

COURSE TITLE	PROCESS EQUIPMENT DESIGN
COURSE CODE	01CH1603
COURSE CREDITS	5

Objective:

- 1 To understand various design techniques and the details of operating conditions of process plant equipment and its design procedure.

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

- 1 Understand basic design concepts, use of Standard design code and design stresses, working conditions, corrosion and its effects on equipment
- 2 Apply learnings to bridge between theoretical and practical design concepts used for designing the equipment in any process industry
- 3 Evaluate the design criteria of process equipment
- 4 Create the actual design and drawing of process industry equipment

Pre-requisite of course: Knowledge of unit operations and process equipments.

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	2	0	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	Design of Piping and Pumps Introduction, Process design of piping, Different types of pumps, Evaluation of Centrifugal pump performance, NPSHA & NPSHR, Power required in pump, Different flow measurement equipment	8
2	Design of Heat Transfer Equipment Types of heat exchanger, Design of double pipe heat exchanger, shell and tube heat exchanger, Design of Evaporator, and Crystallizer, Design of Cooling Tower	10
3	Process design of Distillation Column Design of Distillation column, Calculation for tower diameter & pressure drop, Condition for weeping, downcomer flooding, liquid entrainment, jet flooding and tray efficiency, Design of Condenser, and Reboilers	10
4	Design of auxiliary equipment Design of agitator and reaction vessel. Design of Pressure Vessel, Design of Hortonsphere vessel. Different types of supports and storage vessel, Safety aspects of design equipment	12
Total Hours		40

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	Tutorial 1 Design guidelines for process equipment	2
2	Tutorial 2 Design of piping	2
3	Tutorial 3 Power requirement of pump	2
4	Tutorial 4 Design of heat exchangers	2
5	Tutorial 5 Design of Evaporator	2
6	Tutorial 6 Design of distillation column	2
7	Tutorial 7 Design of Condenser and reboiler	2
8	Tutorial 8 Design of agitator and reaction vessel	2
9	Tutorial 9 Design of cylindrical and spherical vessels	2
10	Tutorial 10 Design of supports and storage vessel	2
Total Hours		20

Textbook :

- 1 Introduction to Process Engineering and Design, S B Thakore and B I Bhatt, Tata McGraw Hill, 2007
- 2 Process equipment design , Joshi, M. V., & Mahajani, V. V, Macmillan India Limited, 1981

References:

- 1 Chemical Engineering Design, Chemical Engineering Design, Ray Sinnott, Gavin Towler, Butterworth-Heinemann, Elsevier, 2008
- 2 Process Equipment Design: Vessel Design, Process Equipment Design: Vessel Design, Lloyd E. Brownell, Edwin H. Young, Wiley-Interscience, 1966

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
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Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
10.00	20.00	25.00	25.00	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 Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory
- 4 Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory

Supplementary Resources:

- 1 <https://nptel.ac.in/courses/103107207>
- 2 <https://learncheme.com/>
- 3 <https://www.aiche.org/ili/academy>
- 4 <https://www.engineeringtoolbox.com/>
- 5 <https://ocw.mit.edu/>