



## ChE 341: Thermodynamics for Chemical Engineering

3 credit hour, 3 contact hour lecture, 3 credit hour engineering

### Instructor

Instructor: Prof. Fahmi Abu Al-Rub

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### Textbooks & References

#### A. Textbook

	Textbook 1
<b>Title</b>	Introduction to Chemical Engineering Thermodynamics
<b>Author(s)</b>	Smith, J.M., H.C. Van Ness, M.M. Abbott, M. T. Swihart
<b>Publisher</b>	McGraw Hill
<b>Year</b>	2017
<b>Edition</b>	8 <sup>th</sup> edition

#### B. References

1. Elliott, J.R., and C.T. Lira. (2012). Introductory Chemical Engineering Thermodynamics. 2<sup>nd</sup> edition. Prentice Hall.

### Specific Course Information

#### A. Course Catalog:

Heat Effects. Thermodynamic properties of pure fluids. Vapor/liquid equilibrium (VLE): Fundamentals. VLE from K-value correlations. Solution thermodynamics Theory. Partial molar properties. Fugacity and fugacity coefficient of pure species and in a solution. Generalized correlations for thermodynamic functions (charts). Chemical reaction equilibria

#### B. Prerequisites or co-requisites

CHE242 Engineering Thermodynamics

#### C. Required/Elective or Selected Elective

##### Required

### Objectives and Outcomes\*

CLO1: To realize and calculate various heat effects of ideal and real gases (1)

CLO2: To know and calculate thermodynamic properties of pure fluids (Vapor Pressure, Accentric Factor, fugacity (1, 6)

CLO3: To know the basic concepts of partial molar properties of substances in aqueous solutions and gas mixtures (1, 2)

\* Number in brackets refer to the Program outcomes

CLO4: To perform vapor-liquid equilibrium calculations for multi component systems (1, 2, 6)

CLO5: To calculate the equilibrium composition of chemically reacting systems (1, 6)

CLO6: To know the effect of temperature on equilibrium of a reacting system (1,6)

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### Contribution of Course to Meeting the Professional Component

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#### Relationship to Student Outcomes (%)

1	2	3	4	5	6	7
40	40				20	

#### Relationship to Chemical Engineering Program Objectives

PEO1	PEO2	PEO3	PEO4	PEO5	PEO6
√	√	-	-	√	-

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### Topics Covered

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Week	Topics
Week 1	Review lecture of main laws of thermodynamics
Week 2	Equation of State (Volumetric Properties of Fluids)
Week 3	Thermodynamic properties of pure gases
Week 4	Residual Properties of pure compounds
Week 5	Estimation of thermodynamic properties of gases by Chart
Week 6	Vapor/liquid equilibrium: Introduction
Week 7	Vapor/liquid equilibria of ideal & real systems.
Week 8	Henry's law & Raoult's law
Week 9	Estimation of dew & flash points of mixtures & solutions
Week 10	VLE from K-values
Week 11	Fundamentals of Solution thermodynamics (partial molar properties)
Week 12	Analytical and graphical solution of partial molar properties
Week 13	Fugacity and fugacity coefficients of pure species and in a mixture.
Week 14	Liquid-liquid phase equilibria, concept of activity and activity coefficient.
Week 15	Concept of Chemical equilibrium of reacting systems
Week 16	Effect of temperature on chemical equilibrium

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### Evaluation

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Assessment Tool	Expected Due Date	Weight
HW, Quizzes, class activities, etc.		50%
Final Exam	TBA	50 %