BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI
HYDERABAD CAMPUS
FIRST SEMESTER 2016-17
Course Handout (Part II)

Date: 01/08/2016

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 **: RAMESH BABU ADUSUMALLI**

Tutorial Instructors : Ramesh Babu Adusumalli

1. **Scope and Objective of the Course:**
This course deals with chemical engineering unit operations which are used to separate solids from solids or solids from liquid or solids from gas in many of the chemical and pharma industries. These operations include size reduction followed by sieve analysis, mechanical separations such as filtration, crystallization, drying, adsorption, humidification and membrane separation process. 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 in this course.

2. **Text Book:**
McCabe W. L., and Smith J. M., & Harriott P., *Unit Operations of Chemical Engineering*, Seventh Edition., McGraw-Hill International Edition, 2005.

3. **Reference Books:**
R1 *Mechanical Operations*, Anup Swain, Hemalatha Patra, GK Roy . McGraw Hill Education, 2011.
R2 *Separation Process Principles*, JD Seader and Ernest J. Henley, 2nd Edition, John Wiley & Sons, 2001.
R3 *Principles of Unit Operations*, Foust A. N. & others, 2nd Edition, John Wiley & Sons, 1980.

4. Course Plan:

Lect. No.	Learning Objectives	Topics to be covered	Ref. Chap./ Sec.Book)
1.	Properties and Handling of particulate solids	Characterization of Solid particles, Particle size distribution, Screen analysis	Ch. 28 (TB)
2	Mixing of solids	Mixers for cohesive/non-cohesive solids	Ch. 28 (TB)
3-4	Size reduction	Size reduction, equipment for size Reduction, Ultrafine grinders	Ch. 28 (TB), Ch. 2 (R1)
5	Mechanical separation	Screening, screening equipment	Ch. 29 (TB), Ch. 5 (R1)
6-7	-do-	Filtration (Plate and frame filter press, rotary drum vacuum filtration, Centrifugal filters)	Ch. 29 (TB), Ch. 6 (R1)
8-9	-do-	Principles of cake filtration, Filtration calculations	Ch. 29 (TB)
10-11	-do-	Gravity sedimentation processes (clarifier, classifier and thickeners, flocculation)	Ch. 29 (TB)
12	-do-	Centrifugal sedimentation processes	Ch. 29 (TB)

13-14	Drying of Solids	Principles of Drying	Ch. 24 (TB), Ch. 18 (R1)
15-16	-do-	Cross circulation drying	Ch. 24 (TB)
17-18	-do-	Through circulation drying, Freeze drying, Drying equipment	Ch. 24 (TB)
19-21	Fixed Bed separation	Adsorption, adsorption equipment	Ch. 25 (TB), Ch. 15 (R2)
22-23	-do-	Ion-exchange	Ch. 25 (TB), Ch. 15 (R2)
24-25	-do-	Chromatography	Ch. 25 (TB), Ch. 15 (R2)
26-28	Membrane separation	Separation of gases	Ch. 26(TB), Ch. 14 (R2)
29-31	-do-	Separation of liquids (Dialysis, Pervaporation, Reverse osmosis)	Ch. 26 (TB)
32-33	Crystallization	Introduction, Crystal geometry, Equilibria, Super saturation	Ch. 27 (TB), Ch. 10 (R1), Ch. 17(R2)
34-37	-do-	Nucleation, Crystal growth &crystallization equipment and Crystallizer design	Ch. 27 (TB)
38-39	Humidification	Humidity chart, Wet-bulb temperature and Cooling towers	Ch. 19(TB)
40	Lab tour	Unit operation equipment in chemical and Pharma labs.	Notes

5. Evaluation Scheme:

Component	Duration	Weightage	Date & Time	Remarks
Test I	50 min	20%	10/9, 8.30-9.30 AM	CB
Test II	50 min	15%	22/10, 8.30-9.30 AM	CB
Surprise tests		10 %		Closed book
Seminars		20 %		OB
Comprehensive Exam.	3 hours	35 %	08/12 AN	OB (1 hrs) + CB

7. **Chamber Consultation Hour:** To be announced in the class. **(Chamber: D 201)**
8. **Notice:** Notice will be displayed on Chemical Engineering Notice Board or CMS
9. **Make-up policy**: Make-up will be granted after he /she maintains minimum 60 % attendance in the class and has genuine reasons not to appear in the regular test. Certificate from authenticated doctor from the Medical Center must accompany make-up application (*only prescription or vouchers for medicines will not be sufficient*)

Instructor-in-charge
CHE F313
Ramesh Babu Adusumalli