

**BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI**  
**INSTRUCTION DIVISION**  
**First Semester 2003-2004**  
**Course Handout (Part-II)**

*Date: 02-08-2003*

In addition to Part I (General Handout for all courses appended to the Time Table), this portion gives further specific details regarding the course.

<b>Course No.</b>	<b>: CHE C431</b>
<b>Course Title</b>	<b>: Selected Chemical Engineering Operations</b>
<b>Instructor-in-Charge</b>	<b>: B.V.BABU</b>
<b>Instructor (Tutorial)</b>	<b>: Rakesh Angira</b>
<b>Team of Instructors (Practicals)</b>	<b>: Ashish S Chaurasia, Manjuri Kumar, Nitin Maheshwari, Pratik N Seth, Rakesh Angira, and Suresh Gupta</b>

**Course Description:**

Chemical engineering operations such as size reduction, mechanical separation, filtration, crystallization, drying, adsorption, membrane separation processes etc.; associated laboratory.

**Scope & Objective:**

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. A laboratory is attached to this course to provide practical knowledge analyses of these unit operations.

**Text Books:**

TB McCabe W. L., and Smith J. M., & Harriott P., *Unit Operations of Chemical Engineering*, 6<sup>th</sup> Ed., McGraw-Hill International Edition, 2001.

**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, 2<sup>nd</sup> 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).

## Course Plan:

### 1. Theory:

Lecture No.	Learning Objectives	Topics to be covered	Reference Chap./Sec. (Book)
1	Properties & 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	Ch. 28 (TB)
4	-do-	Size reduction, equipment for size reduction	Ch. 28 (TB)
5	Mechanical separation	Screening, screening equipment	Ch. 29 (TB)
6-7	-do-	Filtration equipment	Ch. 29 (TB)
8-9	-do-	Filtration calculations	Ch. 29 (TB)
10-11	-do-	Membrane filtration, gravity settling processes	Ch. 29 (TB)
12	-do-	Centrifugal sedimentation processes	Ch. 29 (TB)
13-14	Drying of Solids	Principles of drying	Ch. 24 (TB)
15-16	-do-	Cross circulation drying	Ch. 24 (TB)
17-18	-do-	Through circulation drying, dryers	Ch. 24 (TB)
19-20	Fixed bed separation	Adsorption	Ch. 25 (TB)
21-22	-do-	Ion Exchange	Ch. 25 (TB)
23-25	-do-	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,	Ch. 27 (TB)
34-35	-do-	Nucleation	Ch. 27 (TB)
36-37	-do-	Crystal growth, equipment	Ch. 27 (TB)
38-40	-do-	Crystallizer design	Ch. 27 (TB)

### 2. List of experiments:

S. No.	Name of Experiment	No. of turns
1.	Crushing, grinding, screening	1
2.	Vacuum filtration	1
3.	Plate and frame filtration	1
4.	Rotary drum filtration	1
5.	Froth flotation	1
6.	Sedimentation and thickening	1
7.	Centrifugal double cone classifier	1
8.	Drying	1
9.	Centrifugal pump characteristics	1
10.	Reciprocating pump characteristics	1

**Evaluation Scheme:**

EC No.	Component	Duration	Marks	Date & Time	Venue	Nature
1.	Test I	50 min.	40			CB
2.	Test II	50 min.	40			OB
3.	Lab report & viva		40			
4.	Lab quiz		20			CB
5.	Surprise quiz		20			
6.	Assignment		20			
7.	Comprehensive Exam	3 hrs.	120			OB & CB

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

**Notices:** All notices concerning this course will be displayed on the Chemical Engineering & Workshop Notice Boards.

**Make-up Policy:** Make-up is granted only for genuine cases with valid justification and prior permission of Instructor-in-charge.

**Instructor-in-charge**  
**CHE C431**