19CH204 CHEMICAL ENGINEERING THERMODYNAMICS-II

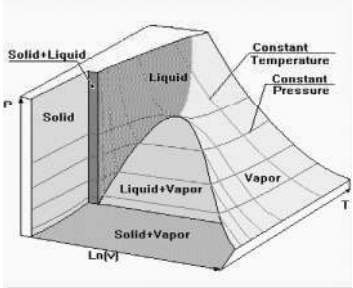
Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
30	60	-	-	5	5



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https://www.google.com/search?q=chemical+engineering+thermodynamics&safe

PRE-REQUISITE COURSES : Chemical Engineering Thermodynamics -I

COURSE DESCRIPTION AND OBJECTIVES:

This course deals with the theory and applications of solution thermodynamics. The objective of this course is to familiarize student with solution thermodynamics, thermodynamic properties, equations of state and methods used to describe and predict the vapor liquid equilibrium and chemical reaction equilibrium.

COURSE OUTCOMES :

Upon completion of the course, the student will able to achieve the following outcomes:

COs	Course Outcomes	POs
1	Familiarize with the theory of solution themodynamics.	1
2	Analyze bubble and dew point calculations for ideal and non ideal solutions using VLE data.	2
3	Model the vapor liquid equilibria.	3
4	Estimate the equilibrium conversions for different chemical reactions.	3

SKILLS:

- ✓ *Estimation of solution thermodynamic properties.*
- ✓ *Modelling of vapor liquid equilibrium.*
- ✓ *Estimation of equilibrium conversions.*

UNIT - I **L-9, T-3**

SOLUTION THERMODYNAMICS THEORY : Review of first and second law of thermodynamics; Fundamental property relation; Chemical potential; Partial molar properties; Ideal gas mixtures; Fugacity and fugacity coefficient- pure species, species in solution; Generalized correlations; Ideal solution; Excess properties.

UNIT - II **L-9, T-3**

SOLUTION THERMODYNAMICS APPLICATIONS : Liquid phase properties from VLE data- fugacity, activity coefficient, excess Gibbs free energy, thermodynamic consistency; Models for excess Gibbs free energy- Van Laar equations, Margules equations, NRTL model, UNIFAC and UNIQUAC models; Property changes of mixing.

UNIT - III **L-9, T-3**

VAPOR - LIQUID EQUILIBRIUM : Nature of equilibrium; Phase rule; Duhems theorem; VLE qualitative behavior; Simple models for VLE- Raoult's law, Henry's law; Dew point and bubble point calculations with Raoult's law; VLE by modified Raoults law; Dew point and bubble point calculations with modified Raoult's law.

UNIT - IV **L-9, T-3**

TOPICS IN PHASE EQUILIBRIA : Liquid-Liquid equilibria; Vapor-Liquid equilibria; Solid-Liquid equilibria; Solid-Vapor equilibria.

UNIT - V **L-9, T-3**

CHEMICAL REACTION EQUILIBRIA : Reaction cordinate; Equilibrium criterion; Standard Gibbs free enrgy change and equilibrium constant; Effect of temperature on equilibrium; Evaluation of equilibrium constant at different temperatures; Relation of equilibrium constant to composition; Equilibrium conversion of single reactions; Phase rule for reacting systems; Multi reaction equilibria.

TEXT BOOK:

1. J. M. Smith, H.C. Van Ness and M. M. Abbott, "Introduction to Chemical Engineering Thermodynamics", 6th edition, Tata McGraw-Hill, 2003.

REFERENCE BOOKS:

1. Dodge B. F., "Chemical Engineering Thermodynamics", 1st edition, Tata McGraw-Hill, 1960.
2. Sandler S. I., "Chemical and Engineering Thermodynamics", 4th edition, John Wiley & Sons, 2006.
3. Kyle B. G., "Chemical and Process Thermodynamics", 2nd edition, Prentice Hall of India,1990.