Course Code: 13CH1117

Course Educational Objectives:
This course introduces the student to the following aspects
- Distillation Operations, McCabe Thiele and Ponchon Savarit methods.
- Liquid-liquid operations.
- Leaching and Adsorption operations.
- Membrane separations processes and membrane modules.

Course Outcomes:
This course gives the student the ability to
- Generate the VLE data.
- Determine the feed tray location, total reflux, minimum and optimum reflux ratios.
- Operate packed bed and Tray towers for distillation, Extraction and leaching operations.
- Select suitable solvent for extraction of solute.
- Design and operate various extractors and equipments for leaching.
- Select suitable adsorbent for recovery of solute and draw adsorption isotherms.

UNIT-I (10 Lectures)
Distillation: fields of application, VLE for miscible liquid, immiscible liquids, steam distillation VLE phase diagrams, tie lines, mixture rules, flash vaporization and differential distillation for binary and multi-component mixtures, batch distillation with reflux for binary mixtures.

UNIT-II (10 Lectures)
Continuous fractionation of binary mixtures, Ponchon-Savarit method, McCabe – Thiele methods for determination of ideal plates for binary
mixtures, optimum reflux ratio, use of total and partial condensers and open steam, plate efficiencies, condenser and reboiler duties, packed bed distillation, principles of azeotropic and extractive distillation.

**UNIT-III** *(14 Lectures)*

**LIQUID-LIQUID OPERATIONS:**
fields of applications of ternary liquid systems, triangular and solvent free coordinate systems, choice of solvent selectivity, extraction with insoluble and partially soluble systems, single stage and multistage cross current and counter current extraction without reflux, multistage counter current extraction with reflux, continuous contact extraction (packed beds), equipment for liquid-liquid extraction operation

**UNIT-IV** *(14 Lectures)*

Leaching: Fields of applications, preparation of solid for leaching, types of leaching, leaching equilibrium, single stage and multi stage leaching calculations, constant under flow conditions, Unsteady state operation equipment – Percolation tanks, Shank system, filter press leaching, Agitated vessels, Steady state operation equipment- agitated vessels, thickeners, CCD, Classifiers, Leaching of Vegetable seeds.

**UNIT-V** *(12 Lectures)*

** ADSORPTION:**
Theories of adsorption, recovery of solvent vapors, industrial adsorbents, adsorption equilibria and isotherms. Single and multi-stage operations, unsteady state adsorption, and equipment for stage-wise and continuous contact.

**TEXT BOOK:**

**REFERENCES:**