

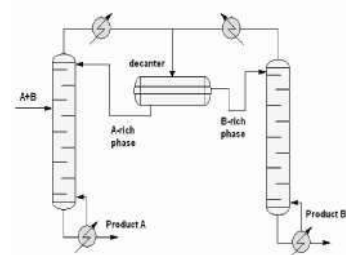
19CH201 CHEMICAL PROCESS CALCULATIONS

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P	WA/RA	SSH/HS	CS	SA	S	BS
45	15	-	25	55	-	-	5	5



Source:

<https://www.google.com/search?q=chemical+process+calculations&safe=strict&tbs=isch&tbs=rimg>

COURSE DESCRIPTION AND OBJECTIVES:

This course deals with the fundamentals of material and energy balance 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 :

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

COs	Course Outcomes	POs
1	Design of flow sheet for a chemical Process.	3
2	Estimate of properties of gases using ideal gas mixtures.	2
3	Evaluate material and energy balance for any chemical plant.	3
4	Estimate the heat capacity.	2
5	Estimate the heat of reaction & adiabatic flame temperature.	2

SKILLS:

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

UNIT – I**L-9, T-3**

BASIC CONCEPTS : Units & dimensions; Graphical integration and differentiation; Use of log-log, semi-log and triangular graphs; Conversion of units.

STOICHIOMETRIC AND COMPOSITION RELATIONS : Stoichiometric relation; Basis of calculation; Method of expressing composition of mixture and solutions; Density and specific gravity.

BEHAVIOR OF IDEAL GASES : Ideal gas law and its applications; Gaseous mixtures; Gases in chemical reactions.

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

MATERIAL BALANCE WITHOUT CHEMICAL REACTION : Formulation; Material balance calculations of unit operations- distillation, absorption, extraction, crystallization (single solute systems), drying, evaporation.

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

MATERIAL BALANCE WITH CHEMICAL REACTION : Material balance calculations- processes with chemical reactions, processes involving recycle, purge and bypass.

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

VAPOR PRESSURE : Concept of vapor pressure; Liquefaction and liquid state; Vaporization; Boiling point; Effect of temperature on vapor pressure; Vapor pressure plots; Vapor pressure of solutions and immiscible liquids; Raoult's law and its limitations.

HUMIDITY AND SATURATION : Relative saturation; Percent saturation; Dew point; Wet bulb and dry bulb temperatures; Humidity charts.

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

THERMOPHYSICS : Concept of energy; Energy balance equation; Heat capacity- gases, liquids and mixtures, Kopp's rule; Latent heat- heat of fusion, heat of vaporization, Trouton's ratio, Kistyakowski equation.

THERMOCHEMISTRY : Heat of formation; Heat of combustion; Heat of reaction; Hess law; Heat of reaction from heat of formation/combustion; Effect of temperature and pressure on heat of reaction; Adiabatic reaction temperature; Fuel & combustion- heating value, theoretical and actual flame temperature.

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Himmelblau D.M. and Rigges J. B., "Basic Principles and Calculations in Chemical Engineering", 8th edition, Prentice Hall of India, 2011.
2. Richard M. F. and Ronald W. R., "Elementary Principles of Chemical Processes", 3rd edition, John Wiley, 2004.