

**NORTHEASTERN UNIVERSITY**  
**School of Engineering Technology**  
**METE U321 Thermodynamics**

*Instructor:*

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– course info will be on Blackboard

*Textbook Requirements:* "Thermodynamics: An Engineering Approach", Cengel & Boles, 5<sup>th</sup> Edition, McGraw-Hill Book Company, 2004.

*Prerequisites:* Physics

*Course Description:* Upon completion of this course, students should have acquired an understanding of; the fundamental definitions, concepts and laws of thermodynamics; the physical properties of matter and energy within the context of engineering thermodynamics. Students should also understand how to apply the first and second law to practical engineering equipment, such as heat exchangers, air conditioning and refrigeration systems, turbines and compressors, and gas power cycles.

*Course Topics:*

1. Introductory definitions and concepts
2. Energy considerations, work, heat and practical units
3. Processes, properties and equilibrium
4. The first law of thermodynamics and its applications
5. Entropy, the second law of thermodynamics and Carnot cycles
6. Properties relationships/perfect gases
7. Otto and Diesel Cycles
8. Bratton Cycle
9. Rankine Cycle
10. Cogeneration
11. Basic Air Conditioning / Refrigeration Concepts

*Basis for Course Grade:*

Attendance to all classes and laboratories is mandatory. Students absent for legitimate reasons are required to seek alternative sources to retrieve missed notes or assignments.

<b>Content</b>	<b>Total</b>
1. Examinations (2)	70% (No Make ups except by prior arrangement)
2. Final Examination	30%
<b>Total:</b>	<b>100%</b>

***University's academic honesty policy:*** Northeastern University is committed to the principles of intellectual honesty and integrity. All members of the Northeastern community are expected to maintain complete honesty in all academic work, presenting only that which is their own work in tests and assignments. If you have any questions regarding proper attribution of the work of others, contact your professor prior to submitting the work for evaluation.

*General Course Schedule:*

*Note : Homework problems listed with a (4) are for 4<sup>th</sup> edition only and a (5) are for 5<sup>th</sup> edition only. All other problems are the same for both editions.*

<b>Topics</b>	<b>Chapter(sections) 5<sup>th</sup> edition</b>	<b>Topic description / Homework Assignments</b>
1	1.1-1.12	Introduction, Forms of Energy, The State Postulate / 5 <sup>th</sup> edition : 1.7, 10, 11, 52, 62, 101, 106 4 <sup>th</sup> edition: 1.7, 10, 11, 68, 78, 137, 142
2	2.1 -2.8	Energy Transfer Heat and Work / 1 <sup>st</sup> Law 5 <sup>th</sup> edition : 2.35, 38, 37, 42 4 <sup>th</sup> edition: 3.35, 3.38, 4.37, 4.42
3	3.1 – 3.8  4.1 – 4.5	Phase Changes, Property Tables, Ideal Gas Law and other Equations of State 5 <sup>th</sup> edition : 3.26, 30, 32, 35, 53, 75, 80, 89 4 <sup>th</sup> edition: 2.26, 30, 32, 35, 51, 70, 75, 84 Boundary Work, Closed Systems, Specific heats / 5 <sup>th</sup> edition : 4.12, 18, 30, 38, 51, 52 4 <sup>th</sup> edition: 3.18, 3.24, 4.14, 4.22, 2.104, 2.105
4	5.1- 5.5	Conservation of Mass, Flow Work, Steady flow Devices, Unsteady Systems /  5 <sup>th</sup> edition : 5.35, 49, 66, 75, 127, 137, 138 4 <sup>th</sup> edition: 4.65, 79, 96,104, 149, 159, 160
5	6.1 – 6.11	Second Law, Carnot Cycle, Heat Pumps /  5 <sup>th</sup> edition : 6.17, 40, 95, 100, 114 4 <sup>th</sup> edition: 5.17, 51, 103, 108, 120
6	7.1 – 7.13	Entropy 5 <sup>th</sup> edition : 7.26, 32, 39, 53 66, 73, 81, 106, 117, 173 4 <sup>th</sup> edition: 6.26, 32, 39, 49 6.61, 68, 76, 97, 108, 153
7	8.1- 8.8	Exergy 5 <sup>th</sup> edition : 8.29, 44E, 65, 85, 118 4 <sup>th</sup> edition: 7.28, 43E, 62, 82, 108
8	9.1 – 9.12	Gas Power Cycles / 5 <sup>th</sup> edition : 9.34, 47, 73 4 <sup>th</sup> edition: 8.33, 45, 70
9	10.1 – 10.9	Vapor and Combined Cycles / 5 <sup>th</sup> edition : 10.15, 23, 34 4 <sup>th</sup> edition: 9.15, 23, 29