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**FIRST SEMESTER 2022-23**

**Course Handout (Part II)**

**Date: 29/8/2022**

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* : D. PURNIMA**

# **Tutorial Instructors** : D. PURNIMA

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

This course deals with chemical engineering operations such as size reduction, aggregation, mechanical separation, filtration, crystallization, drying, adsorption, membrane separation process etc. There are many physical operations that are common to many industrial processes. Each of these processes is classified according to their function without regard to the industry. Each such operation is studied as a unit operation. Some selected unit operations are dealt with in this course.

2.Learning outcomes of the process:

(i) Characterization of particles properties such as spericity, particle size

(ii)Knowledge of various size reduction techniques from few mts in size to nanometers in size

(iii) Various techniques of separations of solids, liquids and gases.

(iv) Characterization techniques such chromatography etc

3. **Text Book:**

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

(ii) Babu, B V and Others Chemical Engg. Lab ManualNotes EDD, 2007.

4. **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 *Unit Operations*, Brown G. G. & others, Chapman & Hall, 1950.

R4 *Chemical Engineers Handbook*, Perry, R. H. (Ed.), McGraw-Hill, New York (all editions).

**5. Course Plan:**

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| **Lect. No.** | **Learning Objectives** | **Topics to be covered** | **Chapter in the Text Book** |
| 1. | Properties and Handling of particulate solids | Characterization of Solid particles,  properties of masses of particles | Ch. 28 (TB) |
|  |  |  |  |
| 2 | -do- | Storage and conveying of solids,  mixing of solids | Ch. 28 (TB) |
| 3 | -do- | Mixers for cohesive/non-cohesive solids  Lab Demo extruder | Ch. 28 (TB) |
| 4 | -do- | Size reduction, equipment for size  Reduction, Ultrafine grinders  Lab demo : Ball mill, jaw crusher, super mass collider, and valley beater | Ch. 28 (TB) |
| 5 | Mechanical separation | Screening, screening equipment  Lab Demo :Sieves | Ch. 29 (TB) |
| 6-7 | -do- | Filtration equipment  Lab demo : Vacuum rotary filter and plate and frame filter press | Ch. 29 (TB) |
| 8-9 | -do- | Filtration calculations | Ch. 29 (TB) |
| 10-11 | -do- | Membrane filtration, gravity settling processes  Lab demo :Water purification plant | Ch. 29 (TB) |
| 12 | -do- | Centrifugal sedimentation processes | Ch. 29 (TB) |
| 13-14 | Drying of Solids | Principles of Drying Lab demo of tray Dryer | Ch. 24 (TB) |
| 15-16 | -do- | Cross circulation drying | Ch. 24 (TB) |
| 17-18 | -do- | Through circulation drying, Freeze drying, Drying equipment | Ch. 24 (TB) |
| 19-20 | Fixed Bed separation | Adsorption | Ch. 25 (TB) |
| 21-22 | -do- | Ion-exchange | Ch. 25 (TB) |
| 23-25 | -do- | Chromatography  Lab Demo : Gas Chromatography | Ch. 25 (TB) |
| 26-28 | Membrane separation | Separation of gases | Ch. 26(TB) |
| 29-31 | -do- | Separation of liquids | Ch. 26 (TB) |
| 32-33 | Crystallization | Introduction, Crystal geometry, Equilibria, Super saturation  Lab Demo:Batch Crystallizer | Ch. 27 (TB) |
| 34-37 | -do- | Nucleation, Crystal growth and crystallization equipment | Ch. 27 (TB) |
| 38 | -do- | Crystallizer design and crystallization from melts | Ch. 27(TB) |
| 39-40 | Humidification | Humidity chart, Wet-bulb temperature and Cooling towers | Ch. 19(TB) |

**6. Evaluation Scheme:**

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| --- | --- | --- | --- | --- |
| Component | Duration | Weightage | Date & Time | Nature of Component |
| Mid test | 90 min | 25% | 04/11 9.00 - 10.30AM | CB |
| Surprise test (2)\* |  | 15% |  | OB |
| Assignment (2) |  | 15 % |  | OB |
| Seminar(1)+Project (1) |  | 10% |  | OB |
| Comprehensive Exam. | 3 hours | 35% | 27/12 FN | CB |

\* Three surprise test will be conducted out of which best two will be taken

**7**. **Chamber Consultation Hour:** To be announced in the class. **(Chamber: D 203)**

8. **Notice:** Notice will be displayed on Chemical Engineering Notice Board (D block, first floor)

9.  **Academic honest 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.

**9. Make-up policy**: Make-up will be granted after he /she maintains minimum attendance in the   
 class and has genuine reasons not to appear in the regular test.

Instructor‑in‑charge

CHE F313