

# Process Equipment Design

B.E. Sem. VIII [MECH]

(Elective – II)

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## EVALUATION SYSTEM

	Time	Marks
<b>Theory Exam</b>	3 Hrs.	100
<b>Practical Exam</b>	–	–
<b>Oral Exam</b>	–	25
<b>Term Work</b>	–	25

## SYLLABUS

- 1. Types of Process Equipments and their components**  
**Static Equipments** : Vertical / Horizontal vessels , Columns , Reactors , Spherical vessels (Horton sphere) , Heat Exchangers , Tanks , Mounded Bullets , Fire Heaters etc.  
**Rotating Equipments** :Pumps ,Compressors, Agitators ,Rotary Dryers
- 2. Design Loads** : Design Pressure , Design temperature , Dead loads ,Wind loads, Earthquake loads , Piping loads , Combinations of design loads.
- 3. Stress Categories and Design Limit Stresses**  
General design criteria of ASME pressure Vessel code Section VIII Div. 1, ASME pressure vessel code Section VIII Div. 2, IS 2825, Indian Boiler Regulations ,BS 5500 , etc. Design stress limits & minimum thicknesses as per TEMA for Heat Exchangers &API 650 /620 for tanks.  
Membrane stress analysis of Vessel shell components
- 4. Material selection & Design of Cylindrical Vessels components as per codes and Standards**  
Design of shell , Formed closures ( Ellipsoidal , Spheroidal , Torispherical , conical ,Flat ) , Nozzles , standard flanges , girth flanges , Supports (Lug , Leg , Skirt , saddle etc. ),expansion joints. Design of cylindrical vessels with formed closures operating under external pressure. Wind and Seismic calculation for tall vertical vessels as per IS 875 & IS 1893 .Empty weight ,hydrostatic weight & operating weight calculations.
- 5. Brief Introduction** -Tank Design as per API 650/API 620  
Heat Exchanger Design as per ASME Section VIII UHX  
Types & Different parts of Heat Exchangers as per TEMA
- 6. Inspection, Testing & Heat Treatment requirements for pressure vessels** (As per ASME Section VIII, Division 1, division 2, ASME Section V, IS2825 , IBR etc.)  
Hydrostatic test, Dye Penetration test, Ultrasonic testing, fatigue test, creep test etc. Requirement of Radiography, Post Weld Heat Treatment.

**Reference Books :**

1. Process Equipment Design (*Brownell & Young*) Wiley India
2. Pressure Vessel Design Handbook (*Henry H. Bednar, P. E.*)
3. Process Equipment design (*Joshi M. V.*)
4. Pressure vessel Design Manual (*Denis Moss*)
5. Pressure Vessels Handbook (*E. F. Megyesy*)
6. An International Code 2007 ASME Boiler & Pressure Vessel Code, Rules For Construction of Pressure Vessels, Section VIII Division1 & 2.
7. IS 2825, IS 875, IS1893, IBR.
8. BS 5500.
9. ASME B16.5, Pipe, Flanges & Flange Fittings
10. An International Code 2007 ASME Boiler & Pressure Vessel Code, Rules For Construction of Pressure Vessels, Section II A, B, C&D
11. Standards of Tubular Exchanger Manufactures Association (TEMA)
12. API Standards 650, 620.

