

AMLT05 CHEMICAL ENGINEERING

UNIT-1 INTRODUCTION

- 1.1 Concept of Chemical Engineering & Chemical Technology
- 1.2 Unit Operation & Unit Process
- 1.3 Material and Energy Balance- Units And Dimensions
- 1.4 Dimensional Analysis.

UNIT-2 FLUID MECHANICS

- 2.1 Fluid properties : Hydrostatics- buoyancy- manometry- Metacentre- Control Volume Analysis for Mass Momentum and Energy Conservation
- 2.2 Differential Equation of Continuity & Momentum (Euler's & Navier- Stokes Equation),
- 2.3 Concepts of Substantial Derivatives for Fluid Acceleration; Relation between Stress and Strain Rate for Newtonian & Non-Newtonian Fluids
- 2.4 Bernoulli's Equation; Qualitative Ideas of Boundary Layers & Separation- Streamlined & Bluff Bodies of Fully Developed Laminar Pipe Flow
- 2.5 Friction Factor & Pipe Flows- Losses in Bends, Tees, Sudden Expansion- Flow Measurement using Venturimeter- Orifice Plates.

UNIT-3 HEAT TRANSFER

- 3.1 Heat Transfer by Conduction, Convection & Radiation, Conducting through Multiple Resistances- Natural & Forced Convection-
- 3.2 Radiation Heat Transfer by Black, Non-Black and Grey Bodies- Design of Heat Exchangers- Single & Multiple Effect Heat Exchangers- Evaporators.

UNIT-4 CRYSTALLIZATION

- 4.1 Theory of Crystallization
- 4.2 Mechanism- Operation of Industrial Crystallizers.

UNIT-5 MECHANICAL OPERATIONS

- 5.1 Transportation Of Fluids: Pipes- Fittings- Pumps- Compressors- Characterization of Solid Particles- Size Reduction- Crushers
- 5.2 Grinders- Ultrafine Grinders- Size Separation- Screening- Settling Process- Sedimentation- Mixing & Agitation- Filtration.

UNIT-6 MASS TRANSFER & ITS APPLICATION

- 6.1 Classification of the Mass Transfer Operations, Principles of Diffusion, Local & Overall Mass Transfer Coefficient, Interface Mass Transfer,
- 6.2 Material Balances in Steady State, Counter Current & Cross Flow Process/ Cascades, Number of Theoretical Stages Calculation by Kremser Equation,
- 6.3 Stage efficiency, Tray Tower- General characteristic, Packed Tower General characteristic, Number of Transfer Unit, Height of Transfer Unit.

UNIT-7 HUMIDITY & AIR CONDITIONING

- 7.1 Humidity Its Measurement, Adiabatic Saturation Temperature,
- 7.2 Dry Bulb & Wet Bulb Temperature,
- 7.3 Humidity Charts, humidification & Dehumidification Air Conditioning, Cooling tower.

UNIT-8 DISTILLATION:

- 8.1 Vapour-Liquid Equilibria, Relative Volatility, Flash Vaporization, Batch Distillation, Raleigh Equation, Fractional Distillation,
- 8.2 Design & Operation characteristic of plate columns by McCabe- Thiele Method for binary mixture, Steam Distillation, Azeotropic & Extractive Distillation.

UNIT-9 DRYING

- 9.1 Drying Characteristics of Materials- Theory & Mechanism of Drying- Rate of Drying- Operation of Industrial Dryers.
- 9.2 Extraction Liquid- Liquid & Liquid- Solid Extraction (Leaching) - Operation of Stage wise & Differential Contact Extractors & Leaching Equipment.

UNIT-10 ADSORPTION

- 10.1 Adsorption Processes- Adsorption Isotherms- Adsorption Equipment.
- 10.2 Application in leather auxiliaries industry: Vegetable Tanning Extraction, Polymer Processing- Oils- Fats- Soap- Detergent- Dyes- Sodium Sulphide- Sodium Dichromate
- 10.3 Potassium Dichromate – Lime – Soda Ash – Basic Chrome Sulphate.

Reference Books:

1. Unit Operations – Mc Cobe & Smith -- McGraw Hill.
2. Chemical Engineering – Coulson & Richardson -- Pergamon Press.
3. Heat Transmission – McAdams, W.H. – McGraw Hill.
4. Mass Transfer Operations – Treybal -- McGraw Hill.
5. Shreve's Chemical Process Industries – George T. Austin – McGraw Hill.