**BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI HYDERABAD CAMPUS**

**FIRST SEMESTER 2021-22**

**Course Handout (Part II)**

# Date: 20/08/2021

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 F313**

***Course Title* : SEPARATION PROCESSES II**

***Instructor-in-charge* : Jaideep Chatterjee Tutorial Instructors** : Jaideep Chatterjee

# 1. Scope and Objective of the Course:

This course deals with Chemical Engineering Unit Operations of 1. Adsorption & other Fixed Bed Separations; 2. Membrane Separations 3. Mechanical Separations such as (Settling & Screening), Filtration (Cake filtration, Depth Filtration / Clarification, Membrane Filtrations); 4. Crystallization;

5. Humidification; 6. Drying and 7. Operations involving Powders & Granules. These Unit operations are common to many industrial processes. Each of these processes is classified according to their function without regard to the industry.

# Text Book:

(i) McCabe W. L., Smith J. M., Harriott P., *Unit Operations of Chemical Engineering*, 7th Edition., McGraw-Hill International Edition, 2005.

# Reference Books:

R1 *Chemical Engineering* (Volumes 1-6), Coulson J. M., Richardson J. F. & others, Pergamon Press, London, 1978 & 1997.

R2 *Principles of Unit Operations*, Foust A. N. & others, 2nd Edition, John Wiley & Sons, 1980. R3 *Mechanical Operations*, Anup K Swain, H Patra, and GK ROY.

# Course Plan:

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| **Lect. No.** | **Learning Objectives** | **Topics to be covered** | **Chapter in the Text Book** |
| 1-6 | Adsorption and other Fixed Bed Separations | Adsorption Equilibria, Adsorption Process Design, Ion-Exchange Systems, Chromatography  Columns | C25 of TB |
| 7-12 | Membrane Separations | Gas separations, Liquid  separations, Reverse Osmosis and Pervaporation | C26 of TB |
| 13-17 | Mechanical Separations : Filtration | Cake Filtrations, Membrane filtrations such as Ultra and  Microfiltration, Clarification & Depth Filtration | C29 of TB |

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| 18-20 | Mechanical Separations : Settling &  Screening | Mechanical Screening, Gravitational Settling, Centrifugal Screening | C29 of TB |
| 21-25 | Crystallization | Fundamentals, Nucleation and  Crystal Growth, Yield estimation, Equipment Design | C27 of TB |
| 26-29 | Humidification | Definitions, Humidity Charts, Wet-Bulb Temperature, Cooling  Towers | C19 of TB |
| 30-35 | Drying | Principles, Cross circulation &  Through Circulation Drying, Freeze drying, Drying Equipment | C24 of TB |
| 36-42 | Unit Operations with Powders | Characterization of Powders, Storage and conveying of powders, Mixing of Solids, Size Reduction Processes &  Equipment, Ultrafine Grinders | C28 of TB |

1. **Evaluation Scheme:**

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| Component | Duration | Weightage | Date & Time | Nature of Component |
| Class Test 1 | 50 min | 12.5 % | Before Mid-Sem | Open Book |
| Mid test | 90 min | 35 % | 20/10/2021 11.00 -12.30PM | Open Book |
| Class Test 2 | 50 min | 12.5 % | After Mid-sem | Open Book |
| Comprehensive Exam. | 2 hours | 40 % | 20/12 FN | Open Book |

1. **Chamber Consultation Hour**: To be announced in the class.
2. **Notices**: All notices concerning this course will be in the CMS system or via emails.
3. **Make-up Policy**: Make-up may be granted only with prior permission for valid reasons at the discretion of the Instructor-in-charge.
4. **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.

**Jaideep Chatterjee Instructor-in-charge**

**CHE F313**