1. Curricula and syllabus for each of the Programmes as approved by the University:

FourYearDegreeCourseinBachelorofEngineeringBranch:**MECHANICALENGINEERING**

Semester Pattern(ChoiceBasedCreditGradeSystem)

SEMESTER:THIRD

Sr. No.	Subject Code	Subject	TEACHINGSCHEME					EXAMINATIONSCHEME								
			HOURS /WEEK			TotalHOURS/WEEK	CREDITS	THEORY					PRACTICAL			
			Lecture	Tutorial	P/D			Duration OfPaper(Hr.)	Max. MarksTheory Paper	Internal Marks	Total	Min.PassingMarks	Max.Marks		Total	Min.PassingMarks
													Int.	Ext.		
THEORY																
01	3ME01	Mathematics-III	3	1	--	4	4	3	80	20	100	40	--	--	--	--
02	3ME02	ManufacturingProcesses	3	--	--	3	3	3	80	20	100	40	--	--	--	--
03	3ME03	MechanicsofMaterials	3	--	--	3	3	3	80	20	100	40	--	--	--	--
04	3ME04	EngineeringThermodynamics	3	--	--	3	3	3	80	20	100	40	--	--	--	--
05	3ME05	FluidMechanics	3	--	--	3	3	3	80	20	100	40	--	--	--	--
06	4ES06	**EnvironmentalStudies	2	--	--	2	--	--	--	--	--	--	-	-	-	-
PRACTICALS/DRAWING/ DESIGN																
07	3ME07	ManufacturingProcesses-lab.	--	--	2	2	1	--	--	--	--	--	25	25	50	25
08	3ME08	MechanicsofMaterials-lab.	--	--	2	2	1	--	--	--	--	--	25	25	50	25
09	3ME09	FluidMechanics-lab.	--	--	2	2	1	--	--	--	--	--	25	25	50	25
10	3ME10	Machine Drawing-lab.	--	--	2	2	1	--	--	--	--	--	25	25	50	25
		Total	**17**	**1**	**8**	**26**	**20**	--	--	--	**500**	--	--	--	**200**	--
														GrandTotal	**700**	

Note: TheExaminationoftheSubjectEnvironmentalStudiesshallbeconductedinIVSemester.**

SEMESTER:FOURTH																	
Sr. No.	Subject Code	Subject	TEACHINGSCHEME					EXAMINATIONSCHEME									
			HOURS /WEEK			TotalHOURS/ WEEK	CREDITS	THEORY					PRACTICAL				
			Lecture	Tutorial	P/D			Duration OfPaper(Hr.)	Max. MarksTheory Paper	Internal Marks	Total	Min.PassingMarks	Max. Marks		Total	Min.PassingMarks
													Int.	Ext.		
THEORY																	
01	4ME01	MaterialScience	3	--	--	3	3	3	80	20	100	40	--	--	--	--	
02	4ME02	EnergyConversion-I	3	1	--	4	4	3	80	20	100	40	--	--	--	--	
03	4ME03	ManufacturingTechnology	3	--	--	3	3	3	80	20	100	40	--	--	--	--	
04	4ME04	BasicElectrical Drives&Control	3	--	--	3	3	3	80	20	100	40	--	--	--	--	
05	4ME05	Hydraulic&PneumaticSystems	3	--	--	3	3	3	80	20	100	40	--	--	--	--	
06	4ES06	**EnvironmentalStudies	2	--	--	2	2	3	80	20	100	40	-	-	-	-	
PRACTICALS/DRAWING/ DESIGN																	
07	4ME07	MaterialScience-lab	--	--	2	2	1	--	--	--	--	--	25	25	50	25	
08	4ME08	ManufacturingTechnology-lab	--	--	2	2	1	--	--	--	--	--	25	25	50	25	
09	4ME09	BasicElectricalDrives&Control-lab	--	--	2	2	1	--	--	--	--	--	25	25	50	25	
10	4ME10	Hydraulic&PneumaticSystems-lab	--	--	2	2	1	--	--	--	--	--	25	25	50	25	
Total			**17**	**1**	**8**	**26**	**22**	--	--	--	**600**	--	--	--	**200**	--	
														Total	**800**		

Note: TheExaminationofMandatorySubject EnvironmentalScienceshallbeconductedinIVSemester.**

SEMESTER:FIFTH																
Sr. No.	Subject Code	Subject	TEACHINGSCHEME					EXAMINATIONSCHEME								
			HOURS /WEEK			TotalHOURS/ WEEK	CREDITS	THEORY					PRACTICAL			
			Lecture	Tutorial	P/D			Duration OfPaper(Hr.)	Max. MarksTheory Paper	Internal Marks	Total	Min.PassingMarks	Max. Marks		Total	Min.PassingMarks
													Int.	Ext.		
THEORY																
01	5ME01	HeatTransfer	3	--	--	3	3	3	80	20	100	40	--	--	--	--
02	5ME02	Metrology&QualityControl	3	--	--	3	3	3	80	20	100	40	--	--	--	--
03	5ME03	KinematicsofMachines	3	1	--	4	4	3	80	20	100	40	--	--	--	--
04	5ME04	MeasurementSystems	3	--	--	3	3	3	80	20	100	40	--	--	--	--
05	5ME05	OpenElective–I(OE-I)	3	--	--	3	3	3	80	20	100	40	--	--	--	--
PRACTICALS/DRAWING/ DESIGN																
06	5ME06	HeatTransfer-lab.	--	--	2	2	1	--	--	--	--	--	25	25	50	25
07	5ME07	Metrology&QualityControl- lab.	--	--	2	2	1	--	--	--	--	--	25	25	50	25
08	5ME08	KinematicsofMachines-lab.	--	--	2	2	1	--	--	--	--	--	25	25	50	25
09	5ME09	MeasurementSystems–lab.	--	--	2	2	1	--	--	--	--	--	25	25	50	25
Total			**15**	**1**	**8**	**24**	**20**	--	--	--	**500**	--	--	--	**200**	--
														GrandTotal	**700**	

OpenElective–I(ForotherDisciplines) :(i)ProductionManagement (ii)ManufacturingTechniques

AnOrientationProgramof15Hoursduration/MOOCsonAdvancedCourseslineMachinelearning,3-DPrinting,VirtualReality,SupplyChainManagement,NumericalComputationforMechanicalEngineers,Bio-mechanics,Fundamentalsofnano-Engineering,Micro-ElectroMechanicalSystems,Nano-to-MacroTransportProcesses,FundamentalsofPhotoVoltaics,MachineToolsetc.beofferedduringVsemester.

OpenElective-ItobeoptedfromtheUniversity‘sfacultyofEngineering&Technologyofferedinter-disciplinarycoursesorMOOCscoursespertainingtotheEngineeringProfession.

SEMESTER:SIXTH																	
Sr. No.	Subject Code	Subject	TEACHINGSCHEME					EXAMINATIONSCHEME									
			HOURS /WEEK			TotalHOURS/ WEEK	CREDITS	THEORY					PRACTICAL				
			Lecture	Tutorial	P/D			Duration OfPaper(Hr.)	Max. MarksTheory Paper	Internal Marks	Total	Min.PassingMarks	Max. Marks		Total	Min.PassingMarks	
													Int.	Ext.			
THEORY																	
01	6ME01	DesignofMachineElements	3	--	--	3	3	3	80	20	100	40	--	--	--	--	
02	6ME02	DynamicsofMachines	3	1	--	4	4	3	80	20	100	40	--	--	--	--	
03	6ME03	ControlSystemEngineering	3	--	--	3	3	3	80	20	100	40	--	--	--	--	
04	6ME04	Prof.Elective -I	3	--	--	3	3	3	80	20	100	40	--	--	--	--	
05	6ME05	OpenElective-II	3	--	--	3	3	3	80	20	100	40	--	--	--	--	
PRACTICALS/DRAWING/ DESIGN																	
06	6ME06	DesignofMachineElements-lab.	--	--	2	2	1	--	--	--	--	--	25	25	50	25	
07	6ME07	Dynamics ofMachines-lab.	--	--	2	2	1	--	--	--	--	--	25	25	50	25	
08	6ME08	Prof.Elective -I-lab.	--	--	2	2	1	--	--	--	--	--	25	25	50	25	
09	6ME09	ResearchSkills-lab.	--	--	2	2	1	--	--	--	--	--	25	25	50	25	
		Total	**15**	**1**	**8**	**24**	**20**	--	--	--	**500**	--	--	--	**200**	--	
												GrandTotal			**700**		

AnOrientationProgramof15Hoursduration/MOOCsonEntrepreneurshipDevelopmenttobeofferedduringVISemester.

6ME04:Prof.Elect.(I):(i) Tool Engineering(ii)Non-ConventionalEnergySources(iii)ComputerAidedDesign&Simulation

6ME05:OpenElect.(II)[ForotherDisciplines]:(i)Non-ConventionalEnergySources(ii)AutomobileEngineering

OpenElective-IItobeoptedfromtheUniversity‘sfacultyofEngineering&Technologyofferedinter-disciplinarycoursesorMOOCscoursespertainingtotheEngineeringProfession.

SEMESTER:SEVENTH

Sr. No.	Subject Code	Subject	TEACHINGSCHEME					EXAMINATIONSCHEME								
			HOURS /WEEK			TotalHOURS/WEEK	CREDITS	THEORY					PRACTICAL			
			Lecture	Tutorial	P/D			DurationOfPaper(Hr.)	Max. MarksTheory Paper	InternalMarks	Total	Min.Passing Marks	Max.Marks Int.	Max.Marks Ext.	Total	Min.Passing Marks
THEORY																
01	7ME01	Mechatronics	3	--	--	3	3	3	80	20	100	40	--	--	--	--
02	7ME02	ProductivityTechniques	3	--	--	3	3	3	80	20	100	40	--	--	--	--
03	7ME03	IndustrialManagement&Costing	3	--	--	3	3	3	80	20	100	40	--	--	--	--
04	7ME04	EnergyConversion-II	3	--	--	3	3	3	80	20	100	40	--	--	--	--
05	7ME05	ProfessionalElective-II	3	--	--	3	3	3	80	20	100	40	--	--	--	--
PRACTICALS/DRAWING/DESIGN																
06	7ME06	Mechatronics-lab.	--	--	2	2	1	--	--	--	--	--	25	25	50	25
07	7ME07	EnergyConversion–II-lab.	--	--	2	2	1	--	--	--	--	--	25	25	50	25
08	7ME08	ProfessionalElective-II– lab.	--	--	2	2	1	--	--	--	--	--	25	25	50	25
09	7ME09	TechnicalSeminar&Project	--	--	8	8	4	--	--	--	--	--	50	--	50	25
		Total	**15**	**0**	**14**	**29**	**22**	**--**	**--**	**--**	**500**	**--**	**--**	**--**	**200**	**--**
														GrandTotal	**700**	

7ME05:Prof.Elect.-II:(i)ComputerIntegratedManufacturing (ii)Robotics(iii)ArtificialIntelligence

SEMESTER:EIGHT

Sr. No.	Subject Code	Subject	TEACHINGSCHEME					EXAMINATIONSCHEME								
			HOURS /WEEK			TotalHOURS/WEEK	CREDITS	THEORY					PRACTICAL			
			Lecture	Tutorial	P/D			Duration OfPaper(Hr.)	Max. MarksTheory Paper	Internal Marks	Total	Min.Passing Marks	Max.Marks		Total	Min.Passing Marks
													Int.	Ext.		
THEORY																
01	8ME01	OperationResearchTechniques	3	--		3	3	3	80	20	100	40	--	--	--	--
02	8ME02	I.C.Engines	3	--		3	3	3	80	20	100	40	--	--	--	--
03	8ME03	ProfessionalElective-III	3	--		3	3	3	80	20	100	40	--	--	--	--
04	8ME04	ProfessionalElective-IV	3	--		3	3	3	80	20	100	40	--	--	--	--
PRACTICALS/DRAWING/ DESIGN																
05	8ME05	I.C. Engines-lab.	--	--	2	2	1	--	--	-- --	--	--	25	25	50	25
06	8ME06	Prof.Elective-IV–lab.	--	--	2	2	1	--	--	-- --	--	--	25	25	50	25
07	8ME07	Project	--	--	12	12	6						75	75	150	75
		Total	**12**	**--**	**16**	**28**	**20**	**--**	**--**	**--**	**400**	**--**	**--**	**--**	**250**	--
														GrandTotal		**650**

8ME03Prof.Elect.–III:(i) AutomobileEngineering(ii)ProductionPlanning&Control(iii)ProductDesign

8ME04:Prof.Elect.IV:(i) DesignofTransmissionSystems(ii)Refrigeration&AirConditioning(iii)FiniteElementAnalysis

SYLLABUSOFB.E.[MECH.]SEM.III&IV{C.B.C.S.}

Semester-III

3ME01MATHEMATICS-III

Course LearningObjectives:

1. To provide the knowledge to solve ordinary Linear Differential equations with constant coefficient and itsreducible equation using particular integral and complementary function and apply method of variation ofparametertosolveordinaryLineardifferentialequations
2. To understand the Laplace transform and its inverse transform for the basic functions. Locate the Laplacetransformofperiodicfunction.ApplytheLaplacetransformtosolvedifferentialequation
3. To provide knowledge to apply False Position, Newton Raphson method to solve nonlinear & polynomialequations, Apply Gauss Elimination method, Gauss Seidal iterative method, Relaxation method to solvesystemoflinearequations,ApplyEulersmethod,Runge-Kuttamethod,Picardsmethodtosolvedifferentialequations
4. To understand the Gradient, divergent and curl of vector point functions. To find the directional derivativesof scalar point functions. To discuss the Irrotational and solenoidal vector fields. To define line surface andvolumeintegrals.

CourseOutcomes:

Studentswillbeableto-

1. Demonstrate the knowledge to solve ordinary Linear Differential equations with constant coefficient andits reducible equation using particular integral and complementary function and apply method of variationofparametertosolve ordinaryLineardifferentialequations
2. DefinetheLaplacetransformanditsinversetransformforthebasicfunctions.LocatetheLaplacetransformofperiodicfunction.Applythe Laplacetransformtosolvedifferentialequation
3. Apply False Position, Newton Raphson method to solve nonlinear & polynomial equations Apply GaussElimination method, Gauss Seidal iterative method, Relaxation method to solve system of linear equations,ApplyEulersmethod,Runge-Kuttamethod,Picardsmethodtosolvedifferentialequations
4. Define Gradient, divergent and curl of vector point functions. Finds the directional derivatives of scalarpoint functions.Discuss the Irrotational and solenoidal vectorfields. Define line surface and volumeintegrals

SECTION-A

UNIT-I : Ordinary differential equations:- Complete solution, Operator D, Rules for finding complementaryfunction, the inverse operator, Rules for finding the particular integral, Method of variations of parameters, Cauchy'sandLegendre'slineardifferentialequations. (10Hrs)

UNIT-II:Laplacetransforms: Definition,standardforms,propertiesof Laplacetransform,inverseLaplacetransform, initial and final value theorem, convolution theorem, Laplace transform of impulse function, Unit stepfunction,Laplacetransformsofperiodicfunction.SolutionofLineardifferentialequations. (10Hrs)

UNIT-III:a)Partialdifferentialequationoffirstorderoffollowingform-(i)f(p,q)=0;(ii)f(p,q,z)=0;(iii)f(x,p)=g(y,q);
(ii) Pp+Qq=R(Lagrangesform);(v)z=px+qy+f(p,q)(Clairautform)
b) Statistics:Curvefittingbymethodofleastsquares(Straightandparabolaonly),Correlation,Regression.
c) ProbabilityDistribution:–Binomialdistribution,PoissonandnormalDistribution. (10Hrs.)

SECTION-B

UNIT-IV: Complex Analysis :- Functions of complex variables, Analytic function, Cauchy-Reimann conditions,Harmonic function,Harmonic conjugatefunctions,Milne's method, conformal mappings(translation,rotation,magnification,inversion,bilineartransformation),singularpoints,expansionoffunctioninTayler'sandLaurent's series.Cauchy'sintegral theoremandformula,Residuetheorem. (12Hrs.)

UNIT-V: Numerical Analysis : Solution of algebric and transcendental equations by Newton-Raphson method &method of false position. Solution of system of linear equations by Gauss-Seidalmethod, Relaxation method.Solution of first order ordinary differential equations by Picard's, modifiedEuler's, Runge-Kutta and Taylor'smethod. (10Hrs.)

UNIT-VI: Vector Calculus :- Scalar and vector pointfunctions, Differentiation of vectors, Gradient of a scalarpointfunction,Directionalderivatives,Divergenceandcurlofavectorpointfunctionandtheirphysicalmeaning,line,surface,volumeintegrals,irrotationalandsolenoidalvectorfields,Stoke'sandDivergencetheorem(withoutproof). (10Hrs.)

BooksRecommended:-

TextBooks:

1. TextbookonAppliedEngineeringMathematics,Vol.II,J.N.WartikarandP.N.Wartikar,PuneVidyarthiGriha Prakashan,Pune.
2. Higher EngineeringMathematics,B.SGrewal,HimalayaPublishingHouse.
3. AppliedMathematics,Vol.III,J.N.WartikarandP.N.Wartikar,PuneVidyarthiGrihaPrakashan,Pune.

ReferenceBook: AdvancedEngineeringMathematics,ErwinKreyzig,JohnWiley.

