



## Course Handout Part II

In addition to part-I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No.	: CHE F412	Lecture: M,W, F	10-11 AM
Course Title	: PROCESS EQUIPMENT DESIGN	Room no:	F 204
Instructor-in-Charge	: Dr. Ramesh Adusumalli		

**1.Scope and Objective of the Course:** This subject will enable students to use basics of applied science in the form of mechanics, strength of materials, and selection of materials to design equipment under certain operating conditions. In a broader view, it would help the students to understand the mechanical design of process equipment such as pressure vessel, support and calculation procedures for design of equipment like storage vessels, reactors, heat exchangers and distillation columns. It will help them to understand various design codes used for fabrication of these equipment's and the various types of tests performed on equipment's before and after assembly of equipment defining its capacity, reliability, and its life.

- i. The students should be familiar with design aspects of equipment's used in chemical industries. These aspects can be selection of materials, design of main body, flanges, gaskets and other components.
- ii. The students should have learnt aspects of material properties especially yield stress and corrosion allowance
- iii. Finally, the students should be skillful in handling the design aspects of new process equipment after coupling with learning outcomes of Process Design Principles-1 and -2.

a.Joshi's Process Equipment Design by V V Mahajani, SB Umari, McMillan Publ. India Ltd, 2009

- a. Process Equipment Design by Shrikant Dawande. Denett & Co, Nagpur, 2009
- b. Chemical Engineering Design. R.K. Sinnott, Vo1. 6, Ed 3 in J.M.Coulson, J.F.Richardson Chemical Engineering Series; Elsevier Butterworth – Heinemann publishers, 2000.
- c. Process equipment design : Vessel design by Lloyd E. Brownell and Edwin H. Young; John Wiley 2004

Lect.	Learning objectives	Topics to be covered	Chap. in
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No.			the Text Book
1	Introduction	Basic considerations in Process Equipment Design	1
2-6	Materials of Construction	Mechanical Properties, Materials of Construction (metals and nonmetals), Corrosion and its prevention, Choice of Materials including FRP	2.1-2.4, notes
7- 10	Design Consideration	Stresses created due to static and dynamic loads, Design stress, Combined stresses and theories of failure, Fatigue, Creep, Temp. effects	3.2, 3.3, 3.5-3.9
11-16	Design of Pressure Vessels	Pressure vessel codes, Selection of Materials, Design conditions and stresses, Design of Shell and its components like Head, Nozzle, Flanges and Gaskets. Design of reinforcement. Numerical covering the above aspects.	5.1-5.8
17	Storage Vessel	Storage of volatile liquids, standard fixed roof storage tanks, Design of tanks, Wind Girders for open-top tanks	7.1-7.7
17-20	Design of Heat exchanger	Design of Shell and tube heat exchanger, tubes/tube sheet, Channel/channel cover and Nozzles. Numerical covering the above aspects.	9.2-9.3
20-25	Design of Distillation and absorption towers/columns	Basic features of towers, Process engineering data, Tower/column internals, Stresses in column shell, Determination of shell thickness. Numerical covering the above aspects.	11.1-11.9
26-27	Supports for Vessels	Bracket or Lug support, Leg Support, Skirt Support, Saddle Supports	13.1-13.5
28-31	Design of Reaction Vessel	Heating systems, Jackets, Design of Vessel Shell with Channel jacket. Numerical covering the above aspects	8.1-8.6
31-35	Safety measures in Equipment design	Analysis of Hazards, Safety measures in Equipment design, Pressure relief devices	17.3-17.6
36-37	Process flow diagrams	Process block diagram, Process flow diagram, Piping and instrumentation diagram	18.2-18.4
38-40	Lab tour	Demonstration of equipment (Rotary digester, Distillation column Shell and tube heat exchanger, Supermass Colloider and Pressure vessel)	

e. **Evaluation Scheme:**

Component	Duration	Weightage	Date & Time	Remarks
Midterm	90 min	30%	14/03 11.30 - 1.00PM	CB
Surprise tests <sup>1</sup>		15 %		OB
Seminars <sup>2</sup>		15 %		OB
Comprehensive Exam.	3 hours	40 %	10/05 AN	OB (1.5 hr, 20%) + CB (20%)

<sup>1</sup>Total three surprise tests will be conducted. Best two will be taken for 15 % weightage.

<sup>2</sup>Seminar topics will be given for those who maintains 50 % attendance.

**7. Chamber Consultation Hour:** To be announced later. (**Chamber: D 207**)

**8. Notice:** Notice will be displayed on CMS

**9. Make-up policy:** Make-up will be granted after he /she maintains minimum 50 % attendance in the class. Certificate from authenticated doctor from the Medical Center must accompany make-up application and follow the guidelines for midterm and comprehensive exams.

**Academic Honesty and Integrity Policy:** Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

**Dr. Ramesh Adusumalli**  
**INSTRUCTOR-IN-CHARGE**

