INSTITUTE	**DIPLOMA STUDIES**
PROGRAM	**DIPLOMA ENGINEERING (CHEMICAL ENGINEERING)**
SEMESTER	**2**
COURSE TITLE	**UNIT OPERATION-I**
COURSE CODE	**09CH2102**
COURSE CREDITS	**4**

Objective:

1 To study about Mechanical Operations generally carried out in Chemical Processes Industries involving solid-solid and solid-liquid handling, mixing and separation.

2 To study about Mechanical Operations generally carried out in ChemicalProcesses Industries involving solid-solid and solid-liquid handling, mixing and separation.

Course Outcomes: After completion of this course, student will be able to:

1 Understand different properties of particulate solids and methods of out its analysis.

2 Express criteria for selection of specific size reduction equipments based on their application.

3 Be able to utilize theoretical knowledge for fundamental design of suitable solid liquid separation operation

4 To build a bridge between theoretical and practical concepts of unit operation used in chemical industry to solve environmental pollution problems.

Pre-requisite of course: Basic concepts of units and dimensions, mass fraction mole fraction, material balance.

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
2	0	4	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	**Particulate Solids** Introduction, Particle characterization, Concept of sphericity, Mixed particles size, specific surface area and specific number of particles Basic terms in screening, Screen analysis- differential and cumulative analysis.	4

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Contents : Unit	Topics	Contact Hours
2	**Size Reduction and Screening** Introduction, Crushing Law, Classification of size reduction equipments, Crushers, Grinders, Ultra-fine grinders, Cutting machines, Open circuit and closed circuit operation, Screen effectiveness, Ideal screen and actual screen, Different screening equipments	6
3	**Filtration, Sedimentation and Centrifugal Separation** Definition and Mechanisms of filtration, Filtration theory, Filter media and filter aids, Classification & Selection of filtration equipments, Bag filter in air pollution control, Plate and frame filter press, Rotary drum filter etc. Batch sedimentation test, Applications of sedimentation, Theory of centrifugal separation, centrifugal filtration, Classification of centrifuges, Simple bowl centrifuge, Disc centrifuge, Tubular-bowl centrifuge, Gas centrifuge	10
4	**Solid-Solid and Solid-Fluid Separation** Introduction, Magnetic Separation, Froth Floatation, Cyclone Separation and Electrostatic Precipitation	8
Total Hours		**28**

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	**Experiment-1** To study the construction and working also find out it`s efficiency of Jaw crusher	2
2	**Experiment-2** To study the construction and working also find out it`s efficiency of Roll crusher	2
3	**Experiment-3** To find out critical speed and efficiency of Ball Mill	2
4	**Experiment-4** To separate heavy particles from solid-solid mixture using cyclone Separator	2
5	**Experiment-5** To separate solid particles with the help of forth flotation unit	2
6	**Experiment-6** To separate out solid from slurry with the help of press Filter	2
7	**Experiment-7** To study Construction and working of centrifugal filtration	2
8	**Experiment-8** To study Construction and working of vacuum filtration	2
9	**Experiment-9** To Perform Batch Sedimentation to separate out un-dissolved solid form solid water solution	2

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Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
10	**Experiment-10** To find out the screen effectiveness of Sieve Shaker	2
Total Hours		**20**

Textbook :

1 Unit Operations of Chemical Engg. by W.L. McCabe, J. C. Smith & Harriott, 6th Edition distribution co., W.L. McCabe, J. C. Smith & Harriott, McGraw Hills India, 2000

References:

1 Chemical Engineering Volume-2, Chemical Engineering Volume-2, J. F. Richardson, J. H. Harker and J. R. Backhurst, Butterworth-Heinemann International, 1990

2 Principles Of Unit Operations, Principles Of Unit Operations, Alan S. Foust, Leonard A. Wenzel, Curtis W, Wiley-India Publishers, 2008

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery					
Remember / Knowledge	**Understand**	**Apply**	**Analyze**	**Evaluate**	**Higher order Thinking / Creative**
40.00	40.00	10.00	10.00		

Instructional Method:

1 The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

2 The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.

3 Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory

Supplementary Resources:

1 https://archive.nptel.ac.in/courses/103/107/103107123/

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