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

		Other types of work	
		Heat definition and transfer modes	
		Treat definition and transfer modes	
3	Energy equation for	For a cycle	5
	a control mass	Control mass & a change of state	
		Internal energy	
		Enthalpy	
		Specific heats of ideal gases	
4	Energy equation for	Conservation of mass	3
	a control volume	First law for a control volume	
		Steady state	
		Transient process	
	Midterm Exam	Chapters 1-4	1
5	Second law of	Heat engine & refrigerators	2
	thermodynamics	Second law of thermodynamics	
		Reversible process	
		Carnot cycle	
	Quiz # 4	Chapter 5	
6	Entropy for a	Clausius inequality	5
	control mass	Entropy	
		Entropy of pure substance	
		Entropy of reversible process	
		Entropy of an irreversible process	
		Entropy generation	
		Entropy change for solids and gases	
	0:- # 5	Polytropic process	
7	Quiz # 5	Chapter 6	3
/	2 nd law analysis for a control volume	Second law of thermodynamics for a control volume	3
	.a control volume		
		Steady state process Transient process	
		Reversible steady state process	
		Principle of increase of entropy	
		Efficiency	
	Final exam	Chapters 1 through 7	
	1 mai Cami	Chapters i through /	

^{*75} minute lecture

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