MASS TRANSFER OPERATIONS-II

COURSE CODE:15CH1120	L	T	P	C
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COURSE OUTCOMES:

At the end of the course the student shall be able to

CO 1 Explain the different distillation processes, prepare the VLE data and estimate the composition of distillate and residue.

CO 2 Estimate the number of ideal plates and feed plate location using McCabe-Thiele and Ponchon- Savarit methods.

CO 3 Explain the liquid extraction process, Select the suitable solvent for recovery of solute, choose different extraction equipments and solve the related problems.

CO 4 Explain the leaching process, choose different leaching equipments and solve the related problems.

CO 5 Explain separation by adsorption and select suitable adsorbent for recovery of solute and solve the related problems.

UNIT-I (10 LECTURES)

DISTILLATION:

Fields of application, VLE for miscible liquid and VLLE for immiscible liquids, steam distillation, VLE phase diagrams, tie lines, mixture rules, flash vaporization and differential distillation for binary and multi-component mixtures, batch distillation.

UNIT-II (10 LECTURES)

Continuous fractionation of binary mixtures, Ponchon-Savarit method (qualitative treatment only), 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 (12 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 (10 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 (8 LECTURES)

ADSORPTION:

Types of Adsorption, recovery of solvent vapor, industrial adsorbents, adsorption equilibria and isotherms. Single and multi- stage operations, unsteady state adsorption, and equipment for stage-wise and continuous contact.

TEXT BOOKS:

1 Treybal R.E., “Mass transfer operations”, 3rd Edition, McGraw Hill, 1980.

REFERENCES:

1. Cussler E.L., “Diffusion: Mass Transfer in fluid system”, Cambridge University Press, 2009.
2. Geankoplis C.J., “Transport processes and unit operations”, 4th Edition, PHI, 2006.
3. Henley E.J and Sieder, J “Separation Processes Principles”, Wiley Publishers, 1998