

GUJARAT TECHNOLOGICAL UNIVERSITY

B.E Semester: 3 Chemical Engineering

Subject Code 130504
Subject Name Process Calculation

Sr.No	Course contents
1	Dimensions and units: Dimensions and system of units, Fundamental and derived units, Dimensional consistency, Dimensional equations, Different ways of expressing units of quantities and physical constant.
2	Basic chemical calculations: Composition of gaseous mixtures, liquid mixtures, solids etc. Ideal gas laws and its application. Dalton law, Raoult's law, Henry's law, solubility and distribution coefficient humidity and saturation.
3	Material balance without chemical reactions: Process flow sheet, Material balance with and without recycle; Bypass, Purge streams, Material around equipments related unit operations like absorber and stripper, Distillation towers. Extractors. Dryers, Evaporators, Crystallizers, Humidification and dehumidification towers. Material balance of unsteady state operations.
4	Material balance involving chemical reactions: Concept of limiting and excess reactants, percentage conversion and yield etc., material balance involving reactions with special reference to fertilizers, petrochemicals, dyestuffs, electrochemical industries.
5	Energy balances: Heat capacity of gases and gaseous mixtures, liquids & solids, Sensible heat change in liquid & gases, enthalpy changes during phase transformation, enthalpy changes accompanied by chemical reactions, standard heat of reaction, adiabatic reactions, thermo-chemistry of mixing process, dissolution of solids etc. Liquid-liquid mixtures, heat of solution by partial molar quantities.
6	Stoichiometry and Unit operations: Distillation, Absorption and stripping, extraction & Leaching, Crystallization, Psychometric, Drying, Evaporation etc. Industrial application to be considered.
7	Fuels and combustion: Types of fuels, calorific value of fuels, problems on combustion of coal, liquid fuels, gaseous fuel etc. Proximate and ultimate analysis, combustion calculations, theoretical flame temp. etc., Air requirement and flue gases.

Reference Books:

1. Stoichiometry', B. I. Bhatt & S. M. Vora, McGraw Hill Publishing Company Limited , 4th edition, 2004.
2. "Basic Principles and calculations in Chemical engineering" by David M Himmelblau, seventh Edition, 2006
3. Process Calculation for Chemical Engineering, Second Revised Edition, Chemical Engineering Education Development Centre, I.I.T., Madras, 1981.