16CH402 CHEMICAL PROCESS EQUIPMENT DESIGN

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
15	10	-	12	3	5

Course Description and Objectives:

This course deals with the selection and design of chemical process equipments. The objective of this course is to acquire basic understanding of design parameters, complete knowledge of design procedures for commonly used process equipment and their attachments (e.g. internal and external pressure vessels, tall vessels, high pressure vessels, supports etc.).

Course Outcomes:

The student will be able to:

- design heat transfer equipment and mass transfer equipment.
- understand internal pressure vessels and external pressure vessels.
- design cooling towers.

SKILLS:

- ✓ *Design shell and tube heat exchanger.*
- ✓ *Analyze pressure vessels.*
- ✓ *Design dryers and sieve tray column.*
- ✓ *Design cooling towers.*

ACTIVITIES:

- *Draw shell and tube heat exchanger.*
- *Calculate design parameters.*
- *Calibration of Psychometer.*

UNIT - 1 **L-9**

DESIGN OF SHELL AND TUBE HEAT EXCHANGERS : 1-2 heat exchanger, Arrangements for increased heat recovery, Calculations for process conditions. Design calculations of a double-pipe heat exchanger, Double pipe exchangers in series-parallel arrangement.

UNIT - 2 **L-9**

PRESSURE VESSELS : Introduction, Vessels subjected to internal pressure & combined loading, Stresses induced in vessels, Optimum proportions of a vessel, Optimum vessel size.

UNIT - 3 **L-9**

DESIGN OF DRYERS : Design of rotary dryer, Tray dryer and spray dryer.

DESIGN OF PACKED TOWERS FOR ABSORPTION : Flow of liquid over packing's, Limiting gas velocities, Pressure-drop calculations, Design of packed towers using absorption coefficients, Design of packed tower using transfer-unit method.

UNIT - 4 **L-9**

DESIGN OF SIEVE TRAY TOWER FOR DISTILLATION : Introduction, Sieve tray, Tower diameter, Plate spacing, Entrainment, Flooding, Weepage, Tray layout, Hydraulic parameters.

UNIT - 5 **L-9**

COOLING TOWER PRACTICE : Mechanism, Types, Rating duty and physical size of cooling towers, Cooling tower components, Construction material, Practical aspects of tower selection

COOLING TOWER DESIGN CALCULATIONS : Heat transfer calculations, Selection of tower size for a given duty, Corrections for altitude, Use of charts for calculation of cooling tower duties.

LABORATORY EXPERIMENTS

List of Experiments : Total hours : 30

1. Drawing of flow sheet symbols.
2. Drawing of instrumentation symbols.
3. Drawing of chemical process flow diagarms.
4. Mechanical aspects of chemical equipment design and drawing of 1-2 shell and tube heat exchanger.
5. Mechanical aspects of chemical equipment design and drawing of 2-4 shell and tube heat exchanger.
6. Design and drawing of feed forward evaporator.
7. Drawing of distillation column by using McCabe-Thiele method.
8. Design of absorption column.