

<b>INSTITUTE</b>	<b>FACULTY OF TECHNOLOGY</b>
<b>PROGRAM</b>	<b>MASTER OF TECHNOLOGY in CHEMICAL ENGINEERING</b>
<b>SEMESTER</b>	<b>2</b>
<b>COURSE TITLE</b>	<b>PROCESS EQUIPMENT &amp; PLANT DESIGN</b>
<b>COURSE CODE</b>	<b>01CM1207</b>
<b>COURSE CREDITS</b>	<b>3</b>

**Objective:**

- 1 To facilitate students with designing skills of process equipments and accessories.

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

- 1 Identify the use of design concepts and relevant application of equipment design in process industry
- 2 Build a bridge between theoretical and practical concepts used for designing the equipment in any process industry.
- 3 Modify the design of the existing equipment to the new process conditions as per new required capacity.
- 4 Create understanding of equipment design with mechanical concepts.

**Pre-requisite of course:** Basic skills of plant/equipment design and the relevant application in process industries.

**Teaching and Examination Scheme**

<b>Theory Hours</b>	<b>Tutorial Hours</b>	<b>Practical Hours</b>	<b>ESE</b>	<b>IA</b>	<b>CSE</b>	<b>Viva</b>	<b>Term Work</b>
3	0	0	50	30	20	0	0

<b>Contents : Unit</b>	<b>Topics</b>	<b>Contact Hours</b>
1	<b>Design of Pressure and Reaction vessel</b> Introduction, Different types of equipment: static and rotary equipment, Design temperature, Corrosion allowance, Concept of internal & external design pressure, Different types of head, their selection criteria, Different types of Nozzles, their selection criteria. Different types of flanges, & their selection criteria, Different types of gaskets, their selection criteria, Different types of agitators & their selection criteria, Different types of jackets & their selection criteria, Selection between coil & jacket	10
2	<b>Mechanical design of Storage Tank</b> Classification of storage tank as per IS-803, Design of structured supported conical roof as per API 620, Selection of column, girders and rafters, Roof curb angel, Floating roof	6

<b>Contents : Unit</b>	<b>Topics</b>	<b>Contact Hours</b>
3	<b>Design of Heat Exchangers</b> Introduction to Shell & Tube heat exchangers & functions of its various parts, General design of shell & tube heat exchanger, Fixed Tube sheet, U Tube & Floating Head heat exchanger, Condenser, selection criteria for Horizontal and vertical condenser, Tinker's flow model, Air cooled heat exchangers, plate heat exchangers, etc. Mechanical design of Shell, tube, tube sheet, head, channel shell, etc. of shell & tube heat exchanger	12
4	<b>Design of Vertical tall tower</b> Introduction, equipment selection for distillation, Key components selection for multi-component distillation, Determination of operating pressure for distillation column, Determination of nos. of theoretical stages for binary distillation using McCabe Thiele method & Poncham method, trays selection, Calculations for tower diameter & pressure drop of sieve tray tower, Checking of conditions for weeping, down comer flooding, liquid entrainment, etc, tray efficiency, Jet Flooding & down comer Flooding, Different types of weirs & down comers of tray tower	12
<b>Total Hours</b>		<b>40</b>

**Textbook :**

- 1 Process equipment and plant design. , Ray, S., & Das, G., Elsevier., 2020

**References:**

- 1 Chemical process equipment: selection and design, Chemical process equipment: selection and design, Couper, J. R., Gulf professional publishing, 2005

**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 and evaluation					
<b>Remember / Knowledge</b>	<b>Understand</b>	<b>Apply</b>	<b>Analyze</b>	<b>Evaluate</b>	<b>Higher order Thinking / Creative</b>
10.00	20.00	30.00	30.00	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

**Instructional Method:**

- 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, ecourses, Virtual Laboratory.

**Supplementary Resources:**

- 1 <https://archive.nptel.ac.in/noc/courses/noc21/SEM2/noc21-ch52/>