17MD011PRESSURE VESSEL DESIGN

COURSE CODE	COURSE TITLE	L	P	T	C
17MD011	PRESSURE VESSEL DESIGN				

Objectiveofthecourse:

Pressure vesseldesigninvolvesfundamentals ofvariouscomponent designs.Thissubjectprovides basic knowledge required for an engineer to design and to analyze the behaviour of pressure vessels.

UNIT-I

Introduction: Material-shapes ofVessels-stresses incylindrical,sphericalandarbitary,shapedshells. Cylindrical Vesselssubjectedtointernalpressure,windload,bendingandtorque-relation ofpressure vessels-conical andtetrahedralvessels.

UNIT-II

Cylindersandplates:Shrinkfitstressesinbuiltupcylinders-auto frettageofthickcylinders. Thermal stresses in Pressure Vessels. Plates subjected to pure bending with different edge conditions. Circular plates with simply supported and clamped ends subjected toconcentrated and uniformly distributedloads,stresses,Designofdomebends,shellconnections,flatheadsandconeopenings.

UNIT-III

Discontinuitystressesinpressurevessels: Introduction,beamonan elasticfoundation,infinitelylong beam,semiinfinitebeam,cylindricalvesselunderaxiallysymmetricalloading,extentandsignificance ofloaddeformationsonpressurevessels,discontinuitystressinvessels,stressina bimetallicjoints, deformation andstressinflanges.Pressurevesselmaterials, ductilematerialtensiletests,structure andstrengthofsteel,Leuder'slines,determination ofstresspatternsfromplasticflowobservations, behaviour of steel beyond theyieldpoint, effect ofcold work orstrain hardening onthephysical propertiesofpressurevesselsteels.

UNIT-IV

Fatigue ofmetals: fatigue crackgrowth, fatigue lifeprediction, cumulative fatigue damage, stress theoryoffailureofvesselssubjecttosteadystateandfatigueconditions.Influenceofsurfaceeffects on fatigue,effectofthe environmentandotherfactorson fatiguelife,thermalstressfatigue,creepand ruptureofmetalsatelevatedtemperatures, hydrogenembrittlement ofpressurevesselsteels,brittle fracture, effect ofenvironment onfracture toughness, fracture toughness relationships, criteria for designwithdefects,significanceoffracturemechanicsevaluations,effectofwarmprestressingon the ambienttemperaturetoughnessofpressurevesselsteels.

UNIT-V

Design features: Localized stresses and their significance, stress concentration at a variable thicknesstransitionsectioninacylindricalvessel,stressconcentrationabouta circularholeina plate subjected to tension, elliptical openings, stress concentration factors for position, dynamic and thermal transient conditions, theory of reinforced openings, reinforcement, placement and shape, fatigueandstressconcentration.

TEXTBOOKS:

1. JohnF.Harvey, "Theory andDesign ofModernPressureVessels", 3rd Edition,VanNostrand ReinholdCompany,NewYork,1997.
2. Timoshenko&Winowsky,"TheoryofPlatesandShells",2nd Edition,TataMcGrawHill,1964.

REFERENCEBOOKS:

1. Bickell M.B., C. Ruiz, "Pressure Vessel Design and Analysis", 1st Edition, Mac Millan /St. Martins,1967.
2. Brownell&EdwinHYoung,"ProcessEquipmentDesign",2nd Edition,Wiley&SonsCo.,2009.
3. IndianstandardcodeforunfiredPressurevesselsIS:2825.
4. Henry H.Bednar, "Pressure Vessel Design HandBook", 2nd Edition, Krieger Publishing Co., 1991.