



**SECOND SEMESTER 2015-2016**

**Course Handout Part II**

**Date: 12/01/2016**

In addition to part -I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

**Course No.** : CHE F244  
**Course Title** : Separation Processes I  
**Instructor-in-charge** : SURESH GUPTA  
**Instructor (Tutorial)** : P Chattopadhyay, Subhajit Majumder

**1. Course Description:**

Molecular diffusion in fluids, Interphase mass transfer, mass transfer coefficient, Theories for interphase mass transfer, overall mass transfer coefficient and correlations, mass transfer with chemical reaction, analogy between momentum, heat and mass transfer, Absorption, Distillation including azeotropic and extractive distillation, Liquid-Liquid extraction, Leaching, Equipment for absorption, distillation, extraction and leaching.

**2. Scope and Objective of the Course:**

This course deals with the basic knowledge of mass transfer fundamentals and separations by phase addition or creation. The primary objective of this course is to encapsulate the important technical fundamentals for designing the mass transfer equipments.

**3. Text Book:**

Seader, J.D., Henley, E.J., "Separation Process Principles," 2<sup>nd</sup> Edition, Wiley India Pvt. Ltd., New Delhi, 2006.

**Reference Books:**

**R1.** Treybal, R.E., "Mass Transfer Operations," 3<sup>rd</sup> Ed. (International Edition), McGraw-Hill Book Company, Singapore, 1980.

**R2.** Dutta, B. K., "Principles of Mass Transfer and Separation Processes," Prentice-Hall of India Pvt. Ltd., New Delhi, 2007.

**4. Course Plan:**

Lecture No.	Learning Objectives	Topics to be covered	Reference Chap./Sec.# (Text Book)
1	Introduction to separation processes	Mechanism of separation, Separation by phase addition or creation, Separation by barrier, Separation by solid agent, Separation by external field or gradient, component recoveries and product purities, Selection of feasible separation processes.	Chap.1





2-13	Mass transfer and diffusion	Molecular diffusion, Diffusion coefficients, One-dimensional molecular diffusion through stationary media, Molecular diffusion in laminar flow, Two-film theory and overall mass transfer coefficients.	Chap.3
14-20	Absorption and Stripping of dilute mixtures	Equipment, General design considerations, Graphical equilibrium stage method for tray towers, Algebraic method for determining the number of equilibrium stages, Stage efficiency, Rate-based method for packed columns, Efficiency of packed columns.	Chap.6
21-36	Distillation of binary mixtures	Equipment and design considerations, McCabe-Thiele graphical equilibrium stage method for tray towers, Estimation of stage efficiency, Diameter of tray towers and reflux drums, Rate-based method for packed columns, Ponchon-Savarit graphical equilibrium stage method for tray towers.	Chap. 7
37-40	Liquid-Liquid extraction with ternary systems	Ternary liquid-liquid systems, Equipment, General design considerations, Hunter-Nash graphical equilibrium-stage method, Maloney-Schubert graphical equilibrium stage method.	Sec. 4.5, Chap. 8
41-42	Leaching and washing	Equilibrium-stage model for leaching and washing, Rate-based model for leaching, Equipment for leaching	Chap.16

#### 5. Evaluation Scheme:

Component	Duration (minutes)	Weightage (300)	Date and Time	Remarks
Mid-Semester Test	90	90	15/3 9:00 - 10:30 AM	CB
<sup>s</sup> Tutorials	20 min. each	50		CB/OB
<sup>s</sup> Surprise Test	20 min. each	20		CB/OB
Assignments	-	20		-
Comprehensive Exam	180	120	5/5 FN	CB/OB

<sup>s</sup>Seven tutorials (each 10 marks) and three surprise quizzes (each 10 marks) will be conducted out of which best five tutorials and two surprise quizzes will be considered for final grading. During tutorial and surprise quizzes the students will be asked to solve problems (numerical/objective/multiple choice type) and submit the answer sheet to the instructor.

**6. Chamber Consultation Hours:** To be announced in the class.





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**7. Make-up Policy:** Make-up is granted only for genuine cases with valid justification and prior permission of Instructor-in-charge.

**8. Notices:** All notices concerning this course will be displayed in IntraBITS Portal and on the Chemical Engineering Notice Board.

**Instructor-in-Charge**

**CHE F244**



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