SECOND SEMESTER 2022-2023
<u>Course Handout Part II</u>

Date: 16/01/2023

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 : *Balaji 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. Seperation Process Principles, Seader and Henley, Wiley student edition.

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," 7th 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
2-4	Molecular diffusion in fluids	Molecular diffusion and fluxes, Molecular diffusion in Gases (stagnant film, equimolal counter diffusion), Diffusivity of gases and liquids.	Chap.2, T1
5-13	Mass transfer coefficients, interphase mass transfer	Relations between mass transfer coefficients, Reynolds analogy. Equilibrium, diffusion between phases, material balances, stages.	Chap 3,5 T1
14-20	Gas absorption	Equilibrium solubility of gases in liquids, one	Chap. 6T1

		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.	
	(Equipment for absorption)		
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
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
37-40	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
Mid test	90 min	30	13/03 11.30 - 1.00PM	OB
Surprise Tests	-	20		OB
Assignments		10		OB
Comprehensive Exam	3hr	40	08/05 AN	CB - 10% OB - 30%

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.
Grading: At least 10% of the total marks to be obtained to obtain a valid grade
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