



**SECOND SEMESTER 2019-2020**

Course Handout Part II

Date: 06/01/2020

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 1  
Instructor-in-Charge : Balaj Krishnamurthy

**Scope and Objective of the Course:**

Introduction to molecular diffusion and mass transfer coefficients; interphase mass transfer. Application of the principles in design of absorption, distillation, extraction and leaching processes. The course will enable the student to design the continuous contact and tray type equipment required for mass transfer.

**Textbooks:**

- T1. Mass Transfer Operations, Robert E. Treybal, Third Edition, McGraw Hill.  
T2. Separation Process principles, J. D. Seader and Ernest J. Henley, Second Edition, Wiley.

**Reference books**

- R1 Binay .K. Dutta ,“Principles of mass transfer and separation processes”, PHI Learning Pvt Ltd, India, 2007  
R2. McCabe, W. L., Smith, J. C., Harriott, P., “Unit Operations of Chemical Engineering,” 7<sup>th</sup> Ed. (International Edition), McGraw-Hill Education (Asia), Singapore, 2005.

**Course Plan:**

Lecture No.	Learning objectives	Topics to be covered	Chapter in the Text Book
1	Introduction to separation processes	Unit operations and unit process, Basic concepts	Chapter 1 T1,T2
2-4	Molecular diffusion in fluids	Molecular diffusion and fluxes, Molecular diffusion in Gases (stagnant film, equimolar counter diffusion), Diffusivity of gases and liquids.	Chap.2, T1 Chap 3 T2
5-13	Mass transfer	Relations between mass transfer coefficients,	



	coefficients, interphase mass transfer	Reynolds analogy. Equilibrium, diffusion between phases, material balances, stages.	Chap 3,5 T1 Chap3 T2
14-20	Gas absorption (Equipment for absorption)	Equilibrium solubility of gases in liquids, one component transfer: material balance for counter – and co-current processes, multi stage operations, non-isothermal operations, calculation of height of packed absorber/desorber, multi-component systems, absorption with chemical reaction.	Chap. 6T1
21-32	Distillation (equipments for distillation)	Vapor-liquid equilibrium, flash vaporization, differential distillation, Continuous distillation, multistage columns, overall mass and enthalpy balances, McCabe-Thiele method, Ponchon-Savarit method, use of open steam, multiple feed, side streams, azeotropic and extractive distillations.	Chap. 9 T1 Chap 7T2
33-36	Liquid extraction (equipments for extraction)	Liquid-liquid equilibrium, distribution curves, triangular and solvent free coordinates, systems of three liquids-one pair partially soluble, insoluble liquids, effect of temperature, continuous counter-current multi-stage extraction, continuous counter-current extraction with reflux.	Chap. 10, T1
37-39	Leaching(equipments for leaching)	Solid-liquid extraction, underflow and overflow locus, Multistage cross current extraction, Calculation of no. of stages for cross current flow.	Chap.13, T1

#### Evaluation Scheme:

Component	Duration	Weightage (%)	Date & Time	Nature of Component
Midterm test	90 min	30%	2/3 1.30 -3.00 PM	CB
Assignments/Surprise Tests	-	30%	TBA	OB
Comprehensive Exam	3hr	40%	2/5 FN	10% CB+30%OB

**Chamber Consultation Hour:** To be announced in class

**Notices:** Notices will be put in CMS and Department of Chemical Engineering Notice Board

**Make-up Policy:** Granted only to **genuine cases** with prior permission from IC.

**Academic Honesty and Integrity Policy:** Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

**INSTRUCTOR-IN-CHARGE**

