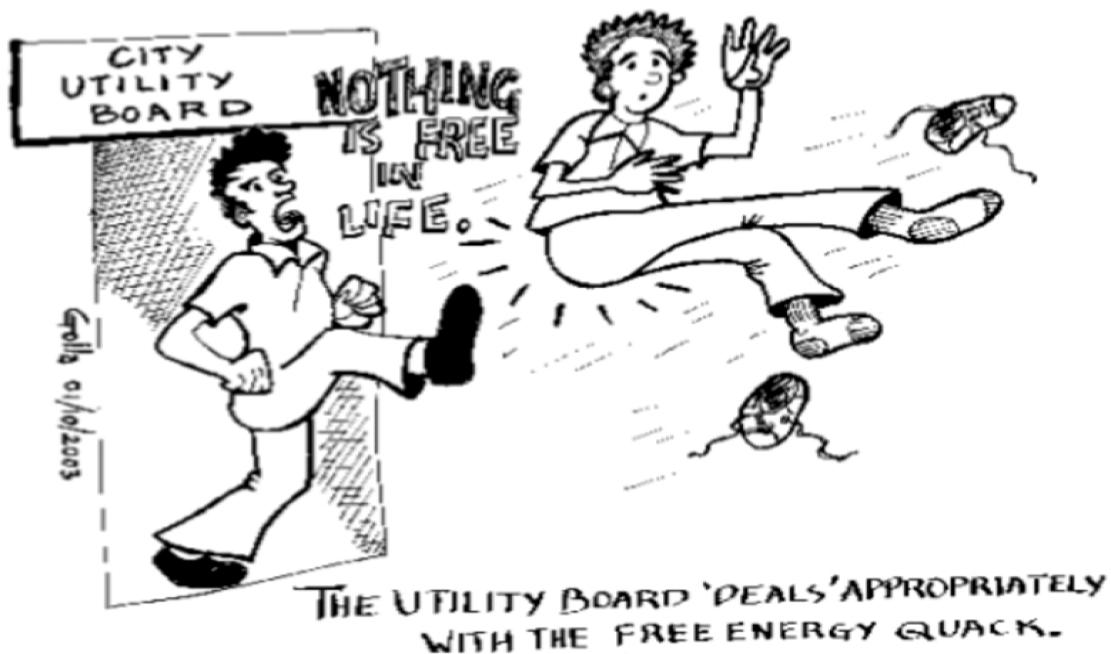(4) **Project Report (10%)**

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

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)