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

**HYDERABAD CAMPUS FIRST SEMESTER 2023-24**

**Course Handout (Part II)**

**Date: 11/08/2023**

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 F313**

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

*Instructor-in-charge*: Jaideep Chatterjee

*Instructors*: Ramendra Kishor Pal

# *Tutorial Instructors*: Jaideep Chatterjee, Ramendra Kishor Pal

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

This course deals with Chemical Engineering Unit Operations of

1. Humidification
2. Drying
3. Adsorption & Other Fixed Bed Separations
4. Membrane Separations (Molecular)
5. Crystallization
6. Mechanical Separations (Settling, Centrifugation, Screening), Filtration
7. Unit Operations involving Powders & Granules.

These Unit operations are common to many industrial processes. Each of these processes is classified according to its function without regard to the industry.

2. **Text Book:**

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

3. **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.

R4 *Principles of Mass Transfer and Separation Processes*, Binay K. Dutta, PHI Learning Pvt. Limited, 2007

**4. Course Plan:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Lect. No.** | **Learning Objectives** | **Topics to be covered** | **Ref. Chapter of Text Book** |
| 1-5 | Through understanding of Humidification and its applications | Humidification  Definitions, Humidity Charts, Wet-Bulb Temperature, Cooling Towers | C19 of TB |
| 6-11 | Through understanding of Industrial Drying and its applications | Principles & applications of Drying, Cross circulation & Through Circulation Drying, Freeze drying, Drying Equipment | C24 of TB |
| 12-18 | Through understanding of Adsorption and other Fixed Bed Separations | Adsorption Equilibria, Adsorption Process Design, Ion-Exchange Systems, Chromatography Columns | C25 of TB |
| 19-24 | Through understanding of Membrane Separations | Gas separations, Liquid separations, Reverse Osmosis and Pervaporation | C26 of TB |
| 25-27 | Crystallization | Fundamentals, Nucleation and Crystal Growth, Yield estimation, Equipment Design | C27 of TB, C13 of R4 |
| 28-32 | Unit Operations with Powders | Characterization of Powders, Storage and conveying of powders, Mixing of Solids, Size Reduction Processes & Equipment, Ultrafine Grinders | C28 of TB, C2, C3, C9 of R3 |
| 33-37 | Mechanical Separations: Settling & Screening | Mechanical Screening, Gravitational Settling, Centrifugal Screening | C29 of TB, C4, C5 of R3 |
| 38-42 | Mechanical Separations: Filtration | Cake Filtrations, Membrane filtrations such as Ultra and Microfiltration, Clarification & Depth Filtration | C29 of TB, C6 of R3 |

**5. Evaluation Scheme:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Component | Duration | Weightage | Date & Time | Remarks |
| Class Test 1 | 50 min | 15 % | Before Mid-Sem | Open Book OB |
| Mid Semester Exam | 90 min | 30 % | 09/10 - 4.00 - 5.30PM | OB |
| Class Test 2 | 50 min | 15 % | After Mid-Sem | OB |
| Comprehensive Exam. | 3 hours | 40 % | 07/12 AN | OB |

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

7. **Notices**: All notices concerning this course will be in the CMS system or via email.

8. **Make-up Policy**: Make-up may be granted only with prior permission for valid reasons at the discretion of the Instructor-in-charge.

9. **Academic Honesty and Integrity Policy**: Academic honesty and integrity are to be maintained by all the students throughout the semester, and violations will be punished.

Jaideep Chatterjee

**Instructor-in-charge**

**CHE F313**