Birla Institute of Technology & Science, Pilani
Hyderabad Campus

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:

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:

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