3ME02MANUFACTURINGPROCESSES

Course LearningObjectives:

1. Tostudythemanufacturingprocessesinsand castingindustries,toolingandequipment
2. Tostudythemetalmeltingprocess,meltingfurnacesanddefectsincasting
3. Tostudythevarioustypesofcastingprocesses
4. Tostudythemechanicalworkingofmetalsandalliedprocesses
5. Tostudythemechanicaljoiningprocessesandfastenings
6. Tostudyweldingprocessesandsurfacetreatmentprocesses

CourseOutcomes:

Studentswillunderstandthe:

1. basicconceptoffoundryprocessandrelatedactivities
2. concept ofcompletesandcastingprocesswithadvancecastingmethods
3. fundamentalsofweldingprocesses
4. variousprocesseslikeelectroplating, anodizingetcandtheirimportanceinindustries

SECTION- A

Unit-I: Introductiontomanufacturingprocesses&classification;IntroductiontopatternmakingPatternmaterials,patternmakingtools,allowances,Typesofpatterns,functionsofpatterns,Generalpropertiesofmoulding sands, Mold hardness. Preparation ofsandmouldsofdifferenttypes, Mouldingprocesses,coremaking, core prints, core boxes. Sand casting Processes - Basic principle and Terminology of sand casting, design ofgatingandrisersystem–bynumericalapproach. (9Hrs)

Unit-II : Technology ofmelting andcasting-Meltingfurnaces, crucibles,pit, open hearth, gasfiredcupola,cupola operation and electric hearth furnaces, Electric furnaces - Direct Arc, Indirect arc and electric inductionfurnace.
Defects in castings and its types, Causes and remediesof casting defects. Origin and classification of defects,shaping faults, Inclusion and sand defects, Gas defects, shrinkage defects, contraction defects, dimensional errors.Inspectionandtestingofcastings:-Radiography,ultrasonic,Eddycurrenttesting,fluorescentpenetranttest. (7 Hrs)**Unit III:** Castingprocessesand theirprincipleofoperationandapplications permanent mold casting, slushcasting, shell molding,Investmentorlostwaxcasting,vacuumprocess,centrifugalcasting,continuouscasting,Diecastingequipmentand processesforGravity,pressureandvacuumcasting methods, cleaning ofcastings,Modernisation&MechanisationofFoundries. (8Hrs)

SECTION–B

Unit IV: Mechanical working of metals: Principle of hot andcold working process and its types, Extrusion,piercing, pipe and tube production, manufacture of seamless pipe and tubing. Shearing operations, tube drawing,wiredrawing,spinning,embossingandcoining,squeezingandbendingoperations,rotaryswaging,loadestimationforbulkforming(forginganddrawing),rollingandtypesofrollingmills. (8Hrs)

UnitV: Joiningprocesses:-Mechanicaljoiningprocesses,Mechanicalfastening, riveting, soldering,brazing Welding, Types of welding processes-Arc welding: principle and working, Gas welding- principle andworking Types and purpose of Electrodes, Electrode coatings(flux). TIG & MIG processes – Working principles anditsapplications,shieldinggases,MIG-Spraytransferanddiptransferprocesses. (6Hrs.)

UnitVI: Submergedarcwelding&resistancewelding:-
Heatgenerationinresistancewelding,operationalcharacteristicsofresistanceweldingprocessessuchasspot welding,projectionwelding,buttwelding.
Principleofoperationoffrictionwelding,forgewelding,plasmaarc,thermitwelding.Weldingdefects,TestingandInspection ofwelds,Ultrasonic,Electroslag,ElectronBeam,laserwelding,weldability.
SurfaceTreatment-Electroplating,electroforming, andiodising,metalspraying,shotpeening,polishing,mechanicalcleaning. (9Hrs)

BooksRecommended:

TextBooks:-

1. WorkshopTechnologyVol.IbyBawa,TataMc-GrawHillPublication.
2. WorkshopTechnologyVolIbyHajraChaudhary,DhanpatRai&Sons2001.

References:-

1. WorkshopTechnologyVolIbyRaghuwanshi.
2. ManufacturingProcesses byJ.P. Kaushish;PHI
3. ProcessesandMaterialsofManufacturebyR.A.Lindberg,PHIPub2001.
4. ManufacturingtechnologyVol.I,byP.N. Rao.

3ME07 MANUFACTURINGPROCESSES-LAB

Practices:-

1. Studyofsafetyprecautionsinworkshoppractices.
2. Foundary:-Any twoofthefollowingjobsSandpreparation andpracticeinmouldingofvarioustypesof patterns:-Patternmaking-onejob,Moulding-onejobCasting- onejob.
3. JoiningProcesses:Twocompositejobsinvolvingelectricwelding,gaswelding andresistancewelding process.
4. OnejobonMechanicalWorkingofMetalslikepiercing/drawing/bending/embossing/spinning/upsetting, etc.

Ajournalshouldbepreparedandsubmittedonabovetermwork.

The practical examination shall consist of a job preparation and collegeassessmentshouldbebaseduponthejobs,termworkandvivaexamination.

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3ME03 MECHANICSOFMATERIALS

Course LearningObjectives:

1. Todeveloptheoreticalbasisforstress,strain conceptinvariouscomponentsunderstudy
2. Tostudymechanicalbehaviorofengineeringmaterial
3. Tofamiliarizeaboutfindingshearforce,bendingmoment,torsion,slopeanddeflectionofvarioustypesofbeamswithdifferentloadingconditions
4. Tobuildthenecessarybackgroundtoapplytheknowledgeofmechanicsofmaterialsonengineeringapplications

CourseOutcomes:

Studentswillbeableto-

1. Determinethestress&straininthemember subjectedtoaxial, bending&torsionalload
2. Toobservedifferenttypes ofmaterialbehaviorsuchaselastic,plastic,ductileandbrittle
3. ApplySFandBMdiagramstoanalyseresistanceofferedbythebeamandabletosolvepracticalproblemsinrealworld
4. Applydeflectioncriteria tocheckthe stabilityofbeam

SECTION-A

Unit-I: 1. Mechanical properties: Concept of direct, bending and shear stresses and strains, stress-strain relations,Biaxialandtriaxialloading,elasticconstantsandtheirrelationship,stress-straindiagramsandtheircharacteristicsformildsteel,andothermetals,factorofsafety,stress andstrainofbarduetoselfweight.

2.Uniaxialstressesandstrains:Stressesandstrainsincompoundbarsinuniaxialtensionandcompression, temperature stresses in simple restrained bars and compound bars of two metals only, introduction totheoryofelasticityandphotoelasticity. (10Hrs.)

Unit-II: 1. Axial force, shear force & bending moment diagrams : Beams, loading and support conditions, bendingmoment and shear force for all types of loadings for simply supported beams, cantilevers, relation between shearforce,bendingmoment andloadingintensity.

2. Simple or pure bending theory: Theory of simple bending, section modulus, moment of resistance,bendingstressesinsolid,hollowandbuilt upsection,leafsprings. (7Hrs.)

Unit-III: 1.Torsion: Theory of torsion & assumptions, derivation of torsion equation, polar modulus, stresses insolid&hollowcircularshaft,powertransmittedbyshaft,closedcoiledhelicalspringwithaxialload.

2.Shearstressdistributiononbeamrectangularandcircularcrosssections. (7 Hrs.)

SECTION–B

Unit-IV: Thinandthickcylindersandthinsphericalshellssubjectedtointernal pressures. (4Hrs.)

Unit–V:1.Strainenergyunderuniaxialtensionand compressionimpactloadsandinstantaneousstresses.

2. PrincipalStresses:Biaxialstresssystem,principalstresses,principalplanes,Mohr'scircleofstresses.
3. Strainenergyandresilience:proofresilience,shearresilience,strainenergyduetoselfload (7 Hrs.)

Unit-VI: Deflection in simplysupported beam, cantilever beam subjected to point loads, uniformlydistributedloads,momentsbyMacauley'smethod. (7Hrs.)

BooksRecommended:

TextBooks:

1. Ramamruthm:StrengthofMaterials,DanpatRaiandSons,NewDelhi.
2. R.S.Khurmi:StrengthofMaterial,S.ChandPublication,Delhi.

Reference Books:

1. E.P.Popov:MechanicsofMaterials,PrenticeHallofIndia,NewDelhi.
2. S. TimoshenkoandO.H.Young:ElementsofStrengthofMaterials,EastWestPressPrivateLtd.,NewDelhi.
3. Shames,I.H.:IntroductiontoSolidMechanics,PrenticeHallofIndia,NewDelhi
4. BeerandJohston:MechanicsofMaterials,McGrawHill.
5. D.S.PrakashRao:StrengthofMaterial:APracticalApproach,UniversityPress,Hyderabad.

3ME08 MECHANICSOFMATERIALS-LAB

Practicals:

MinimumSixtoEightoutofthefollowing:

1. Tensiontestonmetals.
2. Compressiontestonmaterials.
3. Shearteston metals.
4. Impacttestonmetals.
5. Hardness testonmetals.
6. Torsiontestonmetals.
7. Deflectionofbeams.
8. Modulusofrupturetest.
9. Deflectionofsprings.

Practicalexaminationshallbeviva-vocebasedonabovepracticalandthesyllabusofthecourse.

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3ME04 ENGINEERINGTHERMODYNAMICS

Course LearningObjectives:

1. Tostudythe basicconceptsof thermodynamics, thermodynamicsystems,workandheat
2. Tostudythelawsofthermodynamicsandtheir applications
3. Tostudythepropertiesofsteam,workdoneandconceptofheat transfer
4. Tostudytheairstandardcycles

CourseOutcomes:

Studentswillbeableto

1. Understandthebasicconceptsofthermodynamics,thermodynamicsystems,workandheat
2. Applyfirstlawofthermodynamicsandapplication offirstlawtoflowandnon-flowprocesses
3. Applysecondlawofthermodynamicsandunderstandconceptofentropy
4. Understandthepropertiesofsteam,workdoneandheattransferduringvariousthermodynamicsprocesse swithsteamasworkingfluid
5. Understandtheconceptofairstandardcycles

SECTION–A

Unit-I: Introductiontobasicconceptsofthermodynamics,Macroscopicandmicroscopicapproaches,propertiesofsystem,state,processesandcycle,thermodynamicequilibrium, typesofthermodynamicsystems, Temperatures and Zeroth law of thermodynamics, Quasi-static process, Gas Laws and Ideal gas equation ofstates,gasconstantanduniversalgasconstant.

Work and Heat: Definitionof work, thermodynamic work, displacement work and other forms of work, Definitionof Heat, Work and heat transfer as path function, comparison of work and heat, work done during various processes,P-Vdiagrams (10hrs)

Unit-II: Firstlaw of thermodynamics:Energyof asystem,classification of energy,law of conservation ofenergy law, Joules experiment. Energy a property of system, internal energy-a function of temperature, Enthalpy,specificheatatconstantvolumeandconstantpressure.Application offirstlawtoflow processes,Changeininternalenergy,workdoneandHeattransferduringvariousnon-flowprocesses. (7hrs)

Unit-III: FirstLawappliedtoflowprocesses:Steady state,steadyflowprocess,equationforworkdoneinsteadyflowprocessesandits representation - P-Vdiagram ,massbalanceandenergybalanceinsteady flow process, steady flow energy equation and its application to nozzles and diffusers, turbine and compressorpumps,heatexchangers,Throttlevalveetc.workdoneandHeattransferduringsteadyflowprocesses.(9hrs)

SECTION–B

Unit-IV: SecondLawofthermodynamics:LimitationsofFirstlaw,Thermalenergyreservoir,heatenginesrefrigerator and heat pumps,COP and tonne of refrigeration,COP for heatpump and refrigerator,Kelvin-PlankandClausiousstatements,theirequivalence,reversibleandirreversibleprocesses,Carnotcycle,Carnottheoremanditscorollary,Thethermodynamictemperaturescale,ReverseCarnotcycle,InequalityofClausius. IntroductiontoEntropy,availabilityandirreversibility.Principleofincreaseofentropy.

(8Hrs)**Unit-V:**PropertiesofSteam:Triplepointandcriticalpoint,Sensibleheat,latentheat,superheatandtotalheatofsteam. Wetsteam,drynessfraction,Internalenergyofsteam,Externalworkofevaporation,internallatenthear,Specificvolume, enthalpy, internal energy and entropy ofsteam.T-SdiagramMollierchart,Steamtables andtheiruse.Workdoneandheattransferduringvariousthermodynamicsprocesseswithsteamasworkingfluid.Throttlingof steam,determinationofdrynessfractionusingvariouscalorimeters. (8Hrs)

UnitVI:

AirStandardCycles:Ottto,diesel,semidiesel,Brayton,Sterlingandjoulecyclesetc.,theirefficienciesandmeaneffectivepressure,comparisonofauto,dieselandduelcycles.

Vapour Cycles:- Rankine and ModifiedRankine Cycle. Comparison of Rankine and Carnot cycle, representationonP-V,T-SandH-Sdiagram.(Nonumericalonthisunit)(numericalonairstandardcycle) (8Hrs)

BOOKSRECOMMENDED:

TextBooks:

1. EngineeringThermodynamic-byP.K.Nag.
2. FundamentalsofEngineeringThermodynamics;R.Yadav;
3. ThermodynamicsBasicsandApplied:byV.Ganeshan
4. ThermalEngineerirng:byMaheshM. Rathore.

ReferenceBooks:

1. BasicEngineeringThermodynamics-byReynerJoel
2. Thermodynamics-byC.P.Arora.
3. FundamentalsofClassicalThermodynamics-byG.J.Vanwylen.
4. EngineeringThermodynamics;P.Chattopadhyay;Oxford
5. EngineeringThermodynamics;GordonRogers,YonMayhew;Pearson.

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3ME05 FLUIDMECHANICS

Course LearningObjectives:

1. TointroduceandexplainthefundamentalsofFluidMechanicsusedinapplicationsofHydraulics,Aerodynamics,Gas dynamics,etc.
2. Togivefundamentalknowledgeoffluid,itspropertiesandbehaviorundervariousconditionsofinternaland external flows.
3. Todevelopunderstandingabouthydrostaticlaw,principleofbuoyancyandstabilityofafloatingbodyandapplicationofmass,momentumandenergyequationinfluidflow.
4. Toimbibebasiclawsandequationsusedforanalysisofstaticanddynamicfluids.
5. Toinculcatetheimportanceofboundarylayerflowanditsapplications
6. Todeterminethelossesinaflowsystem,flowthroughpipes,impactofjet

CourseOutcomes:

Thestudentwillbeableto:

1. identifyimportance ofvariousfluidpropertiesat restandinmotion
2. deriveandapplygeneralgoverningequationsforvariousfluidflows
3. understandtheconceptofboundarylayertheoryandflowseparation.
4. calculateenergylossesinpipe flow.
5. evaluatetheperformancecharacteristicsofhydraulicjets

SECTION–A

UNIT-I:1.BasicpropertiesoffluidsuchasDensity,Specificweight,SpecificVolume,Specificgravity,Viscocityoffluid,SurfaceTension,Capilarity,vapourpressure &cavitation.

2.pressure&itsmeasurement:Pascalslaw,Hydrostaticlawofpressure&pressurevariationinfluid,measurement ofpressurebyManometer. (10Hours)

UNIT-II:1.Hydrostaticpressureforceonplane&curvedsurfaces.Measurmentoftotalpressure&centreofpressure.

2.Buoyancy&floatation:Conceptofbuoyancy,centreofbuoyancy.Stability offloatingbody,Metacentre&metacentricheight.Conditionofequilibriumoffloating&sub-merged body. (08Hours)

UNIT III : 1. Kinematics of fluid flow, Methods of describing fluid motion, Types of flow, rate of flow, streamline,potentialline, flownet,velocity&acceleration, continuityequationinthree dimensionalflow.

2.Dynamicsoffluidflow:Eulersequationofmotion,Bernoullisequationmeasurementoffluidflowwithventure meter. (08Hours)

UNIT-IV : Flow through pipes: Losses in pipe, major losses, Darcy's Weisbach equation, monor losses due tosudden enlargement, contraction, entry, exit & pipe fitting. Hydraulic gradient & total energy line, flow throughseries&parallelpipes,conceptofwaterhammer inpipes. (08Hours)

UNIT-V : Motion of viscous fluid: Introduction to Laminar & Turbulent flow, Concept of Boundary layer& itstype.Drag&Liftforceonobject.Boundarylayerseparation,Reynoldsnumber&itssignificance.(08Hours)

UNIT-VI : Principal of fluid machinery : Force exerted by fluid jet on plane, curved, stationary & moving vanes.Velocitydiagrams,workdone&efficiency. (08Hours)

BooksRecommended:-

TextBooks:-

1. FluidMechanics&MachinerybyModi&Sheth.
2. FluidMechanicsandHydraulicMachinesbyR.K.Bansal.
3. EngineeringfluidMechanicsbyR. K. Rajput.
4. Fluidmechanics&MachinerybyCRSP.Ojha,R.Berndtsson.
5. FluidMechanicsbyStrecter;TataMacgrawHill.

ReferenceBooks:-

1. R.K.Rajput;EngineeringFluidMechanics;S.Chandpublications.
2. Dr.Mody&Seth;HydraulicsandFluidMechanics;Standardbookhouse
3. S.Ramamrutham,Hydraulic,FluidMechanics&FluidMachines,Dhanpatraipublishingcompany.
4. Strecter, FluidMechanics,TataMc-GrawHill.

