Mass Transfer Operations-02

1.1 Course Number: CH375

1.2 Contact Hours: 2-0-0 Credits: 6

1.3 Semester-offered: 3rd Year- odd

1.4 Prerequisite: Mass Transfer Operations-01

1.5 Syllabus Committee Member: Dr.V.S.Sistla, Dr M S Balathanigaimani

2. **Objective:** The objective of the course is to provide knowledge and to develop designing skills of mass transfer equipment related to solid-liquid and solid-gas, and equipment dealing with simultaneous heat and mass transfer. This is a core course.

3. **Course Content:**

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-topic	Lectures
1	Humidification and Air Conditioning	Basic concepts, Humidification and dehumidification operations and design calculations, Mechanical Draft Towers, Cooling tower design, Evaporation loss	6
2	Drying	Mechanism of drying and drying equilibria, Batch & continuous dryers, Drying time calculation, Constant-rate and falling-rate drying periods, Diffusion and capillary effect, Equipment for drying, Freeze-drying, Thermal processing and sterilization of biological materials	8
3	Leaching	Single stage operation, Multistage operation, Supercritical fluid extraction, Equipment for leaching	6
4	Adsoption, Ion-Exchange, and Chromatography	Physical and chemical adsorption, adsorbents, equilibrium and isotherms, Single-stage, multi-stage counter current operations, equilibrium and operating lines, breakthrough curves, Rate equations for non-porous and porous adsorbents, Non-isothermal operation, pressure-swing adsorption, Principles of ion exchange, analogy between adsorption and ion exchange, Chromatography	8
		Total	**28**

4. **Readings**

4.1 Textbook:

1. Geankoplis, C.J.,“Transport Processes and Separation Process Principles”. 4th Edition, Prentice-Hall of India, New Delhi (2005)
2. Separations in Chemical Engineering: Equilibrium Staged Separations: P. C. Wankat, Prentice Hall, NJ, US, 1988
3. Dutta,B.K.,“Principles of Mass transfer and Separation Processes”.Prentice-Hall of India, New Delhi (2007).

4.2 Reference books:

1. Treybal, R.E.,“ Mass-Transfer Operations”, 3rd Eddition, McGraw-Hill (1981)
2. Hines,A. L.; Maddox, R. N., Mass Transfer: Fundamentals and Applications,Prentice Hall; 1 Edition (1984).
3. McCabe, W. L. and Smith, J. C., Unit Operations of Chemical Engineering,(3rd ed.), McGraw-Hill (1976).
4. Seader, J.D. and Henley,E.J.,Separation Process Principles, Wiley, New York (1998)

5. **Outcome of the Course:** The course will help students to develop designing skills of cooling tower, dryers, leaching equipment, and adsorbers. These mass transfer equipment are widely used in the chemical process industries and refineries. Students will also get knowledge of working principle of ion-exchange membrane and chromatography.