Birzeit University – Faculty of Engineering & Technology
Mechanical & Mechatronics Engineering Department
Thermodynamics ENME 333
1ˢᵗ Session 2022-2023
Course Syllabi
Instructor: Dr. Mohammad Karaeen, Aggad 323, Email:mkaraen@birzeit.edu.
Schedule:T, R11:25 - 12:40.

Course description: Concepts and principles of thermodynamics. Properties of pure substances heat and work. First law of thermodynamics and it applications. Second law of thermodynamics and its applications. Course prerequisite Physics 141.

Textbook: Fundamentals of Thermodynamics,8ᵗʰ. Ed. C. Borgnakke, and R. Sonntag, John Wiley & Sons 2014.

Intended Learning Outcomes:
By the end of the course the student should be able to;
- Find thermodynamic properties of pure substances
- Analyze thermodynamic processes and systems
- Calculate boundary and shaft work
- Apply first law for control mass, steady state and uniform state systems
- Understand entropy and apply second law to cycles, control mass and control volume systems.

Topics to be covered

Chapter	Topics	Details	#lectures*
1	Introduction	?What is thermodynamics Simple power plant Refrigeration cycle Fuel cell	1
1	Control volume & Units	Systems Properties & state Processes & cycles Units Energy Specific volume & density Pressure Equality of temperature Zeroth law	2
	Quiz #1	Chapters 1	
2	Properties of Pure substance	Pure substance Vapor-liquid –solid equilibrium Independent properties Thermodynamic tables P-V-T of gases Equation of state Computerized tables	4
	Quiz #2	Chapters 3	
3	Energy transfers	Work definition Moving boundary work	4

		Other types of work Heat definition and transfer modes	
3	Energy equation for a control mass	For a cycle Control mass & a change of state Internal energy Enthalpy Specific heats of ideal gases	5
4	Energy equation for a control volume	Conservation of mass First law for a control volume Steady state Transient process	3
	Midterm Exam	Chapters 1-4	1
5	Second law of thermodynamics	Heat engine & refrigerators Second law of thermodynamics Reversible process Carnot cycle	2
	Quiz # 4	Chapter 5	
6	Entropy for a control mass	Clausius inequality Entropy Entropy of pure substance Entropy of reversible process Entropy of an irreversible process Entropy generation Entropy change for solids and gases Polytropic process	5
	Quiz # 5	Chapter 6	
7	2nd law analysis for a control volume.	Second law of thermodynamics for a control volume Steady state process Transient process Reversible steady state process Principle of increase of entropy Efficiency	3
	Final exam	Chapters 1 through 7	

*75 minute lecture

Grade distribution

Quizzes	30%
Midterm Exam	25%
Others	5%
Final Exam	40%
Total	100%