3ME09 FLUIDMECHANICS- LAB

PracticalTermWork:-

At leastsix(6) practicals (study/Trials) basedon above syllabus,asgiven belowshall beperformedandareportthereofsubmittedbythestudents:

1. Measurementoffluidpressurebymanometer.
2. Determinationofmetacentricheight.
3. Verification ofBernoulli'sequation.
4. Determinationofco-efficientdischargebyVenturimeter.
5. CalculationofReynoldsnumberforLaminar&Turbulent flow.
6. Determinationofco-efficient offriction(MajorlossesinPipes)throughpipe.
7. Determinationofheadlossduetosuddenenlargement.
8. Determinationofheadlossduetosuddencontraction.
9. Determinationoflossofheadinbends&inelbows.
10. Verificationofmomentumequation.

Note:- Practicalexaminationshallconsistoforalor Experimentationbasedonabove termwork.

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3ME10MachineDrawing-Lab

Course LearningObjectives:

1. Tostudythetechniquesofsectioningandvisualizingtheobjects
2. Toimagineanddevelop themissingviewsofobjects
3. Toseektheknowledgeofdevelopmentofsurfaces
4. Toseektheknowledgeofintersectionofsolid objects
5. Toknowtheconventions formaterialsandpartsusedinindustries
6. Topreparethedrawingsformachineassembly

CourseOutcomes:

Studentwillbeableto-

1. Demonstratethetechniquesofsectioningandvisualizingthe objects
2. Imagine,understandandsketchthemissingviews
3. Developsurfacesofobjectsandapplyknowledgeduringtheirfabrication
4. Understandtheconceptofintersection ofsolidobjects
5. Understandandapplytheconventions formaterialsandpartsusedinindustries
6. Preparedetailmachineassemblydrawings

List of Practicals:

1. Conversion ofpictorialviewintoSectionalOrthographicProjection
2. MissingViews
3. Development ofsurfacesofCubes/ Prisms/Cylinders/ Pyramids/Cones &theircutsections
4. IntersectionsofSolids– Prism &Prism/Cylinder &Cylinder/Cylinder&Prism/Cone&Prism
5. Conventionsforvariousmaterials&parts
6. Preparationofdetaildrawingsofsimplemachineassembly
7. Preparationofassemblydrawingofsimplemachines

Booksrecommended:

TextBooks:

1. EngineeringdrawingbyN.D. Bhatt;CharactorPublications.
2. MachineDrawingbyA. M.Bisen;NewEdgeInternationalpublication.
3. MachineDrawingbyR.K.Dhawan,S. Chand
4. MachineDrawingbyBasant Agrawal,McGrawHill.5.

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B.E.(MECHANICAL)SEMESTERFOURTH4ME01

MATERIALSCIENCE

CourseLearningObjectives:

1. Tostudythebasicconceptsofmetallurgyandclassificationof materials
2. Tostudytheprocessofformationofmicrostructuresofmetalmaterialsand composites
3. Tostudythealloyingelements,theireffectsandapplications
4. Tostudytheferrousand non-ferrousmetalsandrespectivealloys
5. Tostudythevariousheattreatmentprocessesandtheirindustrialapplications
6. Tostudythemechanicalworkingofmetalsandprocessofpowdermetallurgy

CourseOutcomes:

Studentswillunderstandthe-

1. Basicconceptsofmetallurgyandtypesofmaterials.
2. Iron-CarbonEquilibriumDiagram,critical temperatures,formationofmicrostructuresand theywillget theknowledgeofalloys.
3. Usesandpracticalapplicationsofferrous &nonferrous materials
4. Variousheattreatmentprocesses,powdermetallurgyandindustrialapplications.

SECTION-A

UNIT-I:Introductiontometallurgy:Basicconceptofprocessmetallurgy,physicalmetallurgy,andmechanical metallurgy, Classification of materials & their application, Structure of metals and alloys, formation ofAlloys, Solid solutions, typesandtheirformation,leverrulefor phase mixtures.Solidificationofpuremetals,nucleationandgrowth,ingot structure,dendriticsolidification. (8Hrs)

UNIT II: Study of binary equilibrium diagram and invariant reactions,Construction and study of Iron-carbonEquilibrium Diagram,Critical temperatures,Microstructure of slowly cooled steel,Estimation of carbon frommicrostructure,structurepropertyrelation,Introductiontocompositematerials,advantagesandapplications.(8 Hrs)

UNIT III: **Alloy Steels:** Purpose of alloying, Classification of alloy steels, classification of alloying elements,Effect of alloying elementsoneutectoid composition,Eutectoid temperature, and onthe S curve,,alloyingelements and their effect on properties of steels, OHNS steels, Hadfield'S Manganese steels, High speed steels,their heat treatments and applications,Ferritic, Austenitic and Martensitic stainless steels, their properties andapplications,welddecayinstainlesssteel. (8Hrs)

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SECTION-B

UNIT IV: Cast irons **:** Factors governing condition of carbon in cast iron, Maurer's diagram, Solidification of greyand white cast iron, Malleabalizing, Constitution and properties of white, gray, Nodular and Malleable cast irons,theirapplications,Alloycastirons.
NonFerrousMetalsandAlloys: Types,PropertiesandusesofBrassesandBronzes.ImportantalloysofAluminium,Lead,Ti nandZinc,theirapplications.Bearingmaterials,Seasoncracking,precipitationhardening.
(8Hrs)
UNIT V:Principlesof Heat Treatment:- Annealing, Normalizing,TemperingIso-thermaltransformationdiagrams(S-curve),superimpositionofcontinuouscoolingcurveson_s'Curve,pearlite,bainiteandmartenstetransformation, Quenchingmedia,severityofquench,Austempering,Martemperingandpatenting,Retainedausteniteandsub-zerotreatment.Hardenability. (8Hrs)

UNIT VI: Methods of surface hardening:Carburizing,Nitriding, Cyaniding, Flameand Induction Hardening.Mechanical working of Metals: - Hot and coldworking, Relative advantages and disadvantages, study of stressstraincurve,Luder'sbands,Workhardening,strainAgeing;Recovery,Recrystallizationandgraingrowth.Metallurgic alfactorsaffectingvariousMechanicalworkingprocesses,preferredorientation,Deformationmechanisms-Slip&twining,criticalresolvedshearstress.
Powder Metallurgy: Concept, Methods of Manufactureof metal powders, compaction Process- Single die anddouble die, sintering, stages of sintering, Manufacture of porous bearings & cemented carbide tip tools by P.M.T.Advantages,limitationsandapplicationsofpowdermetallurgy. (8Hrs)

BOOKRECOMMENDED:-

TextBooks:-

1. Introductiontophysicalmetallurgy;SidneyHAvner,TATAMc-Grawhill
2. Engineeringmaterials&metallurgyR.K.Rajput,Schandpublication.
3. MaterialnScience&Mettalurgy,byV.D.Kodgire.Everest PublicationHouse.

ReferenceBooks:

1. MechanicalMetallurgy,G.E.Dieter,Mc-GrawHillInternational,London 3rd Edn.1999
2. Physicalmetallurgyforengineers,ClarkeandVarney,secondEdn.,1987.
3. Powermetallurgy,A.KSinhaFirstEdn.1991.
4. MaterialScienceandMetallurgy;V.D.Kodgire;EverestPublishingHouse
5. EngineeringphysicalMetallugrgy,YLakhtin,MirPublications.SecondEd.1999
6. MaterialScienceandMeallurgy-CDanielYesudian,ScitechPublication.

4ME07 MATERIALSCIENCE-LAB

ListofPracticals:-(Atleasteight(8)practicalsoutofthefollowinglist.)

1. Studyofmetallurgicalmicroscope.
2. Preparationofspecimenformicro-examination.
3. Mouldingofspecimenformicro-examination.
4. StudyofmicrostructuresofAnnealedandnormalizedplaincarbonsteels.
5. StudyofmicrostructuresofalloysteelsandH.S.S.
6. Studyofmicrostructuresofvariouscastirons.
7. Studyofmicro structures ofnonferrousmetals.(brasses,bronzes)
8. Studyofmicro structuresofhardened andtemperedsteels.
9. StudyofIroncarbonEquilibriumdiagram&Allotropicformsofiron.

10. StudydifferentHeatTreatmentProcessforsteel.
11. StudyofdifferentsurfaceHardeningprocessesforsteels.
12. Studyofeffectofalloyingelementsonthepropertiesofsteels.
13. MeasurementofhardenabilitybyJominyendquenchtestapparatus.
14. StudyofhardnesstesterandconversionofHardnessnumber
15. Industrialvisittostudyheattreatmentplant.
16. Measurementofparticlesize,grainsize,nodularity,coatingthicknessetc.byusingsomesoftware likeMetzerMicrocam4.0

PracticalExamination:

Note:Practicalexaminationshallconsistofvivavoce/performancebasedontheabovesyllabusandpracticalwork.

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4ME02 ENERGYCONVERSION-I

CourseLearningObjectives:

1. Tostudythepropertiesofsteamanditsbehaviorfordifferentthermodynamicprocess.
2. Tostudydifferenttypesofboilers,theirmountings,accessories,performanceofboilersanddifferentefficien cies.
3. Tostudythe variousfuelhandlingandashhandlingsysteminpowerplant.
4. Tostudyvarioustypesofcondensersandcoolingtowers.
5. Tostudyvariousthermodynamicaspectsofflowofsteamthrough nozzleanddiffuser.
6. Tostudyflowofsteamthroughsteamturbineandconceptof compounding.

CourseOutcomes:

1. Studentswillstudytheconcept steamandsteampowerplant,mountingandaccessories.
2. Studentswilldemonstratethecalculationofvariousefficiency&relatedparameters.
3. Studentwillshowtheadequateknowledgeoffuel &ashhandlingsystems.
4. Studentswilldemonstratetheknowledge ofcondenser &application.
5. Students willunderstandtheconceptsofsteamnozzles&steamturbine.

SECTION–A

Unit I : Flow diagram for steam power plant with basic units such as steam generator, turbine, condenser and pump.Steam power plant layout, site selection. Boilers: Introduction to water tube and fire tube boilers used in thermalpower plants, packaged Boilers, High pressure boilers; Loeffler, Benson, Lamont Boilers, Boiler mountings andaccessories—devicesforimprovingBoilerefficiency.Principleoffluidizedbedcombustion.Conceptofco-generation. (7Hrs.)

Unit II : Boiler draught; Types of draught, expression for diameter & height of chimney, condition for maximumdischarge,efficiencyofchimney,reasonsfordraughtloss.Boilerperformance:- Boilerrating,boilerpower,equivalentevaporation,efficiency.Effectofaccessoriesonboilerefficiencyandheatbalance. (7Hrs)

Unit III :CONDENSERS : Need, Types of condensers, quantity of cooling water required. Dalton's law of partialpressure, condenser and vacuum efficiency. Sources of air in condensers and its effect on performance. coolingtowers:Natural andmechanicalwettypecoolingtower.

Steam nozzles : Flow of steam through nozzles & diffusers, Maximum discharge, critical pressure ratio, chocking innozzles, Effect of friction. Determination of throat & exit areas, Nozzle efficiency, no numerical on concept of supersaturatedflow&Wilsonline. (7Hrs.)

SECTION–B

UNIT IV : Steam Turbines:- Principle of working, Types of steam turbines such as impulse, reaction, axial & radialflow, back pressure & condensing turbines. Compounding. Reheat, regenerative cycles,bleeding.Analysis limitedto two stages only. Analysis of steam Turbines : Flow of steam through impulse & impulse reaction turbine blades,Velocity diagrams. Graphical & analytical methods for work & power developed, axial thrust and efficiency. Heightof turbine blades. losses in steam turbines:- blade friction, partial admission, disc friction, gland leakage losses andvelocitylosses.Governing ofsteamturbines. (7Hrs)

UNIT V :NUCLEAR POWER:- Fusion, fission, Chain reaction, conversionand breeding in nuclearfission.Components of Nuclear Power Plant such as Reactor, Steam generator, turbine, Moderator, Control Rods etc., TypesofnuclearreactorslikeBWR,PWR,CANDUandliquidizedmetalcooled thermalreactors. (7Hrs.)

UNIT VI : Introductionto renewable energy, Wind Energy, solar, fuel cell, bio-gas, MHD, Geothermal, OTEC,tidalpowerplants,ApplicationsofNonconventionalenergy. (7Hours)

RECOMMENDEDBOOKS:

Textbooks:

1. Thermalengineering;MaheshMRathore;TataMcGraw-Hill
2. ThermalEngineeringR.Yadav;Centralpublication
3. Non-conventionalEnergySourcesB.H.KhanTataMcGraw-Hill
4. Non-conventionalEnergySourcesG.D.Rai.

Referencebooks:

1. SteamTurbine;Kearton;Oscar Publications.
2. ThermalPowerEngineering;Mathur Mehta;TataMcGraw-Hill
3. PowerPlantEngineeirng.P.K.Nag
4. PowerPlantEngineeirng;R.K.Rajput;LaxmiPublications
5. ThermalEngineering,P.L.Ballaney;LaxmiPublications.

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4ME03 MANUFACTURINGTECHNOLOGY

Course LearningObjectives:

1. Tostudythemechanicsofmetalcutting,toolcharacteristicsandcuttingforces
2. Tostudytheturningoperationsusinglatheand CNCmachines
3. Tostudytheworkingofdrillingandboringmachines
4. Tostudytheworkingofmillingandgearcuttingmachines
5. Tostudythemachiningoperations usinggrinding,shaper,planer andslottermachines
6. Tostudytheunconventionalmachiningprocesses

CourseOutcomes:

Studentswillbeableto-

1. Applytheknowledgeoftheoryofmetalcutting,toolselection &calculatecutting forces
2. Demonstratetheknowledgeofbasicsofturningoperations
3. Understandthedrillingandboringoperationsandworkingofdrilling&boringmachines
4. Understandthemillingandgearcuttingoperationsandworkingofrespectivemachines
5. Understandtheworkingofgrinding,shaper,planerandslottermachines
6. Understandtheknowledgeofunconventionalmachiningprocesses

SECTION–A

UNITI: Theory ofMetalcutting:MechanicsofMetalcutting,Tool material, Tool Geometry,Cutting toolclassification, Tool life,Toolwear,Calculation ofCuttingforces, Machinability, Cuttingfluids, Chipthicknessratio,Merchantcircle. (8Hrs)

UNIT II : Construction, Operations and accessories of centre lathe, introduction of capstan & turret lathe,indexingmechanism,barfeedingmechanism,Machinetoolclassification.Numericalapproach.Taperturning& Screwcutting&basicconceptofCNC.Introduction,workingprincipal&CNCturningoperation. (10Hrs)

UNIT III:a)Drillingoperation:DrillingM/csgeneralpurpose,MassproductionandspecialpurposedrillingM/cs.
b) Introduction& typesof Boring.Boring M/c :- Horizontal, Vertical and jig Boring M/c. Introduction toBroachinganditstypes,broachterminologies,etc. (8Hrs)

SECTION-B

UNIT IV : (a) CalculationofmachiningtimeforMilling.
(b)MillingM/c:-Types,TypesofMillingCutters,Dividinghead,Compoundanddifferential idexing.
c) GearproducingM/cs. (6Hrs)

UNITV: a)GrindingMachines:Benchgrinders,surfacegrinders,centrelesgrinders,typesofbonds &Abrasivemodificationofgrindingwheels.
b)Studyofvarious part&OperationofShaper,Planer,Slotter. (6Hrs)

UNITVI: Unconventional MachiningProcesses:-

a) MechanicalProcesses:-UltrasonicMachining-principleandapplications.processparameters;Abrasiveandwaterparametersinvolved.
b) Thermalprocesses:-ElectionBeamMachining–Generationofbeam,principleandapplications : Laser Beam machining applications : Plasma-arc machining- Concept andgenerationofplasma,principleofPAM,applications.

c) Electric discharge Machining - Types die-sinking, wire cut EDM, Mechanism of material removal,processparameters,advantagesandapplications. (8Hrs)

BOOKSRECOMMENDED:

TextBooks:

1. ManufacturingTechnology-Vol1&2;R.L.Timings,S.P.Wilkinson;PearsonPublication.
2. WorkshopTechnology-ByHajraChoudhauryVolII.
3. ManufacturingTechnologyVol.IIP.N.Rao,McGrawHill Publication

References:-

1. Pandya&Shah,ModernMachiningprocess,TataMcGrawHill1998.
2. WorkshopTechnology,O.P.Khanna,Dhanpatrai&Sons.
3. WorkshopTechnology-ByRaghuwanshi.VolII.

4ME08 MANUFACTURINGTECHNOLOGY-LAB

Practicals:-

1. Demonstrationofoperationsrelatedtolathe,shaper,slotter,drilling&grindingm/cs.
2. Onejobonlathecoveringtaperturningandthreading.
3. Onejobonshapingcoveringplaneandinclinedsurfaces.

Theabovejobsshouldincludedrilling,grinding, tappingetc.Termworkshouldbesubmittedintheformofjournal.

N.B.:-

Thepracticalexaminationshallconsistsofpreparationofpracticaljobsandassessmentbyexternalandinternale xaminer.

