

GUJARAT TECHNOLOGICAL UNIVERSITY

Diploma in Chemical Engineering

Semester: 3

Subject Code

Subject Name INDUSTRIAL STOICHIOMETRY

Sr. No.	Course content
1.	INTRODUCTION : 1.1 Importance of process calculations 1.2 Dimensions and systems of units 1.3 Fundamental quantities 1.4 Derived quantities 1.5 Definition and units of force, volume, pressure, work energy, power, heat. 1.6 Simple unit conversion problems in FPS, MKS and SI systems.
2.	BASIC CHEMICAL CALCULATIONS : 2.1 definition and basic calculations mol, atomic weight and molecular wt., equivalent weight, specific gravity, API – gravity. 2.2 Composition in solid/liquid by wt % and mole % 2.3 Concept of molarity, normality, molality, gm/lit and simple example . 2.4 Calculations of total organic carbon and theoretical oxygen demand.
3.	IDEAL GAS LAW : 3.1 Concept 3.2 Derivation of ideal gas law 3.3 Definition of STP and NTP 3.4 Explotion of Dalton's law and Amagat's law 3.5 Relation between mole% , volume % and pressure % 3.6 Calculation of average molecular weight, density, mole%/weight% in gas mixture in SI/MKS system only.
4.	ENERGY BALANCE : 4.1 Concept of heat capacity and specific heat 4.2 Derivation of relationship between 4.3 Calculations of heat capacity by integral equation up to three terms. 4.4 Concept of mean heat capacity of gases. 4.5 Concept of heat capacity of gas mixture 4.6 Concept of heat capacity of liquid mixture 4.7 Concept of latent heat of fusion, sublimation, vaporization, sensible heat 4.8 Calculations of standard heat of formation from heat of combustion data. 4.9 Calculations of heat of reaction from heat of formation and combustion data.

5.	HUMIDIFICATION OPERATIONS : <ul style="list-style-type: none"> • Definition <ul style="list-style-type: none"> ⇒ Dry bulb and wet bulb temperature ⇒ Absolute humidity ⇒ Percentage humidity ⇒ Relative humidity ⇒ Humid heat and humid volume ⇒ Dew point. • Simple problems on absolute humidity, relative humidity and percentage humidity
6.	MATERIAL BALANCE IN PROCESS INVOLVING CHEMICAL REACTIONS : <ul style="list-style-type: none"> • Definition : limiting component, Excess reactant. • Simple problems for finding yield, conversion and composition • Simple calculation of material balance based on reaction.
7.	MATERIAL BALANCE IN PROCESS WITHOUT CHEMICAL REACTIONS : <ul style="list-style-type: none"> • Definition of law of conservation of mass <ol style="list-style-type: none"> 1. process flow diagram 2. Engg. flow diagram 3. P & I flow diagram • Simple problems on drying , distillation, absorption and mixing, crystallization, evaporation. • Brief idea regarding recycling and bypassing operation. • Single stage material balance problems of leaching, extraction.
8.	COMBUSTION : <ul style="list-style-type: none"> • Types of fuels • Calorific values of fuels • Brief idea about proximate and ultimate analysis for solid fuel. • Simple problems to find out calorific values and composition. • Problems to find out the air requirement and composition of flue gas

Reference Books:

1. Stoichiometry
2. Stoichiometry
3. Basic principle & calculation
in chemical engineering

B.I Bhatt and S.M. Vora
Gavhane

David M. Himmelblau