22MEHO209	DESIGN OF PRESSURE VESSELS					
PREREQUISITES		**CATEGORY**	**L**	**T**	**P**	**C**
		PE	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

1.	To study about the various types of stresses act in the pressure vessels
2.	To design components of pressure vessel using codes and standards.
3.	To study the design the supportive members of pressure vessels.
4.	To study about design considerations of pressure vessels.
5	To study about the design of pipes related to design of pressure vessels.

UNIT I	**STRESSES IN PRESSURE VESSELS**	**9**	**0**	**0**	**9**

Types of Smart Structures, Potential Feasibility of Smart Structures, Key Elements of Smart Structures, Applications of Smart Structures. Piezoelectric materials, Properties, piezoelectric Constitutive Relations, Depoling and Coersive Field, field strain relation. Hysteresis, Creep and Strain Rate effects, Inchworm Linear Motor. Beam Modeling: Beam Modeling with induced strain Rate effects, Inchworm Linear Motor Beam Modeling with induced strain Actuation-single Actuators, dual Actuators, Pure Extension, Pure Bending harmonic excitation, Bernoulli-Euler beam Model, problems, Piezoelectrical Applications.

UNIT II	**DESIGN OF VESSELS USING CODES**	**9**	**0**	**0**	**9**

General theory of membrane stresses in vessel under internal pressure and its application to shells (Cylindrical, Conical and Spherical) and end closures. Bending of circular plates and determination of stresses in simply supported and clamped circular plate. Thermal stresses, Stress concentration in plate having circular hole due to bi-axial loading, Excessive elastic deformation, Plastic instability, Brittle rupture and creep. Theory of reinforced opening and reinforcement limits, design of composite analysis, wind and seismic load consideration in the design of pressure vessel.

UNIT III	**SUPPORTS FOR VERTICAL & HORIZONTAL VESSELS**	**9**	**0**	**0**	**9**

Introduction to ASME codes for pressure vessel design, Pressure vessel and related components' design using ASME codes; Supports for short vertical vessels, Stress concentration at a variable thickness transition section in a cylindrical vessel; Design of nozzles.

UNIT IV	**OTHER DESIGN CONSIDERATIONS**	**9**	**0**	**0**	**9**

Buckling phenomenon, Elastic Buckling of circular ring and cylinders under external pressure, Collapse of thick-walled cylinders or tubes under external pressure, Effect of supports on Elastic Buckling of Cylinders, Design of circumferential stiffeners, and buckling under combined External pressure and Axial loading. Fatigue, shock, high pressure, high temperature, irradiation, corrosion, and other hostile environments; High strength, light weight pressure vessels, Vessels resistant to external high pressures found in undersea exploration, offshore drilling, and mineral mining.

UNIT V	**PIPING DESIGN**	**9**	**0**	**0**	**9**

Flow diagram, Piping layout and piping stress analysis; Flexibility factor and stress intensification factor; Design of piping system as per B31.1 piping code. Piping components - bends, tees, bellows and valves. Types of piping supports and their behavior; Introduction to piping Codes and Standards.

TOTAL(45L) : 45 PERIODS

TEXT BOOKS:

1.	Dennis Moss "Pressure Vessel Design Manual"
2.	Henry H Bednar, "Pressure vessel Design Hand book", CBS publishers and distributors.

REFERENCES:	
1.	Harvey J F, “Pressure vessel design”, CBS, publication.
2.	Brownell L. E & Young. E. D, “Process equipment design”, Wiley Eastern Ltd., India.
3.	Stanley M Wales, “Chemical Process Equipment, Selection and Design”, Butter worths,
4.	Series in Chemical Engineering, 1988. 6. J. Phillip Ellenberger “Pressure Vessels: ASME Code Simplified”.
5.	“ASME Pressure Vessel and Boiler Code”, Section VIII Div. 1, 2, and 3.
6.	“American standard code for pressure piping”, B 31.1.
7.	Smith P, “Fundamentals of Piping Design”, Elsevier.

COURSE OUTCOMES: Upon completion of this course, the students will be able to:		**Bloom Taxonomy Mapped**
CO1	Determine stresses in pressure vessels	Evaluate
CO2	Design pressure vessels using ASME codes	Create
CO3	Design support members of pressure vessels	Create
CO4	Apply other design considerations for pressure vessels	Apply
CO5	Design of pressurized fluid piping	Create

COURSE ARTICULATION MATRIX

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	2	2	0	0	0	0	0	0	0	0	3	3	0
CO2	2	3	3	3	0	0	0	0	0	0	0	0	3	3	0
CO3	2	3	3	3	0	0	0	0	0	0	0	0	3	3	0
CO4	3	1	1	1	0	0	0	0	0	0	0	0	3	3	0
CO5	2	3	3	3	0	0	0	0	0	0	0	0	3	3	0
Avg	**2**	**2.4**	**2.4**	**2.4**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**3**	**3**	**0.0**

3/2/1 – indicates strength of correlation (3 – high, 2- medium, 1- low)