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4ME04BASICELECTRICALDRIVESANDCONTROL

Course LearningObjectives:

1. Tostudytheworkingofelectricaldrivesandtheircomponents
2. Tostudythe basicsofDCmotorsandtheircharacteristics
3. TostudytheworkingofACmotors,Inductionmotorsandconceptofbraking
4. Tostudythedifferentspeedcontrolmethodsof A.C.and D.C.motors
5. Tostudyanddesignoftransducersandtheirapplications
6. Tostudytheindustrialapplicationsofdifferent drives

CourseOutcomes:

Studentswillbeableto-

1. Understandtheworkingofelectricaldrivesandtheircomponents
2. UnderstandthebasicsofDCmotorsandtheircharacteristics
3. UnderstandtheworkingofACmotors,inductionmotorsandconceptofbraking
4. UnderstandthedifferentspeedcontrolmethodsofA.C.andD.C.motors
5. Understandthedesignoftransducersandtheirapplications
6. Understandtheindustrialapplicationsofdifferentdrives

SECTION-A

Unit I : Conceptofgeneralelectricdrives,classification and comparisonof electrical drive system,Coolingand heatingofelectricmotors.Introductiontomechatronics,Theoryand principleofPowerTransistor,SCR.**(**8Hrs**)**

Unit II : Basic characteristics ofD.C.motor,Torqueequation,Modifiedspeed–Torquecharacteristics.StartingandbrakingofElectricalD.C.motors,comparisonofmechanicalandelectricalbrakingmetho ds.Introduction,Principle,constructionandworkingofServomotors,steppermotors,BrushlessD.C.motors.**(**8Hrs**)**

Unit III : Classification of A.C. motors, construction, types, principle of working and characteristics of 3 phaseInduction motors, applications.Startingandbrakingof3phaseinductionmotors.Classificationofsinglephaseinductionmotors.construction,p rincipleandworkingandapplications.Principleandworkingofuniversalmotor. **(**8Hours**)**

SECTION-B

Unit IV : Conventional methods of speedcontrolof A.C.and D.C. motors.Thyristorizedstatorvoltagecontrolof3phaseinductionmotor,(v/f)controlmethod,slip-powerrecoveryscheme.ThyristorizedarmaturevoltagecontrolofD.C.motorsusingphasecontrol&Thyristorizedchopper. **(**8Hours**)**

Unit V : Basic principle, construction & applications of sensors and transducers, contact - non- contact type, opticalproximitysensors. Switches, contact type, magnet type,electromagnetic type, sound, light,pressure,vibrationtransducers,Halleffect-sensorsA.C./D.C.Tachogenerators. **(**8Hours**)**

Unit VI: Industrial applications - classes of duty selection of an electric drive forparticular applications such as steel mill,papermill,cementmill,textilemill,sugarmill,electrictraction,coalmining,etc.Inductionheating,surfacehardening&Dielectricheating. **(8Hours)**

BOOKSRECOMMENDED:

TextBooks:

1. AFirstCourseonElectricalDrives-S.K.Pillai.
2. BasicElectricalTechnology(Vol.11) -B.L.Theraja

Reference Books:

1. DrivesandControl-N.Dutta
2. Mechatronics-W.Bolton,Addison Wesley,LongmanLtd.
3. ACourseinElectrical,ElectronicsMeasurement andInstrumentation,ByA.K.Sawhney,Dhanpat Rai &Sons,

4ME09BASICELECTRICALDRIVESANDCONTROL-LAB

ListofExperiments:

AnyEIGHTpracticalsfromthefollowinglist:

1. TostudytheSpecificationof VariousElectricalMachines.
2. TostudytheD.C.MotorStarters.
3. TostudytheRunningandReversingofD.C.Motor.
4. SpeedMeasurementsusingMagneticPick-up.
5. TostudytheSpeedreversalofcounterCurrentBreakingof3-phaseInductionMotor.
6. TocontrolthespeedofD.C.Motorbya)ArmatureControlb)FieldControl.
7. ToperformLoadTestonInductionMotor.
8. Tostudy Dynamic/RheostaticBreakingofD.C.Motor.
9. TostudyCharacteristicsofThyristor.
10. Tostudythespeed-TorqueCharacteristicofServoMotor.

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4ME05 HYDRAULICANDPNEUMATICSYSTEMS

CourseLearningObjectives:

1. Togetfundamentalbackgroundabout thehydroelectricpowerplants
2. Tostudyoperation,working principle&performancecharacteristicsof hydraulicturbines
3. Tostudyoperation, workingprinciple&performancecharacteristicsofcentrifugalpump,reciprocatingpumpandother hydraulicpumps
4. Tostudythebehaviorofcompressiblefluidflow
5. Tostudydifferenthydrostatic&hydrokinematicsindustrial applications

CourseOutcomes:

Studentswillbe ableto-

1. Demonstratebasicconceptsofprimemoversandturbines
2. Utilizetheknowledgeofcentrifugalandreciprocatingpumpsforapplications
3. Revealtheimportanceofotherwaterliftingdevices
4. Solvethe elementarytreatmentoncompressible fluidflow
5. Understandtheconcept ofhydrostaticandhydrokineticsystems
6. Usetheknowledgeofhydraulics&pneumaticsindevelopingprojectwork.

SECTION-A

UnitI: HydraulicTurbines-
Theoryofimpulseandreactionturbines.Pelton,FrancisandKaplanturbines,theirconstruction,classification,analysis, characteristicsandgoverning,drafttube. (10Hours)

UnitII:Centrifugalpumps:-
BasicTheory,classification,construction,operation,characteristics,multistage,NPSHandcavitationsinpumps. (7Hours)

UnitIII:

1. Axialflowpump:-Basictheory,construction,&operation.
2. Other waterliftingdevices:-(a)Airliftpump.(b)JetPump.(c)HydraulicRam.
3. ComputationalFluidDynamics(CFD)
4. IntroductiontoCFD: Necessity, limitations,philosophybehindCFD,applications (6Hours)

SECTION -B

UnitIV: PositiveDisplacementandotherPumps:Reciprocatingpumptheory,Slip,Indicatordiagram,Effectofacceleration, airvessels. Comparisonofcentrifugalandreciprocatingpumps,performancecharacteristics.(9Hours)

UnitV: Compressiblefluidflow:-
Perfectgasrelationship,speedofsoundwave,machnumber,Isothermalandisotropicflows,shockwaves. (8Hours)

UnitVI: Hydraulicaccumulator,Hydraulicintensifier,HydraulicPress,hydrauliccrane,hydrauliclift,hydrauliccoupling,h ydraulictorqueconverter. (8Hours)

BOOKSRECOMMENDED :-

TextBooks:-

1. CSPOjha,R.Berndtsson,Fluidmechanicsandmachinery;OxfordUniversity.
2. BansalR.K.,Fluidmechanicsandfluidmachines;Laxmipublications.

ReferenceBooks:-

1. JagdishLal,Hydraulicmachines;MetropolitanBookCo.Pvt.Ltd.
2. Dr.Modi &Seth,HydraulicsandFluidMechanics;Standardhousebook.
3. Sengupta,Computationalfluiddynamics;PearsonPublishers.
4. Sameersheikh,IliyasKhan,TreatiesonHydraulics;Pneumatics,R.K.Publication.

4ME10 HYDRAULIC&PNEUMATICSYSTEMS -LAB

ListofPracticals:-Atleast**SIX**(6)practicalsbased onfollowing:

1) Trial/StudyofPeltonwheel
2) Trial/StudyofFrancisTurbine
3) Trial/StudyofKaplan Turbine
4) Trial/Studyofcentrifugalpump
5) Trial/Studyofreciprocatingpump
6) Trial/Studyofaxialflowpump
7) Trial/Studyofhydraulicram
8) Trial/Studyofmultistagepump
9) Trial/Studyofspecialpumps(airliftpump/jetpump)
10) Trial/StudyofGearpump
10) AnyonepracticalbasedonCFDsoftware

Note: PracticalExamination:PracticalexaminationshallconsistofVivaVoce/performancebasedonabovesyllabus &practicalwork.

SYLLABUSPRESCRIBEDFORSEMESTERV&VIOFB.E.(MECHANICALENGG.)

SEMESTER–V

5ME01HEATTRANSFER

CourseLearningObjectives(CLOs):

1. Toprovidedetails ofheattransferinvolvingconduction,conventionandradiation mechanisms.
2. Tocarryoutheattransferanalysisandtodemonstratedifferenttechniquesusedinsolvingaheattransferproblem.
3. Toimpartbasicsofdesigningheattransferequipment.

CourseOutcome(COs) :

AttheendofHeatTransfercoursethestudentwillbeableto:

1. Solvesteadystateheattransferproblemsof1-Dheatconduction withand withoutinternalheatgeneration.
2. Designandtoanalyzetheperformanceofextendedsurfaces.
3. ApplyLumpedheatcapacitymethodforanalysisofunsteadystateheattransfer.
4. Explainthelawsofradiationanditsapplications.
5. Predictheattransfercoefficientsforforcedandfreeconvectionheattransferappliedtointernalandexternalflowc onditions.
6. Designandanalyzetheperformanceofheat exchangersusingNTUandLMTDmethods.

UNIT- I: Introduction, heat transfer in engineering, modes of heat transfer, basic laws of heat transfer and their basicequations. Conduction-thermal conductivity and thermal diffusivity effect of phase &temperature onthermal conductivity, one dimensional steady state heat conduction through slab, cylinder & sphere-

simpleandcomposite.Combinedconduction-convection,overallheattransfercoefficient.Generalheatconductiondifferentialequation.Onedimensionalsteadystateconductionwithinternalheatgenerationforinfiniteslab,wire&cylinder. **(**8Hrs**)**

UNITII: Insulations,criticalradiusofinsulation,Conductionthroughextendedsurfaces,analysis ofauniform C.S.fin,finefficiency,fineffectiveness,Biotnumber.Introductiontounsteadystateheatconduction,Newton's lawofcooling, lumpedheatcapacityanalysis. **(8Hrs)**

UNITIII: Radiation-generalconceptsanddefinitions,blackbody&greybodyconcept.Lawsofradiation -Kirchoff'sPlank's,Stefan-Boltzman's,Wien'slaw.Conceptofshapefactor,emissivityfactorandradiationheattransferequation.(Nonumericals).Radiationerrorsintemperature,measurement,radiationshield.(7Hrs)

UNITIV: Forcedconvection-heatconvection,forcedandnaturalconvection,boundarylayertheory,hydrodynamic&thermalboundarylayers,boundarylayerthickness.Laminar&turbulentflowoverflat plate and through pipes & tubes (only concept, no derivation & analytical treatment). DimensionlessnumberandtheirphysicalsignificanceReynold,Prandtl,Nusselt,Grashoffnumber,empirical correlations for forced convection for flow over flat plate, through pipes & tubes & their applications inproblemsolving.**(8Hrs)**

UNIT V: Free convection- velocity and thermal boundary layers for vertical plate, free convection over verticalcylinder and horizontal plate/cylinder (only concept, no derivation & analytical treatment). Use ofempirical correlations in problem solving. Condensation & Boiling - introduction to condensation heattransfer,film&dropcondensation.Boilingheattransfer,poolboilingcurves. **(7Hrs)**

UNITVI: Heatexchanger-applications,classification,overallheattransfercoefficient,fouling.L.M.T.D.&E.N.T.U.methods, temperature profiles, selection of heat exchangers. Introduction to working of heat pipe withandwithoutwick. **(7Hrs)**

BooksRecommended:

TextBooks:-

1. HeatandMassTransfer;R.KRajput;S.Chand,NewDelhi.
2. HeatandMassTransfer;V.M.Domkundwar;Dhanpat Rai&Co.Delhi.
3. HeatTransfer;A.F.Mills,V.Ganesan,PearsonPublication.

ReferenceBooks:-

1. HeatTransfer;J.P.Holman;McGrawHill
2. HeatTransfer;P.K.Nag;TMH.
3. HeatandMassTransferDatabook,V.M.Domkundwar,DhanpatRai&Co.
4. HeatandMassTransferDatabook;C.P.Kothandaraman;Newage International.

5ME02METROLOGY &QUALITY CONTROL

CourseLearningObjectives:

1. Tostudygeneralizedproductiontechnology, applications, generalconfigurationandfunctionalelementsofinspectioninstruments.
2. Tostudyaboutqualityinproduction andservicesandqualitymanagement.
3. Tostudyapplicationofnondestructivetestforincreasingproductivityandefficiencyofthework.
4. Tostudydesign andapplications ofvariousgauges andcomparatorsusedininspection.
5. Tostudyvarioustechniquesfortheinspection ofgearsandthreads.
6. Tostudyvarioustechniquesforangularmeasurement,surfacetexturemeasurement,andgeometricfeaturesmeasurement.
7. Tostudyadvance inspection techniquesCMM,profileprojectoretc.

UNIT I : Concept of quality and quality control, quality of design and quality of conformance, Qualitycharacteristics, Cost of quality & Value of quality,Specification of quality, quality control &inspection.
Concept of TQM & Quality assurance, Concept of variation, variable and attribute data, Frequencydistribution, Measures of Central tendency - Mean, mode & median, Measures of dispersion. -Range,std.deviation&variance. (8**Hrs**)

UNIT II : Concept of universe and population, Normal distribution curve; Control charts for variables, processcapability, Control charts for attributes; comparison between variable charts and attribute charts;precision&accuracy,Samplingplans,OperatingCharacteristiccurve,Qualitycircle(7**Hrs**)

UNIT III : Introduction to Non-Destructive testing, Ultrasonic testing, X-ray or Radiography Testing, LiquidPenetrant testing, Magnetic Particle Testing, Eddy current testing, it's applications, Advantages &Disadvantages. (7**Hrs**)

UNIT IV : Standards of measurements: line standards, end standard, wave length standard. Limits, fits andgauges: terminology of limits, Fits and gauges, concept of interchangeability, allowance tolerance,Indian Standard Specification forlimits,fits andgauges,B.S.System.Limitgauging-designofGo,NoGogauges. (8**Hrs**)

UNITV: Linearmeasurement:variouscomparatorssuchasmechanical,electrical,optical,pneumaticcomparators,theirprinciple,operationsandapplications.
Angular measurements: vernier, optical, bevel protractor universal bevel protector, Sine bar levelclinometers, taper gauges. Thread measurement: screw threadlimitandfit limitsgaugingofscrewthreads (8**Hrs**)

UNIT VI : Gear measurement : alignment error, master gear, Parkinson tester. Study and use of optical dividinghead, auto collimator, toolmakers microscope. Interferometry,flatness testing, squareness testing.Surfacetexturetesting.Coordinatemeasuringmachine-types,roleandapplication. **(7Hrs**)

BooksRecommended:

TextBooks:

1. EngineeringMetrology–R.K.Jain-KhannaPublishers.
2. StatisticalQualityControl-M.Mahajan–Dhanpatrai&Co.Pvt.Ltd.
3. NonDestructiveTestingtechniquesbyRaviPrakash, NewAgePublications.

ReferenceBooks:

1. QualityControl-ByJuran- Mc.GrawHillPub.Company.
2. StatisticalQualityControl-ByGrantE.L.–R.S.L.LeavgenWorth-.Mc.GrawHillPub.Company
3. StatisticalQualityControl-ByGupta-Dhanpatrai&Com. Pvt.Ltd

5ME03KINEMATICSOFMACHINES

CourseLearningObjectives:

1. TogetthebasicKnowledgeabout themechanismusedinautomobiles,industrialmachinesetc.
2. Tostudyaboutthesynthesisandanalysisofthe mechanismusedinmachines.
3. Togettheoperationalknowledgeaboutthepowertransmittingdevicesusedinautomobiles.
4. Tostudythedesigningandimportanceofcamsinmachines.
5. Tostudythemosteffectivepowertransmissiondeviceusedinautomobiles,industrialequipment,toys,etc.

CourseOutcomes:

Students willbeableto-

1. Understand&applytheconceptanditsapplicationsoflink,mechanismsandmachines.
2. Demonstratetheabilitytoanalyzethemechanismsandmachinesonthebasisofvelocityandaccelerationandtheywills howtheabilitytosolve analyticalmethods.
3. Show the ability to use graphical and analytical methods for synthesis of mechanisms to develop mini projects inthecourseduration.
4. Understandthepractical forstudyofbrake,clutch,dynamometer,geartrainetc.

Unit I: 1. Introduction to study of mechanisms, machines, different types of links, kinematic pairs. Grashof's law-class-Iandclass–IImechanisms. Grubler'scriterion,Kutzbach'scriterionfor planermechanism.Inversionsoffourbar, single slider, doubleslidermechanisms.

2. Transmission angle, Mechanical Advantage, Transmission angle and Mechanical Advantage of 4-barmechanism. **(7Hrs)**

UnitII:1.**Velocityanalysis**:-Relativevelocitymethod,methodofequivalentmechanisms,Instantaneouscentreofrotationmethodfor4-barmechanism, bodyandspacecentroids.

