Department of Chemical Engineering

Course Syllabus

Course Code & Number	CHE 203		
Course Title	Thermodynamics I		
Credit & Contact Hours	3 Credits; 3 Lectures, 0 Laboratories (3-0-3)		
Instructor	Dr. Muhammad Naveed Khan		
Office Location	Room# 2320		
Instructor's Office Phone	00966 13 720 5178		
Instructor's Email	muhkhan@uhb.edu.sa	**Homepage link**	*https://www.uhb.edu.sa/Pages/MemberDetails.aspx?Param=college&Ref=29&Member=429*
Prerequisites	CHE 201		
Course Description	The first law of thermodynamics is studied in detail. Material covered includes concepts of energy, enthalpy, heat effects, conservation of energy, mechanical work, chemical energy liberation and equations of state, behavior of gases and liquids and standard heats of reaction, formation and combustion and heat effects of industrial reactions. Thermodynamics properties of materials and methods of their estimation are presented. Study the combined mass and energy balances and applications to problems through use of enthalpy concentration charts and humidity charts.		
Course Objectives	i. To introduce the basic concept of energy, heat and work. ii. To develop expertise to apply the first law of thermodynamics to open and closed system for nonreactive and reactive processes. iii. To introduce PVT behavior pure substances and equation state for gases. iv. To familiarize students with second law thermodynamics and entropy balance to pure and multicomponent systems.		
Required Textbook	Richard M Felder, Ronald W Rousseau. and Bullard Lisa G. "Elementary Principles of Chemical Processes" 3rd Edition, John Willey & Sons. J.M. Smith, H. C. Van Ness, M.M. Abbott and M. T. Swihart, "Introduction to Chemical Engineering Thermodynamics," 8th edition, McGraw-Hill Education.		

Grading Scheme

Assessments	Assessments Task	Week due	Proportion of Final Mark (%)
1	Quizzes	fortnightly	15
2	Home-works	fortnightly	15
3	Midterm exam	6	30
4	Final exam	13	40

Course Learning Outcomes & Mapped So's

- To demonstrate a basic understanding of the energy, heat and work. (ABET SO 1)
- To apply the first law of thermodynamics to open and closed system for nonreactive and reactive processes. (ABET SO 1)
- To demonstrate the understanding of PVT behavior of pure substances. (ABET SO 1)
- To apply the second law thermodynamics and entropy balance to pure and multicomponent systems. (ABET SO 1)

Attendance

	Number of unexcused absences			Tot Absences (excused* + unexcused)
	Warning I	Warning II	DN	DN
3 Hours / Week (45 Hours Total)	4 Hours (8%)	8 Hours (17%)	11 Hours (25%)	15 Hours (33%)
Laboratory session	NA	NA	NA	NA

Topics

Weeks	List of Topics
1-4	Course Introduction, Forms of Energy: The First Law of Thermodynamics, Energy Balances on Closed Systems
	Energy Balances on Open Systems at Steady State, Tables of Thermodynamic Data, Energy balance procedures
	Mechanical Energy Balances, Elements of Energy Balance Calculations, Changes in Pressure and Temperature
5-8	Phase Change Operations, Mixing and Solutions, Heats of Combustion
	Heats of Reaction, Measurement and Calculation of Heats of Reaction: Hess's Law, Formation Reactions and Heats of Formation, Energy Balances on Reactive Processes

	9-11	Fuels and Combustion, Phase Rule and PVT Behaviour of Pure Substances, Ideal Gas and Ideal-Gas State
		Virial Equations of State, Application of the Virial Equations
		Cubic Equations of State, Generalized Correlations for Gases, The Second Law of Thermodynamics to Heat Engines and Heat pumps, Carnot Engine with Ideal-Gas-State Working Fluid, Entropy and Entropy Balance, The Third Law of Thermodynamics
	12	Calculation of Ideal Work and Lost Work, Entropy from the Microscopic Viewpoint