

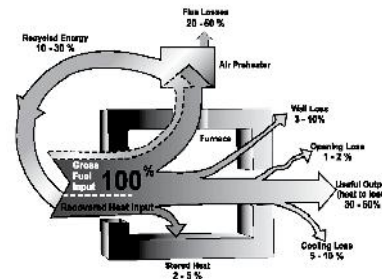
16CH201 CHEMICAL PROCESS CALCULATIONS

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P	WA/RA	SSH/HSB	CS	SA	S	BS
45	15	-	20	50	-	5	5	5



Course Description and Objectives:

This course deals with fundamentals of material and energy balances involved in chemical processes. The objective of this course is to develop basic understanding pertaining to principles of chemical engineering processes and calculations.

Course Outcomes:

The student will be able to:

- use mole concepts and perform calculations involving concentrations.
- apply gas laws to solve problems related to ideal gas mixtures.
- carry out detailed material and energy balance for any chemical plant having different unit operations and unit processes.

SKILLS:

- ✓ *Material balance calculations for different chemical processes.*
- ✓ *Energy balance for any chemical plant.*

ACTIVITIES:

- *Mini project on material and energy balance of a chemical process.*
- *Estimation of physical properties.*

UNIT - 1**L-10, T-2**

STOICHIOMETRIC RELATIONS : Basis of calculations, Methods of expressing composition of mixtures and solutions, Mole fraction and mole percent, Density and specific gravity, Baume and API gravity scales.

BEHAVIOR OF IDEAL GASES : Kinetic theory of gases, Application of ideal gas law, Gaseous mixtures, Gases in chemical reactions, Gas densities and specific gravities.

UNIT - 2**L-9, T-2**

VAPOR PRESSURE : Liquefaction and liquid state, Vaporization, Boiling point, Effect of temperature on vapor pressure, Antoine equation, Vapor pressure plots, Vapor pressure of immiscible liquids and ideal solutions, Raoult's law, Non-volatile solutes, Basics of humidification.

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

MATERIAL BALANCE : Materials balance without reaction, Materials balance with reaction–recycle, purge, bypass.

UNIT - 4**L-8, T-4**

THERMO PHYSICS : Energy, Energy balances, Heat capacity of gases, Liquid and mixture solutions, Kopp's rule, Latent heats, Heat of fusion and heat of vaporization, Trouton's rule, Kistyakowsky equation for non-polar liquids, Enthalpy and its evaluations.

UNIT - 5**L-9, T-4**

THERMO CHEMISTRY : Calculation and applications of heat of reaction, Combustion and formation, Kirchoff's equation, Calculation of theoretical and actual flame temperatures, Combustion calculations.

TEXT BOOKS:

1. Hougen O.A., Watson K.M. and Ragatz .R. A., "Chemical Process Principles Part – I: Material and Energy Balance", John Wiley sons, 2nd edition, CBS Publishers & Distributors, 2004.
2. Bhatt B. I., and Vora S. M., "Stoichiometry", 4th edition, Tata McGraw-Hill, New Delhi 2004.

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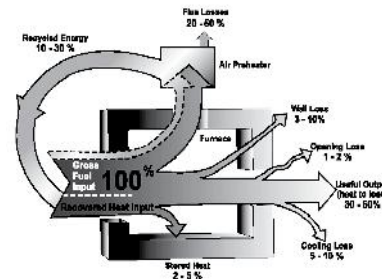
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