2.**Accelerationanalysis**:-Relativeaccelerationmethodandanalyticalmethod. **(8 Hrs)UnitIII:SynthesisofMechanisms**:-Introductiontotype,numberanddimensionalsynthesis,graphicalmethodof twoposition,threepositionandfourpositionsynthesisforinputoutputcoordination,Freudenstien'sequation, Bloch'smethod. **(7Hrs)**

Unit IV: Frictional torque in pivot and collar bearing. Clutches and Dynamometers: types, constructional details,operation. **(7Hrs)**

Unit V: Special purpose mechanisms:- Steering mechanisms, Geneva wheel mechanism. **Cams**:-Introduction,types of cam & follower, different motions of followers, graphical layout of cam profiles, cam with specifiedcontours. (8Hrs)

UnitVI:1.**Gear**:Introduction,terminology,geartooth profiles,lawofgearing,involumetry,interferenceofspurgears,minimumnumberofteethtoavoidinterference.

2.**GearTrains**:-Typesofgeartrainsanditsspeedratioapplications. **(7 Hrs)BooksRecommended:**

TextBooks:

1) TheoryofMachines,P.L.Ballaney,PublishedbyDhanpatRaiandsons-NDelhi.
2) TheoryofMachines,S.S.Ratan,PublishedbyTataMcGrawHill.
3) TheoryofMachine,R.S.Khurmi andGuptaJ.K.,PublishedbyEurasiaPublishinghouse-NDelhi.

ReferenceBooks:

1) TheoryofMachinesandMechanisms,J.E.Shigley,UickerandGordon,PublishedbyOxfordUniversitypress-NewYork.
2) TheoryofMachines,V.P.Singh, PublishedbyDhanpatRai-NDelhi.
3) TheoryofMachinesand Mechanisms,GhoshandAmitabh,PublishedAffiliatedEastWestPress,N-Delhi.

5ME04MEASUREMENTSYSTEMS

CourseLearningObjectives:

1. Tostudythegeneralizedmeasurementsystemandthegeneralperformancecharacteristicsofmeasuringinstruments,applications,generalconfigurationandfunctionalelementsofmeasuringinstruments.
2. Tostudythestraingauges,theirtypes,straingaugecircuitsforstrainmeasurementandtostudythepressuremeasurementmethodsanddevices
3. Tostudythetypes,constructionaldetailsandworkingofforce,torqueand flow measuringdevices.
4. Tostudythedifferent types of temperaturemeasuring devices, standards, construction detailsandtheirworkingandtostudythedifferenttypesofliquidlevelmeasuringdevices.
5. To study the mechanical andelectricaltypesofspeedmeasuringdevices,contactandcontactlessspeedmeasuringdevicesandtheirapplications.
6. Tostudythemethodsofvibrationsmeasurementandmethods of linear and angulardisplacements.

CourseOutcomes:

AttheendofMeasurementSystemcourse,thestudentwillbeableto:

1. Analyzedifferentmeasurementsystems.
2. Calculatedifferenttypesoferrorsinthemeasurementsystem.
3. Usestraingaugesandpressuremeasurementdevices for severalapplications.
4. Comparedifferentmethodsofforce, Powerandflowmeasurementusingdifferentmethods.
5. Selectappropriateliquidlevelandtemperaturemeasurementdevicesforgivenapplications.
6. Measurespeedofmotorsandrotatingshaftsbyusingtachometers,stroboscope.

UNITI:1.GeneralizedMeasurementsystem:Significanceofmeasurement,generalizedsystems.applicationofmeasuringinstruments.Typesofmeasuringinstruments.

2.Generalconfigurationandfunctionalelementsofmeasuringinstruments,typesofinputs,variousmethodsofcorrectionforinterferingand modifyinginputs. (6Hrs)

UNITII:GeneralperformanceCharacteristics:-

1. Static characteristics, different types of errors, combination of component errors in overallsystems.
2. Dynamic characteristics: General mathematical model of zero order, first order and secondorderinstruments,responseoffirstandsecondorderinstruments to followinginputsstep,ramp,impulse andfrequency. (8Hrs)

UNITIII:StrainMeasurement:

1. Types of strain gauges, strain gauge circuits, calibration, Temperature compensation, use of straingaugesonrotatingshafts,selectionandinstallationof straingauges.
2. PressureMeasurements:- Basicmethodsofpressuremeasurement:straingaugepressurecell,Highpressure measurement Bridgeman type, low pressure Measurement - Mcleod, Knudsen, ionisation,Thermalconductivitygauges. **(8Hrs)**

UNITIV:1.ForceMeasurement:Variousmechanical.Hydraulic,pneumaticandelectricalmethods.

2. TorqueandPowerMeasurements: Variousmechanical,hydraulic&electricmethods.
3. Flow Measurements: Construction- orifice, Rota meter. Pressure probes- Pitot static tube, turbinemeter,electro-magneticflowmeter. **(6Hrs)**

UNIT V :1. Temperature Measurements:Standards,Varioustemperaturemeasuringdevices,Bimetallicstrip, pressure thermometers,thermo couples, electrical resistancethermometers, Thermistors,radiationThermometers.

2.LiquidLevelMeasurements:Variousmethodssuchas-singlefloat,displacementorforcetransducers.Pressuresensitivity,bubbleorPagesystem,capacitancevariationtype(forboth conductingandnonconductingtypeliquids)Resistancevariationtype. **(8Hrs)**

UNITVI:1.SpeedMeasurements:Variousmechanicaltypetachometers,electricaltypestachometers,stroboscopeetc.

2. VibrationMeasurements:Seismic,Straingaugeandpiezoelectricaccelerometers.
3. Displacementmeasurements:Linearandangulardisplacementmeasurements,LVDT,LDR,Capacitive &inductivepickups. **(8**Hrs)

BOOKSRECOMMENDED:

TextBooks:-

1. MeasurementSystems:-ByErenestO.Doebelins-MCGrawHill.
2. MechanicalMeasurement&Control:ByD.S.Kumar.

ReferencesBooks:-

1. MechanicalMeasurements:-ByT.G.Beckwith&N.L.Bulk-AddisonWerllv.
2. InstrumentalMeasurement&Analysis:ByNakraChoudhariTataMcGrawHill.
3. MechanicalMeasurement&Instrumentation:ByR.K.Rajput,KatsonsBooksPublications.

5ME05OPENELECTIVE-I(1)PRODUCTIONMANAGEMENT

CourseLearningObjectives:

1. Tostudythenewproductdesign&manufacturingprocesstechnology.
2. Tostudytheobjectives offorecasting, factorsaffectingforecasting.
3. Tostudymethodstudy,workmeasurement.
4. TostudyobjectivesandfunctionsofProductionPlanningand Control.
5. Tostudyinventorycontrol&inventorycontrolapplication
6. Tostudyqualitymanagement,qualityrelated costs,qualityfunctiondeployment&totalqualitymanagement.

CourseOutcomes:

1. Applytheknowledgeofoperationsmanagementanditsapplicationsinindustrialenvironment.
2. Demonstratetheknowledgeofadvanced manufacturingtechnologiesandphilosophies.
3. Students willdemonstratetheimportanceofinventorycontrol, JITinmanufacturing.
4. Applythebasic conceptofqualitymanagement, TQM etc.

UNIT I: Designing products, services and processes; Historical evolution of productions and operationsmanagement,newproductdesigns,manufacturingprocesstechnology. Flexiblemanufacturingsystems(FMS)andcomputerintegratedmanufacturing(CIM). **(9Hrs.)**

UNITII:SalesForecasting: Objectives,typesofforecasting,factorsaffectingforecasting,processofsalesforecasting,methodsofsalesforecasting. **(7Hrs.)**

UNITIII:Workstudy:methodstudy,recordingtechniquesofmethodstudy,principlesofmotioneconomy.Workmeasurementtechniques. **(7Hrs.)**

UNIT IV: Production planning and control: Objectives and functions of PPC, types of production systems,principlesofsoundproductioncontrolsystem. **(7Hrs.)**

UNIT V: Inventory Control: Demand and control system characteristics, inventory concepts, costs Modeling,Deterministic inventory models, stochastic inventory models, inventory control application, just-in-timemanufacturing. **(7Hrs.)**

UNITVI: QualityManagement:Qualityandqualityrelatedcosts,qualityfunctiondeployment(QFD),Taguchi'soff-linequalitycontrolmethods,managerialresponsibilityinmanagingforqualityproducts&services.TQM.Failureanalysis,bathtubcurve,Reliabilityofsystem.**(8Hrs.)**

BooksRecommended:

TextBooks:

1. Productionandoperationsmanagement-conceptsmodelsandBehaviourbyEverettE.Adam,Jr.,&Ronald J. Ebert(Prentice-HallofIndia)
2. Industrialengineering&productionManagementbyM.Mahajan(DhanpatRai&Co.)

ReferencesBooks:

1. Productionandoperationsmanagement– TotalQualityandresponsivenessbyHamidNoori&RussellRadfort(McGrawHill, Inc.)
2. Industrialengineering&managementbyO.P.Khanna(DhanpatRai&Co.)
3. Production andOperationsManagement;J.P.Saxena;McGrawHill.

5ME05OPENELECTIVE-I

(2)MANUFACTURINGTECHNIQUES

CourseLearningObjectives:

1. Tostudythefundamentalsofdifferentmanufacturingprocessesandvariousactivitiesinmanufacturing.
2. Tostudythefundamentalsofmetals&alloys,propertiesofengineeringmaterialslikeferrous,non-ferrousmetalsandtheiralloys
3. To study different machine tools. cutting tools used in machine shop , various operations performedwithworkingprinciplesofthese machinetools
4. Tostudytheactivitiesrelatedtomechanicalworkingofmetals,varioushot working&cold workingoperations fundamentals of metal forming ; sheet metal working processes with different tools andequipment
5. Tostudythenecessarydetailsregardingpattern making,moulding,coremakingandcastingwith foundrytools&equipment,alsomeltingpracticebycupolafurnace.
6. To study differentJoining processes,basicterms ofwelding processestikearc welding,gas welding,resistancewelding.frictionwelding, soldering;brazingprocesseswithtools&processes.
7. Tostudythemethodsofproducingmetalpowders
8. Tostudyplasticpartmanufacturingbydifferentprocesseslikeextrusion.Injection,blow,compression,andtransfermouldingprocesses.

CourseOutcomes:

1. Applytheknowledgeofvariousmanufacturingtechniquesanditsapplicationsin engineering.
2. Understandtheknowledgeofmachiningoperations,sheetmetalworkingandprocesses.
3. Students willshowtheabilitytoapplyvariousjoiningmethodsinpractice.
4. Studentswillexhibittheknowledgeofpowdermetallurgy.

Unit I : Overview of manufacturing: Classification of manufacturing processes, selection ofmanufacturingprocesses,types&propertiesofmaterials,selectionofmaterials,Introductiontoconventionalandnon-conventionalmachiningprocesses. (6Hrs)

Unit II : Introduction to cutting type shaping processes, Basic concept of metal cutting, Types of cuttingtools,Orthogonal&obliquecutting,GeneralpurposemachinesVsSpecialpurposemachines.(8Hrs)

UnitIII: Introduction&applicationofvariousmetalcuttingoperations– Turning,drilling,boring,milling,shaping,planningandgrindingprocess. (8Hrs)

Unit IV: Introduction to metal forming and sheet metal process: Forming process- Forging, rolling,extrusion, wire drawing. Sheet metal processes- Forming, bending, drawing, coining, embossing. Cuttingprocess:Punching,blanking,shearing,lancing. (7Hrs)

Unit V : Metal casting: Steps involved in casting, advantages of casting, pattern, difference between patternand casting, pattern allowances, material used for patterns, molding sand, sand mould making core, types ofcores,defectsofcastings,meltingfurnace(Cupola),castingprocessanditsapplications. (6Hrs)

UnitVI:Joiningprocesswithitstypes,advantagesanddisadvantagesofriveting,soldering,brazing.Arcwelding,gaswelding,resistancewelding,friction welding. (6Hrs)

BooksRecommended:

TextBooks:

1. Manufacturingprocesses–Workshoppractice,R.A.Khan,AliHassan,ScitechPub.
2. WorkshopTechnology-HajraChaudhary, DhanpatRaiandSons.

ReferenceBooks:

1. ProcessesandmaterialsofmanufactureE.P.Degarmo,PrenticeHallofIndia(PHI)
2. MaterialandprocessesinmanufacturingLindberg,TataMcGrawHillPub.

5ME06HEATTRANSFER-LAB.

Courselearningobjective: Thelabworkshouldclearthevisionaboutallthe modesofheattransfer.Thepracticalknowledgeshould enhancetheapproach ofstudent towardsreallifeapplicationsofthesubject.

CourseOutcomes:

Uponsuccessfulcompletionoflab Course,studentwillbeableto:

i) Understandvariousmodesofheattransfer
ii) evaluatevariousparametersoftheheattransferprocess

ListofPracticals(Anysixofthefollowing):-

1. Determinationofthermalconductivityofametalbar.
2. Determinationofthermalconductivityofinsulatingpowder.
3. Studyofheattransferthroughcompositewall.
4. Studyofheattransferthroughcompositecylinders.
5. Determinationoffinefficiency.
6. VerificationofStefan-Boltzman'slaw.
7. Determinationofemissivityofgreybody.
8. Determinationofheattransfer coefficientforforcedconvection.
9. Determinationofheattransfercoefficientfornaturalconvection.
10. Studyofpool&nucleate boiling.
11. Trialondoublepipeheatexchanger.
12. Determinationofefficiencyofcrossflowheatexchanger.
13. Towriteacomputerprogramforconductionheattransferproblem.

PracticalExamination:-Thepracticalexaminationshallconsistoforalonthetermworkandsyllabus.

5ME07METROLOGY&QUALITYCONTROL-LAB.

Courselearningobjective:

The course aims at understanding the principles of metrology for precision measurement of various mechanicalcomponents using various measuring tools. Students shall also learn to use standard practices and standard data,learntousestatisticalconcept,controlchartforvariables,controlchartforattributes.

CourseOutcomes:

Uponsuccessfulcompletionoflab Course,studentswillbeableto:

i) Explaintheprinciplesinvolvedinmeasurementandinspection.
ii) Selectanduseappropriatemeasurementinstrumentforagivenapplication
iii) Applythe basicsofsamplinginthecontextofmanufacturing

Practicals: Atleastsixfromthebelowlist.

1. Determination of Lineardimensions of a given specimen/partusingPrecision/Non-PrecisionMeasuringinstruments.
2. DeterminationofAngularMeasurementusingPrecision/Non-PrecisionMeasuringinstruments.
3. MeasurementofGearToothThicknessbyGearToothVernierCaliper/ConstantChord/SpanMicrometer.
4. MeasurementofCircularity/Roundnessofagivenspecimen.
5. MeasurementofScrewThreadElementbyFloatingCarriage Micrometer.
6. Testingof SurfacesbyusingOpticalFlat.
7. Measurements of various angles of single point cutting tool by usingProfile Projector and Tool Maker'sMicroscope.
8. PreparationofVariableControlChartsforthegivenlotofsample.
9. PreparationofAttributeControlChartsforthegivenlotofsample.

PracticalExamination:-Thepracticalexaminationshallconsistoforalontermwork.

5ME08KINEMNATICSOFMACHINES-LAB.

Course Learning Objectives: Objectives of this lab are to impart practical knowledge on design and analysis ofmechanisms for the specified type of motion in a machine. With the study of rigid bodies motions and forces for thetransmissionsystems,machinekinematics canbewellunderstood.

CourseOutcome: Onsuccessfulcompletionofthecoursestudentswillbeableto:

Designlinkage,camandgear mechanisms foragivenmotionoragiveninput/output motionorforcerelationship,identify the basic relations between velocity & acceleration and use graphical and analytic methods to study themotionsofvariousmechanisms

Practicals:-*Atleasteightpracticalsfromthebelowlistshallbeperformed.*

1. ToStudy,Analyseanddrawingofinversionsoffourbarmechanismtoidentifythetypesandnumber oflinks,typesofmotionanditsmodeoffixingarrangementfor therequired application.
2. ToStudyandanalyseofinversionsofslidercrankmechanismusingworkingmodelsandgraphicalrepresentationstofindtype &numberkinematicpair, typeofjointand Degreeoffreedom.
3. To Study and analyse of inversions of doubleslider crank mechanism using working models and graphicalrepresentationstofindtype& numberkinematicpair,typeofjointandDegreeoffreedom.
4. TodetermineVelocityandaccelerationoflinksinmechanism byrelativevelocitymethod.(2Problem)
5. To determine Velocity and acceleration of Piston of a reciprocating engine by clein's construction method.(2Problem)
6. To findbrakingforce,brakingtoqueofinternalexpandingandexternalexpandingbrake.

7. Tostudy,understandand observetheactualworkingand functionofeachpartofsingleplateclutchbydismantlingandassembling.
8. Tostudy,understandand observetheactual workingandfunctionofeachpartofcentrifugalclutchbydismantlingandassembling.
9. Studyofdynamometers.
10. TodrawCamprofileforagivenfollowertypeandfollowermotion.(2Problem.)
11. ToStudyandfindtrain valueandspeedratioofvarioustypes ofgeartrains
12. TostudyanddrawingofSimplefourbarMechanismusingpositionsynthesis.
13. ToStudyanddrawing offourbarmechanism byinput-outputcoordinationmethodsusingBloch's Synthesisand Freudenstein'sequation.
14. Tostudyinterferenceandundercuttingofspurgearpairusinggraphicallayout.
15. TostudyanddrawingofGenerationofInvoluteandCycloidalSpurGearToothProfile.Thepractica lexaminationshallconsistofviva-voceontheabovesyllabus&practicalwork.

5ME09MEASUREMENTSYSTEMS-LAB.

