

UCH505 PROCESS EQUIPMENT DESIGN-I

L	T	P	Cr
3	1	0	3.5

Design Preliminaries: Introduction, General design procedure, Equipment classification, Design codes, Design considerations, Design pressure, Design temperature, Design stress, Factor of safety, Design wall thickness, Corrosion allowance, Weld joint efficiency factor, Design loadings, Stress concentration, Thermal stress and Criteria of failure.

Design of process vessels under internal pressure: Thin wall vessels, Cylindrical vessels, Tubes, Pipes, Spherical vessels, Design of heads and closures such as different heads, Nozzle, Flange joints, Gaskets, Types & design of non- standard flanges and Bolts.

Design of process vessels under external pressures: Introduction, Determination of safe pressure against elastic failure, Circumferential stiffeners, Spherical shells, Pipes and tubes under external pressure.

Design of tall vessels: Introduction, Equivalent stress under combined loadings and Longitudinal stresses.

Design of support for process vessels: Introduction, Different types of supports, Design of supports.

Design of thick walled higher pressure vessels: Introduction, Stresses and theories of elastic failure.

Equipment fabrication and testing: Welding joints, Inspection and Non-destructive testing of equipment.

Design of some special parts: Introduction, Expansion joints and its design, Expansion loop in piping system, Design equations for expansive forces in pipe lines, Shafts and Keys.

Storage tanks: Introduction, Classification of storage tanks, Filling & breathing losses, Design of liquid and gas storage tanks.

Course Learning Outcomes (CLO):

The students will be able to:

1. determine the parameters of equipment design and important steps involved in equipment's fabrication.
2. design internal pressure vessels and their heads.
3. design flange joints, vessel supports, expansion joints, expansion loop, etc.
4. design internal pressure thick vessels and external pressure vessels.
5. design tall vessels and storage vessels.

Text Books:

1. *Bhattacharyya, B.C., Introduction to Chemical Equipment Design, Mechanical Aspects, CBS Publishers and Distributors (1998).*
2. *Joshi, M.V. and Mahajani, V.V., Process Equipment Design, Macmillan India Limited (1997).*

Reference Books:

1. *Brownell, L.E. and Young, E.H., Process Equipment Design, Wiley Eastern India Limited (1991).*
2. *I.S.: 803 – 1962, Code of practice for Design, Fabrication and Erection of vertical Mild steel cylindrical welded oil storage tanks.*
3. *I.S.: 2852-1969, Code for unfired pressure vessel.*
4. *Bhandari, V.B., Design of Machine Elements, Tata McGraw-Hill Publishing Company Limited (2002).*

Evaluation Scheme:

S. No.	Evaluation Elements	Weightage (%)
1	MST	30
2	EST	45
3	Sessional (May includes tutorials/ assignments/ quiz's etc)	25