SUBJECT TITLE : CHEMICAL PROCESS PRINCIPLES
SUBJECT CODE : 3 0 8 1
C O U R S E C A T E G O R Y : B
PERIODS/WEEK : 5
PERIODS/SEMESTER : 90
CREDITS : 5

TIME SCHEDULE

MODULE	TOPIC	PERIODS
I	Unit, dimension, Conversions of units, Basic Chemical Operations, Chemical process in the field of Chemical Engg.	23
	Test I	1
II	Gas laws and their applications	23
	Test II	1
III	Material balances involving with Chemical reactions	21
	.Test III	1
IV	Fundamentals of Thermodynamics Energy balance equations	19
	Test IV	1
	TOTAL	**90**

OBJECTIVES

MODULE – I

1.1.0 Apply the dimensions used in chemical Engineering and convert the units

1.1.1 Dimension – state the concepts is dimension
1.1.2 Explain the various system of units
1.1.3 Explain the difference between fundamental and derived units
1.1.4 List the fundaments and derived units and SI systems
1.1.5 List the commonly used prefixes and suffixes used in SI systems
1.1.6 Solve problems in conversions of units
1.1.7 Calculate , using chemical formule, the mass, volume, mole relation, molality,
molarity, normality
1.1.8 Define gm atom, kg atom, gm mole, jg mole
1.1.9 Solve problems using atomic weight molecular weight and equivalent weight
1.1.10 Solve problems using mass, volume relationship for gaseous substances
1.1.11 Solve problems to find out the compositions of mixtures of solid, liquid and gases in
volume, mass andmole.
1.1.12 Explain density and specific gravity and specific gravity scales
1.1.13 Solve problems in density and specific gravity
1.1.14 Explain various chemical process in the field of chemical engineering

1.2.0 Use gas laws in chemical Processes

1.2.1 Explain ideal gas law and the deviation from ideal behavior

1.2.2 State Dalton's law and Amagat's law
1.2.3 Solve problems in gas mixtures applying Dalton's law and Amagat's law
1.2.4 Derive the relation volume % = mole % = Partial pressure %
1.2.5 Solve problems using above relations
1.2.6 Calculate the average molecular weight of gas mixture
1.2.7 Calculate densities of ideal gas mixture
1.2.8 Solve problems with volume change and composition changes
1.2.9 Solve problems using wet, dry basis composition

MODULE- II

2.1.0 Understand Material Balances involving without chemical reactions

2.1.1 State law of Conservation of mass
2.1.2 Define the various unit operations like evaporation, distillation, crystallization absorption leaching, extraction
2.1.3 Solve material balance problems involving unit operations like, Evaporation, Distillation, Crystallization, Absorption, Leaching, Extraction
2.1.4 State key component
2.1.5 Solve material balance equations using key component

MODULE- III

3.1.0 Understand material balance involving chemical reactions

3.1.1 Define the terms complete reaction and incomplete reaction
3.1.2 Define the terms limiting reactant and excess reactant
3.1.3 Calculate stoichiometric proportions of reactants and products
3.1.4 Calculate percentage conversion and yield
3.1.5 Solve material balance problems involving incomplete, complete reactions. Calculate the percentage conversion and yield
3.1.6 Solve material balance problems in combustion of fuels
3.1.7 Calculate percentage of excess air
3.1.8 Calculate the ratio of air to fuel, flue gases to fuel
3.1.9 Define recycle, Bypass and purge

MODULE- IV

4.1.0 Appreciate the fundamental principles of Thermodynamics

4.1.1 Outline development of thermodynamics as a science
4.1.2 Define a system.
4.1.3 Classify the system
4.1.4 Explain the terms system and surroundings
4.1.5 Explain the terms such as pressure, temperature, work, energy etc
4.1.6 Explain the laws of thermodynamics
4.1.7 Explain the terms enthalpy, internal energy, entropy etc.

4.2.0 Understand energy balances equations

4.2.1 Define law of conversation of energy
4.2.2 Define heat capacity and mean heat capacity
4.2.3 Solve problems in enthalpy and heat capacity
4.2.4 State Hess's law of heat of summation
4.2.5 Define heat of reaction, heat of formation heat of combustion, heat of solution
4.2.6 Solve problems by heat balance equation for simple process.

COURSE CONTENT

MODULE-I

Units and dimensions, conversion of units,

Chemical formulae, mass relation, chemical reactions, gm atom, gm mole, kg atom, kg mole, Relation between mass and volume of gaseous substances . Method of expressing compositions of mixture of solids, liquids and gases, Density , specific gravity and specific gravity scales.

Ideal gases – gas laws (derivation is not required), simple problems involving single gas. Derivation from ideal behavior. Gas mixtures – Dalton's Law, Amagat's law, Volume % = mole % = partial pressure % .
Average molecular mass, density, specific gravity of ideal gases and mixtures. Compositions of gases on wet and dry basis. Problems with volume changes and compositions changes.

MODULE-II

Material Balances – Not involving Chemical Reactions.
Types of processes – Material balances equations – key component - material balances problem involving mixing , leaching, crystallization, evaporation, distillation, absorption .

MODULE– III

Material Balances involving chemical reactions

Chemical reactions, complete and incomplete reactions, stochiometric proportions of reactants and product limiting reactant and excess reactants, percentage conversion and yield. Material balance calculation involving chemical reactions including combustion problems.

MODULE –IV

Fundamentals of Thermodynamics and Energy Balance

Introduction – explain the tems systems & surrounding, pressure, volume temperature, work, energy, internal energy, total heat, concept of perfect gas, thermodynamic explanation of the first and second law
of thermodynamics. Define the term entropy, Law of conservation of energy and applications, enthalpy,
simple problems, heat capacities, heat of reactions, heat of combustion, heat of formation, Hess's law –
solve problems by heat balance
equations.

REFERENCE BOOKS

1. Stoihiometry - B. I. Bhatt & S. M Vora
2. Process Calculations for chemical engineers -Chem.Engg., Edn.Development Centre, IIT Madrass
3. Chemical process Principles - Houghen., O. A Waston K. M, Regatz. R. A