CourseLearningObjectives:

i) Tostudyvarioussensersandmeasuringinstrumentsrequiredtomeasurevariouspropertiesand quantitiesoccurringinatypicalengineeringsystem.
ii) Tounderstandgeneralperformancecharacteristicsofmeasuringinstruments,applicationsand general configurationofthemeasuringinstruments.

CourseOutcomes: Uponcompletionofthiscoursestudentswillbeableto:

i) Chooseappropriatemeasuringdeviceformeasurementofvariousquantities
ii) Analysetheperformanceofvarious
iii) Analyseandexecutethecalibrationprocessformeasuringinstruments

ListofPracticals:

Atleasteightpracticalsfromthefollowinglist:

1. Measurementofstrainusingstraingauges.
2. Calibrationofpressuregaugewithpressuregaugetester.
3. MeasurementoflineardisplacementbyLDRandinductivepick-uptransducers.
4. Performanceofcapacitancetransducerasanangulardisplacementmeasuringdevice.
5. PerformanceofinductiveTransducers.
6. MeasurementofflowusingopticalflowmeterandR otameter.
7. Speedmeasurementbyastroboscope.
8. Speedmeasurementbymagneticpickuporphotoelectricpickuptachometer.
9. Pressuremeasurementbystrainsgaugetypetransducer.
10. Vibrationmeasurement byusingSeismicTransducer.
11. MeasurementofLiquidlevelbyusingcapacitivepickuptransducer.
12. Temperaturemeasurementusingcontactandnoncontacttypeinstrumentsorvarioustypesofsensors.

*Thepracticalexaminationshallconsistofviva-voceontheabovesyllabus&practicalwork.

SEMESTER:SIXTH

6ME01DESIGNOFMACHINEELEMENTS

CourseLearningObjectives(CLOs):

1. Tostudytheconceptofstressesandunderstandthedesignprocedureofrivetedandweldedjoints.
2. Tostudydesignprocedureofknucklejoint,springsandpowerscrew.
3. Toanalyze&selecttypesofshafts, keys,couplingsforvariousmachinesandindustrialapplications.

COURSEOUTCOMES(COs):

1. Understandtheconceptofvariousstressesandapplythedesignproceduretorivetedjointsandweldedjoints.
2. Understanddesignprocedureofknucklejoint,springsandpowerscrew.
3. Analyze&selecttypesofshafts, keys, couplingsfor variousmachinesandindustrialapplications.
4. Analyzethevarioustypesofbearingsandunderstandthedesignprocedureof ICEngineparts.

UnitI:

(A)Meaningofdesign,Phasesofdesign,Simplestresses,Thermalstresses,ImpactStress,Torsionalstre ss,bendingstressesinstraight&curvedbeams,it'sapplications,Hooks,C-clamps.
(B) RivettedJoints-Design,failures, strength&efficiencyofrivetedjoint.
(C) WeldedJoint-Strength,oftransverse&parallelfillet weldedsection. **(11 hrs)**

UnitII:(A)Designofknucklejoint.
(B) Designofspiral &leafspring.
(C) Design of power screw- Torque required to raise loads, efficiency & helix angle, overhauling &selflockingofscrew, ACMEthreads,stressesinpowerscrews. **(11hrs)**

UnitIII:(A)DesignofShaft–Subjectedtotwisting,bending&combinedtwisting&bendingloads,basedonrigidity.
(B)Designofcoupling,rigidcoupling,sleeve,muffcoupling,flangecoupling&flexiblecoupling. **(**11 hrs**)**

UnitIV:(A)Antifrictionbearing:Typesofbearing,construction,lifeofbearings,selectionofbearings.
(B) Journalbearing:Lubrication,selectionoflubrication,designprocedure&numerical.
(C) DesignofICEngineparts:Connectingrod,designofflywheelbasedonTMdiagram.**(11hrs)**

BooksRecommended
:-TextBooks:

1. MachineDesignbyDr.P.C.Sharma&dr.D.K.Agrawal,KatsonsPublicationsLtd.
2. MachineDesignbyR.K.Jain,KhannaPublisher‘s
3. MachineDesign,R.S.Khurmi,J.K.gupta,EurasiaPublications,NewDelhi.
4. MachineDesignDatabookbyPSG,Coimbtore
5. MachineDesigndatabookbyMahadevan.

ReferenceBooks:-

1. DesignofMachineElementbyV.B.Bhandari,TataMcGrawHillPubluication.
2. MachineDesign–Jindal,PearsonPublication.
3. DesignofMachineElement–C.S. Sharma&KamleshPurohit,PHIPublication.

6ME02DYNAMICSOF MACHINES

CourseLearningObjectives:

1. TostudyStaticforce analysisandDynamicforce analysis ofplanemechanisms.
2. Todemonstratetheuseofgyroscopiceffectonship,aeroplane,fourwheelerandtwowheeler
3. Todeterminenatural frequencyvibrations.
4. Toseektheknowledgeofstaticanddynamicbalancing.

CourseOutcomes:

Students willbeableto:

1. Applybasicconceptofstaticforceanalysisandlubricationmechanism.
2. Understandtheknowledge ofdynamicforceanalysis analyticallyandgraphically.
3. Applytheknowledgeofspacemechanismandvehicledynamics.
4. Understandconceptoffreevibrationandforcevibration,conceptofTorsionalvibration.
5. Analyzetheconceptofbalancingofmachinery.

UnitI:1.Staticequilibrium,superstitionprinciple,Staticforceanalysisappliedtoplanemotionmechanisms,virtualw orkmethod,static forceanalysiswithout andwithfriction.

2.Theoryofhydrodynamiclubrication,boundarylubrication,filmlubrication,rollingfriction,performanceofbeari ng. (8Hrs)

UnitII:1.D‘AlembertsPrinciple.Engineforceanalysis-pistoneffort,thrustalongconnectingrod,sideofcylinder,onthebearings, crankeffortandturningmoment onthe crankshaft.

2. Dynamicequivalentsystemofconnectingrod.

3. Turningmomentdiagramsfortwostroke,fourstrokeandmulticylinderengines,fluctuationsofspeed&energy,Flyw heelrequirements. **(7Hrs)**

UnitIII:1.**Space mechanism**:-Gyroscope,gyroscopic effectasappliedtoship,aeroplane,four wheeler,twowheeler, universaljoint.

2.**Vehicledynamics**:-Coefficientofadhesion,resistancetovehiclemotion,relativedriveeffectiveness, brakingofvehicles. **(7Hrs)**

UnitIV: Typesofvibrations,elementsofmechanicalvibratingsystems,degreeoffreedominmechanicalvibratorysystem.

1. **Longitudinal vibrations**- Natural frequency of free longitudinal vibrations by equilibrium, energy and Rayleighmethod. Effect of inertia constraint in longitudinal vibrations. Damped vibrations with mass, spring and dash pot.Definitionsoflogarithmicdecrement,magnificationfactor,transmissibility,vibrationisolation.

2. **Torsionalvibration**-singlerotorsystems,TwoRotorsystem,threerotor system,gearedsystems. **(**8Hrs**)Unit V:** 1.**Transverse vibrations**- Natural frequency of free transverse vibrations. Effect of inertia constraints intransversevibrations.Naturalfrequencyoffreetransverse vibrationsduetopointloadanduniformdistributedloadactingoverasimplysupportedshaft.Frequencyoffreetransversevi brationsofashaft subjecttoanumberofpointloadsbyenergyandDunkerley‘smethod.

2.**Whirlingorcritical speedshaft**. (6Hrs)

UnitVI:Balancing:-
Balancingofrotatingmassesinsameanddifferenttransverseplanes,Partialbalancingofreciprocatingmasses &Studyofitseffect. **(**8Hrs**)**

BooksRecommended:

TextBooks:

1) TheoryofMachines,P.L.Ballaney,PublishedbyDhanpatRaiandsons-NDelhi.
2) TheoryofMachines,S.S.Ratan,PublishedbyTataMcGrawHill.
3) TheoryofMachines,V.P.Singh, PublishedbyDhanpatRai-NDelhi.
4) TheoryofMachine,R.S.Khurmi andGuptaJ.K.,PublishedbyEurasiaPublishinghouse-NDelhi.

ReferenceBooks:

1) Theory of Machines and Mechanisms, J.E.Shigley, Uicker andGordon, Published by Oxford Universitypress-NewYork.
2) TheoryofMachinesand Mechanisms,GhoshandAmitabh,publishedaffiliatedEastWestPressN-Delhi.

6ME03CONTROLSYSTEMENGINEERING

CourseLearningObjectives:

1. Tostudythebasicsofcontrolsystems andtheirmathematicalmodelingalongwithreductionmethods.
2. Studythebasic control actionsandIndustrial controllers.
3. Tostudytheanalysisofcontrolsystemswithrespecttotransienttimeresponseandtheirerrors.
4. Tostudythedifferentpneumaticcontrollers andprimemoversandtheiractions.
5. Tounderstandstabilityanalysis,frequencyanalysisbyusingbodeplot foranalyticalproblems.
6. Studyofimportantautomaticspeedcontrolsystems.

CourseOutcomes:

1. Understandthebasicsystemconceptandstudydifferenttypesofsystems.
2. UnderstandtheconceptTransient-Responseanalysisandwillapplyinnumericalmethods,theknowledgeofbasic control actionandindustrialcontrollers.
3. UnderstandtheconceptofStabilityandexhibittheknowledgeofrootlocusconcept.
4. Understandthe concept ofFrequencyResponse method and use bode diagram in solvinganalyticalproblems.

UnitI: Introduction system concept, open &closed loop systems, Mathematicalmodelsof physicalsystems,transferfunctions.Blockdiagramsreductionandsignalflowgraphs. (8 Hrs)

UnitII: BasiccontrolactionsandIndustrialcontrollers:- Classificationofindustrialautomaticcontrollers,controlactions,proportionalcontrollers,obtainingderivativeandintegralcontrolaction,effectsofintegralandderivativecontrolactiononsystemsperformance.(7 Hrs)

Unit III : Transient Response Analysis :- Introduction Std. Test signals, steady state response of first andsecondordersystemsforstop,rampandimpulseinput,transientresponsespecifications,steadystateerror&errorconstants. (7Hrs)

Unit IV: Concept stability, necessary condition for stability, Rauths stability criterion, Root locus concept,constructionofRootloci,systemswithtransporationlag. (8Hrs)

UnitV: FrequencyResponsemethods:-Introduction,concept ofBodediagrams. (7Hrs)

Unit VI : Study of important automatic speed control systems in machine tools,Primemovers,systemgenerators,etc.Analysisofperformancecharacteristics. (7Hrs)

BOOKS RECOMMENDED:-

TEXTBOOKS:

1. AutomaticControlEngineeringbyF.H.Ravan Mc-Graw-Hill.
2. ModernControlEngg.-byKatsuhikoOgata,PHI,.
3. ControlSystemEngg.-byNagrath& Gopal.

REFERENCEBOOKS:

1) AutomaticControlEngg.-byKuoB.C.&F.Golnaraghi,
2) ModernControlSystembyRichardC.Dorf,RobertH.Bishop,

6ME04PROFESSIONALELECTIVE-I(1)TOOLENGINEERING

CourseLearningObjectives(CLOs):

1) Tostudythebasicgeometriesofdifferentcuttingtools,chipformationmechanism,toolforceanalysisetc.inmetalcutting.
2) Tounderstandthestepsindesigningand drawingofsingleandmultipointcuttingtoolsandformtools.
3) To study the basic principles of workpiece positioning and clamping. To get acquainted with designs of locators,clamps,drillbushes andmethodsoflocation.
4) TounderstandthedesignandoperationofvarioustypesofJigsandFixtures.
5) Todevelopagraphicaldesignofajigorfixturesuitabletotherequirementsofaworkpiece.
6)Tounderstand thetheoryofmetalcuttingandhowtoestimate therequired forceandclearance amount insheetmetalcuttingandformingoperations.
7)Tostudyconstructionandworkingofvarioustypesofdiesusedfordifferentpressworkingoperations.
8) Tostudythe stepsindesigningand drawingofdifferent cutting,drawingandformingdiesinpressworking.

CourseOutcomes:

1. Createthedesignofsingleandmulti-pointcuttingtools.
2. Applytheknowledgerelatedtomachininginordertoestimatetoollifeandselectionofcuttingfluids.
3. Createthedesignofmultipointtoolsliketwistdrills,reamers,broachandmillingcutters&pressworkingdieslikepunching, blankinganddrawing.
4. Analyzetherealtime problemsofworkholdingbydesigningjigsandfixtures.

Unit I: Single Point cutting Tool: Shear angle, shear strain, velocity relations, un-deformed chip thickness,Merchant's circle, energy relations, nomenclature, single point cutting tool design, recommended speed, feed anddepthofcutFormtools.Graphicalapproachofcircularformtooldesign. (08Hours)

Unit II: Jig & Fixture Design: Economics, principles of locations, types of locations, prevention of jamming,problemsofchip&dustinlocation,useofdowels.Redundantlocation,Principlesofclamping,typesofclamps, powerclamping,Toolguiding&toolsetting,typesofdrillJigs&fixtures, (07Hours)

Unit III: Jig & Fixture Design: Design of Plate, Channel, Box, Turnover and Post type Drill Jigs. Design ofTurning,Milling,Fixture,Broaching,Assembly&WeldingFixtures. (07Hours)

Unit IV: Multi-point Cutting Tools: Types, Geometric elements and forces in various tools like Twist drills &Reamers,CircularBroaches,MillingCutters,TapsandDies,Gearshapercutter&GearHobs. (07Hours)

Unit V: Press tools: Classification of presses, Theory of sheet metal cutting, clearance, cutting force calculations,Methods of reducing cutting forces, Centre of pressure & its significance, Classification of press workingoperations, Theory of bending, spring back action in metals, drawing fundamentals, calculation of drawing &bendingforces,planningforcuppingoperation,Stocklayout. (07Hours)**Unit VI :**Design of Press working Tools: Types of die construction, function & nomenclature of die components,Cutting Dies- Blanking & Punching, Forming Dies-Forming, Drawing and Bending etc. Design of Compound,Combination and progressive dies miscellaneous dies- Horn die, Cam-action die, Rubber & Building die, Suppressdie. (08Hours)

TextBooks:

1. ToolDesign -CyrilDonaldson(Tata Mc-grawHill)
2. Jigs&Fixtures-P.H.Joshi(TataMc-grawHill)
3. FundamentalsofMetalCutting&M/cTools-Juneja(NewAgeInternational).
4. FundamentalsofToolDesign-A.Kumar(Dhanpatrai &Sons).
5. ATextbookofProductionEngineering-P.C.sharma(S.ChandPublication).

ReferenceBooks:

1. MetalCuttingTheory&CuttingToolDesign-Arshinov(MirPublications)
2. Tool Design-ASTME(ASTME)
3. JigsandFixture-Grantt.

6ME04 ProfessionalElective–I (2)NON-CONVENTIONALENERGYSOURCESCourseLearningObjectives(CLOs):

1. Tostudytheintroduction torenewableandnon-renewableresources ofenergy.
2. Tostudytheradiationtransmissionthroughcovers&SolarEnergycollections.
3. Tostudythesolar energyutilisationandsolarenergystorage.
4. Tostudyenergyfromoceanandenergyfromwind.
5. Tostudybiomassenergyresourceslikebiomassandbiodiesel.
6. Tostudyphotovoltaiccell,fuelcellandgeothermalenergy.

CourseOutcomes(COs):

1. Abletostudytheconceptofrenewableandnon-renewable sources.
2. Applythebasicconceptofsolarenergyutilization andstorage.
3. Applytheconceptofenergyfromoceanandwind.
4. Studytheconceptofbio-massenergyresources.

UNITI:

1. Introduction:-
GlobalandIndianenergyscenario,NeedofRenewableenergy,need,Renewableandnonrenewableenergysources, energyandenvironment,

2. Solar Radiation: Solar constant, Definitions of basic earth-sun angles. T ypes of Sol ar radiation,Measurement of solar radiation using Pyrheliometer, Pyranometer and Sunshine Recorder, estimation ofsolarradiationintensity.(7hrs)

UNITII:

1. **Solar thermal systems** : Low temperature applications: solar water heating, space heating, drying. Hightemperature applications, dish and parabolic collectors. Central tower solar thermal power plants. Solar energystorageandutilization:Methodsofstorage- mechanical, thermal, electricalstorage systems.
2. **Solar Photovoltaic Systems:** Basic principle of power generation in a PV cell ; Types of photovoltaic cell,ApplicationofPV; Briefoutlineofsolar PV stand-alonesystem;StoragebatteryandBalanceofsystem.(8Hrs)

Unit III:

Wind Energy Systems: Potential of wind electricity generation in India and current scenario. Wind patternand wind speed data, Types of turbines, Coefficient of Power, Betz limit. Wind electric generators, Powercurve; wind characteristics and site selection; Windfarms for bulk power supply to grid. Application forpumping (7Hrs.)

UnitIV:

Biomass Energy: Biomass: Sources and Characteristics; Wet biogas plants; Biomass gasifiers:ClassificationandOperatingcharacteristics;UpdraftandDowndraftgasifiers;Gasifierbasedelectricitygeneratingsystems.
Biogas-Types of bio gas plants, factors affecting production rates. Introduction to biodiesel and ethanol asalternativefuels, (7Hrs.)

