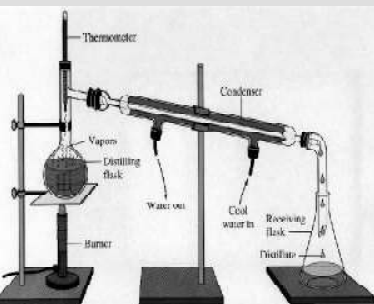


16CH307 MASS TRANSFER OPERATIONS-II



Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P	WA/RA	SSH/HSB	CS	SA	S	BS
45	-	30	20	50	-	5	5	5

Course Description and Objectives:

The course deals about mass transfer phenomena and its usage for engineering application. The objective of this course is to familiarize students on various mass transfer operations such as distillation, extraction, adsorption, and leaching.

Course Outcomes:

The student will be able to :

- construct operating line equation for a fractionating column.
- understand and apply McCabe-Thiele and Ponchan-Savarit methods for distillation column design.
- develop a model for the co-current and counter current extractors,
- design adsorption and leaching equipments.

SKILLS:

- ✓ Verify the Rayleigh's equation for binary and ternary liquid mixtures.
- ✓ Estimation of equilibrium data.
- ✓ Design of distillation column.
- ✓ Test the working condition of the fractionating column with varying reflux ratio.
- ✓ Design of multistage extractor.

UNIT - 1 **L-9**

DISTILLATION - I : Introduction, Fields of application, VLE for miscible liquids, Immiscible liquids, VLE phase diagrams, Tie lines, Flash vaporization and differential distillation for binary system.

UNIT - 2 **L-9**

DISTILLATION - II : Continuous fractionation of binary mixtures, McCabe-Thiele method, Ponchon-Savarit method, Determination of no of ideal plates for binary mixtures, Optimum reflux ratio, Plate efficiencies, Condenser and reboiler duties, Principles of azeotropic and extractive distillation.

UNIT - 3 **L-9**

LIQUID-LIQUID EXTRACTION : Fields of application of ternary liquid systems, Triangular and solvent free coordinate systems, Choice of solvent and selectivity, Single and multi stage cross and counter current extraction with reflux, equipment for liquid – liquid extraction.

UNIT - 4 **L-9**

LEACHING : Introduction, Fields of application, Preparation of solid for leaching, Types of leaching, Leaching equilibria, Constant under flow conditions.

MEMBRANE SEPARATION : Introduction, Types of membranes, Principles and applications.

UNIT - 5 **L-9**

ADSORPTION : Principles and applications, Types of adsorption, Use of adsorbents, Adsorption equilibria, Adsorption isotherms for vapor and dilute solutions, Design of steady state moving bed adsorber for one component, Break through curve, Fixed bed adsorber.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS

Total Hours-30

1. Verification of Rayleigh's equation using batch distillation.
2. Determination of steam distillation temperature and vaporisation efficiency.
3. Estimation of capacity coefficient of packing in a packed bed distillation column under total reflux condition.
4. Determination of solubility characteristics of given ternary system.
5. Determination of VLE data for a binary mixture.
6. Determination of percentage adsorption of ternary system.
7. Estimation of number of equilibrium trays in distillation.
8. Estimation of NTU, HTU & height of packed column
9. Adsorption studies on a binary mixture.
10. Leaching studies on a ternary mixture.

TEXT BOOKS:

1. Treybal R. E., "Mass Transfer Operations" 3rd edition, McGraw-Hill, 2005.

ACTIVITIES:

- Verify the Rayleigh's equation using Mat Lab.
- Selection of best method for separation of a given binary or ternary mixture.
- Application of appropriate mass transfer operation using C Language.

2. Binay. K.Dutta, "Principles of Mass Transfer and Separation Processes", Prentice Hall of India, New Delhi, 2007.

REFERENCE BOOKS:

1. Judson King C., "Separation Processes", 2nd edition, McGraw-Hill, 2005.
2. Seader. J. D, Henley E. J. and Keith Roper D., "Separation Processes Principles", John Wiley & Sons, New York, 2010.
3. Alapati Suryanarayana "Mass Transfer Operations", 1st edition, New-Age International, 2006.