UnitV:**EnergyfromOcean:**Energyfromtides,basicprincipleoftidalpower,singlebasinand doublebasintidalpowerplants,advantages, limitationand scopeoftidalenergy.
OceanThermalElectricConversion(OTEC)systemslikeopencycle,closedcycle,Hybridcycle,prospectsofOTEC in India. Wave energy and power from wave, wave energy conversion devices, advantages and disadvantagesofwaveenergy (7Hrs.)

UNITVI:FuelCells: Introduction,workingprincipleoffuelcell,Typesoffuelcells,conversionefficiencyoffuelcell,application offuelcells.
Hydrogen Energy: Hydrogen as alternative fuel, Production methods, Hydrogen storage, **Geothermal EnergyResources:** Hot Dry Rock system, Vapor dominated, liquid dominated, flash steam, binary fluid and total flowconceptofpowergeneration. **(8Hrs)**

BooksRecommended:

TEXTBOOKS:-

1. SolarEnergy,S.P.Sukhatme,TMH.
2. Non-ConventionalEnergySources,G.D.Rai,KhannaPublications.
3. Non-ConventionalEnergySources,B.H.Khan

REFERENCEBOOKS:-

1. TreatiseonSolarEnergy:H.P.Garg;JohnWiley&Sons.
2. RenewableEnergyConversion, TransmissionandStorage,BentSorenson;ElsevierPublication
3. RenewalleEnergy;GodfreyBoyle,OxfordUniversityPress,Mumbai.

6ME04PROFESSIONALELECTIVE-I

(3)COMPUTERAIDEDDESIGN&SIMULATIONCourseLe

arningObjectives(CLOs):

1. Tostudyproductcycle &fundamentalsofCAD/CAM.
2. Tounderstandtheconceptofrepresentationsofcurvesandsurfaces.
3. Tostudythesolidmodelingtechniques.
4. Tostudythegeometrictransformation techniques.
5. Tostudybasicprobability&statisticsandphysicalmodeling.
6. TostudySimulationofMechanicalSystems&Simulation ofmanufacturingsystems.

CourseOutcomes(COs):

1. UnderstandtheconceptofCAD/CAMandCIM.
2. ApplyknowledgeusingCADmodelingforcomponentdesign
3. Applytheknowledgeofgeometrictransformation.
4. UnderstandtheMechanical&Manufacturingsimulationsystems.

UnitI:FundamentalsofCAD/CAM:

Product cycle and scope of CAD/CAM/CIM in product cycle, CAD/CAM, Hardware and software, selection ofsoftware,CADworkstationconfigurations. (6 Hrs)

UnitII:Representationsofcurvesandsurfaces:

Introduction to analytical curves, synthetic curves: Hermite cubic Spline, Bezier Curve, B- Spline curve. SurfaceRepresentation:SyntheticSurfaces,Applicationsofsurfacemodeling. (6 Hrs)**UnitIII:SolidModeling :**

2D Vs 3D modeling, Comparison of Wireframe, surface and solid modeling techniques, Geometry Vs Topology,Requirements of Solid Modeling Methods: Constructive Solid Geometry (CSG), Boundary Representation (B-rep),etc. (6 Hrs)

UnitIV:Geometrictransformation

2Dgeometrictransformations,Homogeneousco-ordinaterepresentation,CompositeTransformations,3Dtransformations,Inversetransformations,geometricmapping. (8 Hrs)**Unit V: Introduction to statistics and physical modeling:** A review of basic probability and statistics, randomvariablesandtheirproperties,Estimationofmeansvariancesandcorrelation.PhysicalModeling-ConceptofSystemandenvironment,Principlesofmodeling,typesofmodels. (8Hrs)

Unit VI: Simulation of Mechanical Systems: Basic Simulation modeling, Role of simulation in model evaluationandstudies,advantages ofsimulationSimulationofmanufacturingSystems:IntroductiontoFlexible manufacturing systems,Simulationsoftwareformanufacturing. (8Hrs)

BooksRecommended:Text Books:

1) P. N.Rao;CAD/CAMPrinciplesandApplications;McGrawHillsPublications.
2) MikelP.GrooverandEmoryW. Zimmers:Computer AidedDesignandManufacturing,Prenticehall.
3) IbrahimZeid: MasteringinCAD-CAM, TataMcGrawHillPublication.
4) GeoffreyGordon,SystemSimulation;PrenticeHall

ReferenceBooks:

1) MikellP.Groover:Automation,Productionsystems&ComputerIntegradedmanufacturing,PrenticeHall.
2) RobertE.Shannon;SystemSimulation:TheArtandScience;PrenticeHall
3) J. SchwarzenbachandK.F.GillEdwardArnold;SystemModellingandControl
4) P.Radhakrishnan and Subramaniam: CAD/CAM/CIM,wileyEasternLtd.

6ME05OPENELECTIVE-II

(1) NON-

CONVENTIONALENERGYSOURCESCourseLearningObjectives(CLOs):

1. Tostudytheintroduction torenewableandnon-renewableresources ofenergy.
2. Tostudytheradiationtransmissionthroughcovers&SolarEnergycollections.
3. Tostudythesolarenergyutilisationandsolarenergystorage.
4. Tostudyenergyfromoceanandenergyfromwind.
5. Tostudybiomassenergyresourceslikebiomassandbiodiesel.
6. Tostudyphotovoltaiccell,fuelcellandgeothermalenergy.

CourseOutcomes(COs):

1. Understandconceptofrenewableandnon-renewablesources.
2. Understandthebasicconceptofradiationtransmissionthroughcoversandsolarenergycollections,thebasicconceptofSolarenergyutilizationandstorage.
3. Demonstrate, concept ofenergyfromoceanandwind.
4. Understandtheconceptofbio-massenergyresources,conceptofdirectenergyconversionandfuelcell.

UNITI:

1. **Introduction:-**GlobalandIndianenergyscenario,NeedofRenewableenergy,need,Renewableand nonrenewableenergysources,energyandenvironment,
2. **Solar Radiation:** Solar constant, Definitions of basic earth-sun angles. T ypes ofSolarradiation,MeasurementofsolarradiationusingPyrheliometer,Pyranometer andSunshineRecorder,estimationofsolarradiationintensity.(7hrs)

UNITII:Solarthermalsystems. Lowtemperatureapplications:solarwaterheating,spaceheating,drying.Hightemperatureapplications,dish and paraboliccollectors.Centraltowersolar thermalpowerplants.

SolarPhotovoltaicSystems: BasicprincipleofpowergenerationinaPVcell;Typesofphotovoltaiccell,

Application ofPV;Briefoutlineofsolar PV stand-alonesystem ;StoragebatteryandBalanceofsystem. (8 Hrs)**Unit III** : Wind Energy Systems: Potential of wind electricity generation in India and current scenario. Types ofturbines, Coefficient of Power, Wind electric generators, Power curve; wind characteristics and site selection;Windfarmsforbulkpowersupplytogrid. (7Hrs.)

Unit IV : Biomass Energy: Biomass: Sources and Characteristics; Wet biogas plants ; Biomass gasifiers:Classification and Operating characteristics; Updraft and Downdraft gasifiers; Gasifier based electricity generatingsystems. Introductiontobiodiesel andethanolasalternativefuels, (7Hrs.)

UnitV:**Energy fromOcean:**Energyfromtides,basicprincipleoftidalpower,singlebasinand doublebasintidalpower plants, advantages, limitation and scope of tidal energy. **Ocean Thermal Electric Conversion** (OTEC)systemslikeopencycle,closedcycle,Hybridcycle,prospectsofOTEC inIndia.

Waveenergyandpowerfromwave,waveenergyconversiondevices,advantagesanddisadvantagesofwaveenergy. (7Hrs.)

UNITVI:

1. **FuelCells:**workingprinciple,typesoffuelcells,applications.
2. **Geothermal Energy Resources:** Hot Dry Rock system, Vapor dominated, liquid dominated,flashsteam,binaryfluidandtotalflowconceptofpowergeneration. (8Hrs)

BOOKSRECOMMENDED:

TextBooks:

1. SolarEnergy; S.P.Sukhatme;TMH
2. Non-ConventionalEnergySources; G.D.Rai; KhannaPublications
3. Non-ConventionalEnergySources; B.H.Khan.

ReferenceBooks:

1. Treatiseon SolarEnergy;H.P.Garg;JohnWiley&Sons.
2. RenewableEnergyConversion,Transmission andStorage;BentSorensen;ElsevierPublication
3. RenewableEnergy;GodfreyBoyle;OxfordUniversityPress,Mumbai
4. RenewableEnergySourcesandEmergingTechnology;D.P.Kothari,K.C.Singal,RakeshRanjan;PHI

6ME05OPEN ELECTIVE-II (2)AUTOMOBILEENGINEERING

CourseLearningObjectives:

1. TostudytheIntroductionofautomobiles,enginetypesandworkingofSI andCIengines.
2. Tostudythefuelfeedsystems,theirtypesandtounderstandthebasicsofcoolingsystem.
3. To study the electrical system, Battery capacity and its ratings, starter motor drive and to understand thebasicsofIgnitionsystem.
4. To study the basics of transmission system, clutches, gear boxes and to understand the principle ofdifferential.
5. Tostudythe brakingsystem,steeringsystem,wheelbalancingandalignmentandtostudytheintroductionofpowersteering.
6. Tostudythebasicsofsuspensionsystem,shockabsorbersandtostudythetypesoflubricantsandlubricationsystem ,crankcaseventilation.

CourseOutcomes(COs):

1. Understandthebasicsofautomobileengineeringanditscomponents.
2. Analyze&developaboutthecoolingsystemanditsfunction.
3. Understand basic concept of transmission system and types of gears box, basic concept of electrical systemandignitionsystem.
4. Applytheknowledgeofsuspensionandlubrication.

UNITI: Introduction,Classificationofautomobiles,chassislayout,basic workingofSIandCIengines,engineparts,enginetypes,Multiplecylinderengines. (7Hrs)

UNIT II : Fuel feed systems- fuel feed systems for petrol and diesel engines, Basic principles of MultipointFuel Injection Systems(MPFI) and Common Rail Diesel Injection Systems(CRDI). Cooling system: purpose,Aircoolingandliquidcoolingsystem, radiator,bypass recirculationsystem,antifreezemixtures.(7Hrs)**UNITIII:**Theelectricalsystem.BatteryCapacity,standardcapacityratings,startermotordrive-Bendixdrive.Ignitionsystem:-Batterycoilignitionsystem,Electronicignitionsystem. (7 Hrs)**UNIT IV:** Transmission system:- Layout, Working principle of clutch, single plate friction clutch andmultiplate clutch, Gear Boxes:- Sliding mesh, constant mesh gear box, Propeller shaft, Hotchkiss drive, torquetubedrive,differential. (8 Hrs)

UNIT V: Braking system: Mechanical, hydraulic brakes, power brakes and vacuum brakes. Steering system:- Function, types of linkages, steering gears, wheel balancing, wheel alignment, camber, castor, king pininclination,toe-in&toe-out&theireffects,Introductiontopowersteering. (7 Hrs)**UNIT VI:** Suspensions : shock absorbers, Rigid axle and independent suspension system, Auto lubrication :-Types of lubricants, their ratings, multi viscosity oils. Engine lubrication:- types of lubricating systems, fullpressuresystem,drysumpsystem,crankcaseventilation.

(6Hrs)**BO**

OKSRECOMMENDED:

TextBooks:

1. AutomobileEngineering-Vol.I&II;KirpalSingh;Standard PublishersDistributors
2. AutomobileEngineering; R.K.Rajput;LaxmiPublications,NewDelhi

ReferenceBooks:

1. AutomotiveMechanics;Crouse&Anglin;TMH.
2. AutomotiveMechanics;J.Heitner;EastWestPress
3. AutomotiveMechanics;S.Srinivasan;TMH.

6ME06DESIGNOFMACHINEELEMENTS-LAB.

Courselearningobjectives:

1. Tostudythebasicdesignprinciples
2. Tofamiliarize withuseofdesigndatabooks&variouscodesofpractice
3. Tomakeconversantwithpreparationofworkingdrawingsbasedondesigns

CourseOutcomes: Aftersuccessfullycompletionofthiscoursestudentswillbeableto:

1. Designvariousmachineelementslikejoints,springs, couplingsetc, undervariousconditions
2. Convertdesigndimensionsintoworking/manufacturingdrawing
3. Usedesigndatabook/standardcodestostandardizethedesigned dimensions

PracticalTermWork: AtleastSixexercisesbasedonthefollowing:

1. DesignofCotterorKnucklejoint.
2. Design&drawingofscrewjack.
3. Design&drawingofRivetedjoints.
4. Design&drawingofleafspring.
5. Designofshaftonthebasisofvariousloading.
6. DesignanddrawingofCoupling(anyonetype).
7. DesignanddrawingofJournalBearingPlumberBlockType).
8. DesignanddrawingofconnectingrodinICEngine.
9. DesignanddrawingofFlywheel.
10. DetermineHydrodynamiclubricationprofileusingJournalBearingApparatus.

PracticalExamination:-Thepracticalexaminationshallconsistoforalonthetermworkandsyllabus.

6ME07DYNAMICSOFMACHINES-LAB.

CourseLearningObjectives:

1. TounderstandStaticforceanalysisandDynamicforceanalysisofplanemechanisms.
2. Todemonstratetheuseofgyroscopiccoupleanditseffect.
3. Tounderstandthephenomenonofvibrations.
4. Todemonstratetheeffectofstaticanddynamicbalancing.

CourseOutcomes:

Studentswill beableto:

1. Applybasicconceptofforceanalysisandlubricationmechanism.
2. Understandtheknowledge ofdynamicforceanalysis analyticallyandgraphically.
3. Applytheknowledgeofspacemechanismandvehicledynamics.
4. Understandconceptofvibrations.
5. Analyzetheconceptofbalancingofmachinery.

Practicals:-Atleast eightpracticalfromthefollowinglist:

1. Studyofstaticforceanalysisofmechanism.(any2 problem)
2. Determiningtheinertiaforcesofconnectingrod
3. Determinationofgyroscopiccoupleusingmotorizedgyroscope.
4. Studyofvehicledynamics.
5. Tostudythelongitudinal vibrationofhelicalspringand todeterminethefrequencyandtimeperiodofoscillationtheoreticallyandexperimentally.
6. Experimentonfreeanddampedvibration ofsystemswithonedegreeoffreedom.
7. Experimentonforceddampedvibrationofsystemswithonedegreeoffreedom.
8. Experimenton freedampedtorsionalvibration.
9. ToverifytheDunkerley‘s rule.
10. Todeterminethenaturalfrequencyoffreetorsionalvibrationofsinglerotorsystem.
11. Todeterminethenaturalfrequencyoffreetorsionalvibrationoftworotorsystem.
12. Experimentonwhirlingspeedofshaft.
13. Experimenton staticbalancingofrotatingmasses.
14. Experimenton dynamicbalancingofrotatingmasses.

PracticalExamination:-Thepracticalexaminationshallconsistoforalonthetermwork andsyllabus.

6ME08PROFESSIONALELECTIVE-I-LAB(i) TOOLENGINEERING–LAB.

Courselearningobjectives:

1. Tostudythebasic geometriesofdifferentcuttingtools
2. Tostudycuttingforcesinvolvedinmachining operationusingtooldynamometer.
3. Tounderstandthestepsinvolved indesigninganddrawingofvarioustools.
4. TounderstandthedesignandoperationofvarioustypesofJigsandFixtures.

CourseOutcomes: Oncompletionofthiscoursestudentswillbeableto:

1. Createthedesignofsingleandmulti-pointcuttingtools.
2. Createthedesignofmultipointtoolsliketwistdrills,reamers,broachandmillingcutters&pressworkingdieslikepunching, blankinganddrawing.
3. Analyzetherealtime problemsofworkholdingbydesigningjigsandfixtures.

TERMWORK:(AnySixofthefollowing)

1. Design&Drawingofsinglepointcuttingtool.
2. Design&DrawingofFormTools(UsingGraphical Method).
3. MeasurementofforcesinOrthogonalcuttingbyLatheToolDynamometer.
4. Measurementofforces&TorqueinDrillingbyDrillToolDynamometer.
5. StudyofgeometricElements&Forces inMulti-PointCuttingTool.6.Design&drawingofPostDrillJig.
7. Design&DrawingofTurnoverDrillJig.
8. Design&DrawingofMillingFixture.
9. Design&DrawingofTurning Fixture.
10. Design&DrawingofCompoundDie.
11. Design&DrawingofProgressiveDie.
12. Design &DrawingofDrawingdie.

PracticalExamination:Practicalexamshallconsistofviva-vocebasedonthetermworkandtheorysyllabus.

6ME08PROFESSIONALELECTIVE-I–LAB

(2) NON-CONVENTIONALENERGYSOURCES–LAB.

CourseLearningObjectives(CLOs):

1. Tostudytheintroduction torenewableandnon-renewableresources ofenergy.
2. Tostudytheradiationtransmissionthroughcovers&SolarEnergycollections.
3. Tostudythesolarenergyutilisationandsolarenergystorage.
4. Tostudyenergyfromoceanandenergyfromwind.
5. Tostudybiomassenergyresourceslikebiomassandbiodiesel.
6. Tostudyphotovoltaiccell,fuelcellandgeothermalenergy.

CourseOutcomes(COs):

1. Understandconceptofrenewableandnon-renewablesources.
2. Understandthebasicconceptofradiationtransmissionthroughcoversandsolarenergycollectio ns,thebasicconceptofsolarenergyutilizationandstorage.
3. Demonstrate, conceptofenergyfromoceanandwind.
4. Understandtheconceptofbio-massenergyresources,conceptofdirectenergyconversionandfuelcell.

Listofpracticals:Anysixpracticalswillbebasedonthefollowingtopics:-

1. StudyofPyrheliometerandmeasurementofdirectradiation.
2. Study ofpyranometerandmeasurementof globalanddiffuseradiation.
3. Studyofsunshinerecorderandmeasurementofsunshinehours.
4. Studyandtestingofaflatplaterecorder.
5. Studyofbiogasplant.
6. Studyofphotovoltaicsystem,
7. StudyofvarioustypesofWindmill.
8. Studyofvarioussolarequipment.

PracticalExamination:-Thepracticalexaminationshallconsistoforalonthetermworkandsyllabus.

6ME08PROFESSIONAL ELECTIVE-I–LAB

(1) COMPUTERAIDEDDESIGN&SIMULATION

CourseLearningObjectives(CLOs):

1. TounderstandfundamentalsofCAD.
2. Tostudythesolidmodelingtechniques.
3. Tostudythegeometrictransformation techniques.
4. TodemonstrateSimulationofMechanicalSystems.

CourseOutcomes(COs):

1. UnderstandtheconceptofCAD.
2. ApplyknowledgeusingCADmodelingforcomponentdesign
3. Applytheknowledgeofgeometrictransformation.
4. UnderstandtheMechanical&Manufacturingsimulationsystems.

Practicals:-Anysixpracticalsfromthelistshouldbeperformed.

1. Creationof2Ddrawing(SketchingModule)ofanymechanical

machinecomponentusinganymodeling/drawingsoftware.
2. Creationofisometric viewfromgivenorthographic viewofanymechanical machinepartusinganymodelingsoftware.
3. Creationof3Ddrawingofanymechanicalmachinepartusinganymodelingsoftware.
4. CreationofassemblyofKnucklejoint/Cotterjointusinganymodelingsoftware.
5. Creationofsheetmetalcomponentusinganymodelingsoftware.
6. SimulationofFourbarchainmechanismusinganymodelingsoftware.
7. SimulationofSlidercrankchainmechanismusinganymodelingsoftware.

PracticalExamination:-Thepracticalexaminationshallconsistoforalonthetermworkandsyllabus.

6ME09 RESEARCH SKILLS – LAB

1. Apply fundamental and disciplinary concepts and methods in ways appropriate to their principal areas of study.
2. Demonstrate skill and knowledge of current information and technological tools and techniques specific to the professional field of study.
3. Use effectively oral, written and visual communication.
4. Identify, analyze, and solve problems creatively through sustained critical investigation.
5. Integrate information from multiple sources.
6. Demonstrate an awareness and application of appropriate personal, societal, and professional ethical standards.
7. Practice the skills, diligence, and commitment to excellence needed to engage in lifelong learning.

Course Outcomes:

1. Demonstrate a sound technical knowledge of their selected research topic.
2. Undertake problem identification, formulation and solution.
3. Design engineering solutions to complex problems utilizing a systems approach.
4. Conduct an engineering research.
5. Demonstrate the knowledge, skills and attitudes of a professional engineer.

Students will have to perform any one task and prepare a report on it; from the following list:

1. A mini project involving mechanisms/ electromechanical systems/
2. CAD modeling/ simulation of any thermal, hydraulic or mechanical system.
3. IoT based system for any domestic/ rural/ agricultural/ industrial application
4. A system using non- conventional energy source
5. Market research for launching a new product.
6. Study of any Small Scale Industry.
7. Any other innovative concept for promoting research and innovation among students.

*Practical Examination:- The practical examination shall consist of oral basedon the task and the report.

SYLLABUSPRESCRIBEDFORBACHELOROFMECH ANICALENGINEERING

SEMESTERPATTERN(CHOICEBASEDCREDITGRADESYSTEM)SEMESTER:SEVEN

7ME01MECHATRONICS

CourseLearningObjectives(CLOs):

1. Tostudyvarioustypesofswitches,sensors,motorsandtheirworking.
    1. Tounderstandtheconceptofcomputerprocesscontrol.
    2. Tostudyvariouspartsofmechatronicsystem.
    3. Tostudyvarioustypesofvalvesandtheirworking.
    4. Tounderstandandcreatepneumaticandhydrauliccircuitsforvario usindustrial applications.

Courseoutcomes(CO):

2. Understandthe conceptofcomputerprocesscontrol.
3. Createtheworkingmodelsforvariousmechatronicssystemforindustrialapplications.
4. Createminiprojectsonmaterialhandlingsystemslikepickandplacetyperobot,machineload ingsystemetc.
5. Createpneumaticandhydrauliccircuitsforvariousindustrialapplic ations.

Section-

AUnitI:IntroductiontoMechatronics–

Definition,Blockdiagram&Example,BasicsofSensors,Position&SpeedSensors, Proximity Sensors&Switches,LVDT,Digital opticalencoder,TemperatureSensors Actuators-Functions, Electromagnetic Principles, Solenoids and Relays,working of DC motors and stepper motors, hydraulic and pneumatic actuators,(6Hrs.)

UnitII:DataAcquisition:Analogsignalprocessingusingoperationalamplifier-Introduction, types of amplifiers, sample and hold circuit, introduction to dataacaquisiton, sampling thermo, Quantizing theory, Analog to digital conversion,Analogtodigitalconvertor,Digitaltoanalogconversion,Multiplexer.(6Hrs)

Unit III: Mechatronic Systems – control architecture Introduction, Control architecture,Analog circuits, digital circuits, Design oflogic networks, sequential logic, flip-flops,applicationofflip-flops,micro-controlrs,Programmablelogiccontroller.(6Hrs)

SECTION-B

UnitIV:ControlValves–

Studyofdifferentcontrolcomponentsandpneumatic&Hydraulicsystem-Construction,worlingandfunctionofDirectionalcontrolvalve,Flowcontrolvalves,Pressurereliefvalve,p ressurereducingvalve,sequencevalvewithsymbols.(7Hrs)

UnitV:PneumaticSystem–

Designandanalysisofpneumaticcircuits,Synchronizing,Powerchuckingoperations,controllingtherateo fspeedofpiston,circuittomovewithpiecearound

acorner,circuittomoveaworkpieceataconstantspeed.(6Hrs)

UnitVI:HydraulicSystem–

DesignanalysisofHydraulicsystems-Sequencing,pneumo-hydraulic,regenerationcircuit,circuittocontroltoolmovementonlathers,grinders,etc.(7Hrs)

BooksRecommended:

TEXTBOOKS:

1. Introduction to Mechatronics and Measurement systems- 2/e byAciatore andM.B.Histant,TataMcGrawHilledition.
2. PneumaticsandHydrauticsbyH.L.Stewart.

REFERENCEBOOKS:

1) IntroductiontoMechatronicsbyAppusKuttanK.K.-OxfordUniversityPress.
2) Mechatronics–Amultidisciplinaryapproach4/ebyW.Bolton-PearsonPublication,
3) Automation,ProductionsystemsandCIMbyM.PGroover- PearsonPublication.

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7ME02PRODUCTIVITY TECHNIQUES

CourseLearningObjectives:

1-Tomeasureand evaluate productivity
2-To Plan and implement various productivity techniques3-
Reengineertheprocessforimproveproductivity
4-Toimplement BPR tools forimprovingthe productivity

CourseOutcome:Afterlearningthe coursethe studentsshould beable to:

1. UnderstandProductivity.
2. DifferentiateMethodStudy&WorkMeasurement.
3. ApplyErgonomics Principles.
4. AnalyzeWedgepayment&IncentivePlans.
5. Implementreengineering.
6. UnderstanddifferentMaintenancemethods.

SECTION-A

UNIT-I–**Productivity**Definition,ConceptandImportanceofproductivity,Differencebetween Production and Productivity, Tools of productivity, Reasons for low productivity,Factors that help increasing productivity, Productivity index, Productivity ratio , Kinds ofproductivity measurement, Causes of low productivity and techniques of their elimination,Factors affecting productivity, Technical methods to improve productivity, Main contributorstoproductivityimprovement, Advantagesfrom increased productivity.(7Hrs)

UNIT-II-**Method Study** Definition, Concept , Objectives and Procedure of method study,Process chart symbols, recording techniques like Flow process charts, Operation, Flow andTwohandedProcesscharts,Flowdiagram,Stringdiagram,MultipleActivitychart,Operation Analysis, Analysis of motion, Motion economy, Design of work place layout,Therbligs,SIMOchart.(7 Hrs)

UNIT-III-**Work Measurement** Definition, Concept and Objectives of work measurement,Stopwatchprocedureforcollectingtimestudydata,Timeestimatingtechniqueslikeanalytical estimating, Predetermine Motion Time System-PMTS, Elemental Motion TimeSystem,Basic MotionTimeSystem,Method TimeMeasurement, Workfactor. (7Hrs)

SECTION-B

UNIT-IV-Ergonomics Introduction, Principles, Work system design, Man-machine system,Humanbehaviorandequipmentdesign,Tools,Techniquesandapplications,Effectofenvironmenton performanceof worker.(7 Hrs)

UNIT-V- **Performance Rating, Wage Payment & Incentive Plans** Introduction, Variousincentiveschemes, PerformanceRating.

Contemporary Issues in Productivity Activities of National Productivity Council and otherorganizations,ProductivityScenario and changes.(7Hrs)

UNIT-VI-**Business Process Re-engineering (BPR)** Introduction, Development of BusinessProcess Re-engine, BPR is not for everyone, Advantages of BPR, Steps involved in BPR,ApplicationofBPR,TrainingforBPR,WhentoreengineerWaystofailatBPR,Requirements of BPR, Human Resource Engineering, Fundamentals of BPR, Implementationmethodology of BPR, Organizational re-engineering, Organizational reengineering process,Reengineering values, Approach to reengineering, Re-engineering tools, What re-engineeringisnot, Kindsof changes thatoccurs in re-engineering,succeeding.(7 Hrs)

RecommendedBooks:

TextBooks:

1-Work Study, Khanna , Dhanpat Rai Publications2-
TotalQualityManagement,K.C.Arora,Katsons
3-IndustrialEngineeringandManagement,Khana,DhanpatRai

ReferenceBooks:

1. IntroductiontoWorkstudy, ILO,Oxford
2. IndustrialEngineeringandManagement,Reddy,NewAge
3. IndustrialEngineeringandManagement,Verma

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7ME03INDUSTRIALMANAGEMENT&COSTING

CourseLearningObjectives(CLOs):

1. Tostudybasicconcepts&techniques of management.
2. Tostudytheconcept ofmarketingmanagement.
3. Tounderstandthepersonnelmanagement&materialsmanagementtechniques.
4. Tostudytheestimationprocedureforrawmaterialandmachiningprocessesinmanufacturing.
5. To studythecostingprocess &costingtechniques.
6. Tostudybusinessfinance,financialstatementsanddepreciationanalysis.

CourseObjectives (COs):

1. Understandthe workingofbusinessenvironment.
2. Understandthemanagementthoughts,itsevolutionandfunctions.
3. Applystandardandscientifictechniquesinmaterialsmanagement.
4. Evaluatetime,costs,costsheetanddepreciationofindustry.

Section-A

UNITI :Concept, Principles and Techniques of Management; Evolution of managementthoughts,functionsofmanagement,organizationstructure&relationship.(6-Hrs)

UNITII:MarketingandManagement:Marketingstrategymarketresearch,buying,motives, types of market, new product development, Product life cycle, SalesOrganization,advertising,methodsofselling,consumerbehaviour..(6-Hrs)

UNITIII:a)Functionsofpersonnelmanagement,Humanresourceplanning,Recruitment, training and development, workersparticipation in management,jointconsultation,collectivebargaining.
b)Materialsmanagement,classesofmaterials,scopeofmaterialcontrol,scope

andfunctionofpurchasingdepartment,purchasingprocedure,inventorycontrol,orderingprocedure ,materialidentification,storefunction..(7-Hrs)

SECTION-B

UNIT IV: Objectives, functions, principle factors of estimating and estimating procedure,Estimation of weights & materials, Estimation of machining time, estimation offabricationcost,forgingcost,and foundrycost.(6-Hrs)

UNIT V : a) Introduction to costing and costing Techniques: Definitions, objectives,elements of costs, components of cost, job costing, simple process costing,normalandsubnormallossesinprocess,waste,scrap.(8Hours)

UNITVI: a) Financing of Business: - Basis of business finance, need of finance, Kinds ofcapital,sourcesoffixed&workingcapital.

b) Financialstatements:-Profitandlossstatement,balancesheet

c) DepreciationAnalysis:-Causesandsignificance,methodsofcalculation ofdepreciation. (7Hrs)

BooksRecommended:

TEXTBOOKS:

1. Management-principles, processes and practicals, Anil Bhat,Aryakumar; OxfordUniversityPress
2. ManagementAccounting;PareshShah;OxfordUniversityPress
3. Estimatingandcosting;TTTIMadras.

REFERENCEBOOKS:

1. Essentials ofManagement; Koontz,Harold;McGraw-HillEducation(India)
2. CostAccounting;JawaharLal;TataMcgrawHillPublishing
3. CostAccounting byBhar.

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7ME04ENERGYCONVERSION–II

CourseLearningObjectives(CLOs):

1. Tostudytheconstruction,workingandoverallperformanceofareciprocatingcompressor.
2. Tostudytheconstruction, workingand overallperformanceofa rotarycompressor.
3. Tostudythevapourcompressionrefrigerationsystemwithreferencetodomesticrefrigerator .
4. Tostudyvarious types ofair conditioningsystems.
5. Tostudyvariousaspectsofagasturbineplantalongwithdifferenttechniquestoimproveits performance.

CourseOutcomes(CO):

1. Understandtheworkingofdifferenttypesofcompressors.
2. Analyze,handleand resolvetheproblems relatedtoworkingofair compressor.
3. Understandtheprincipleofworkingofrefrigerationsystems,airconditioninganditsapplic ations.
4. Understandvariousnuclearreactionsandissuesrelatedtoworkingandmaintenanceofnucl ear powergeneration.

SECTION–A

UNIT-I:**Reciprocating,AirCompressions**:-Industrialusesofcompressedair,Methods of compression and efficiencies of compression, Methods of reducinglossesduringcompression

single and multistage of compressions, clearance volume and its effect on workdoneandvolumetricefficiency,conditionfor minimumworkintowstagecompression,intercoolinganditseffects,Overall,isothermalandadiabaticefficiencies,IHP,BHP,requirementsandaftercooler.(7Hours)

UNIT-II:**RotaryCompressors**:-
Comparisonbetweenreciprocatingandrotarycompressors,differencebetweenfans,blowersandcompressors,generalequations for rotary machines, Vane, Roots blower, construction, working andvelocitydiagramsof centrifugalandaxialflowcompressors,performancecharacteristicsofblowersandcompressors.(8Hours)

UNIT-III: **Refrigeration:** Principle of refrigeration, Applications, Unit of refrigeration, Carnotvapourcycle, reversed heatengine, CoP.

AirrefrigerationSysytem,VapourcompressionRefrigerationcycleCoefficientofPerformance,Numericals basedon simplesaturatedcycle.

Vapourabsorptionrefrigerationsystems, (8 hours)

Section-B

UNIT-IVAir-

conditioning: PrincipleofAirconditioning,ClassificationandapplicationsofAirconditioning system, Psychrometry, Psychrometric chart, Psychrometricprocessesrelated toAir conditioning,AdiabaticMixingoftwoAir-streams.

ElementarysimpleproblemsbasedonPsychrometricchart. (7 hours)

UNIT -V: **Classification of gas turbines**, construction and working Gas turbine ideal andactualcyclesconstantvolume,constantpressure,(OpenandClosed)cycleanalysis,Intercooling,Regeneration and reheating application,optimumandmaximum pressure ratios,workrations,Performance characteristics.Fields ofapplication of gas turbine power plant, Introduction to Jet Propulsion, Ram jet,turbojet.(NonumericaltreatmentforJetPropulsion).(8Hours)

UNIT-VI:**IntroductiontoAutomobilesandElectricvehicles:**,

Generallayoutoftheautomobile,Classificationofautomobiles,varioussubsystemsand theirrole. Basics ofvehicleperformance

Introduction to Hybrid and Electric Vehicles: basic concept of hybrid andelectric vehicles and their configurations, environmental importance of hybrid andelectricvehicles,Basicconceptofelectrictractionandarchitecture.Introductionto electric components used in hybrid and electric vehicles, Configuration andcontrolof; drives useinEV. (8Hours)

RECOMMENDED BOOKS:-

TEXTBOOKS:

1. SteamandgasturbinesR,Yadav;CentralPublicationAllahabad.
2. ThermalEngineering,Domkundwar,Kothandarawar,DhanpatRai&Co.
3. PowerPlantEngineering;R.K.Rajput;Laxmipublication.
4. SolarEnergybyS.P.Sukhatme;TataMcGraw-HillinNewDelhi

REFERENCEBOOKS:

1. ThermalengineeringbyMaheshM.Rathore;TataMcGraw-HillinNewDelhi

2. Gas Turbines Theory- By Cohen and C.F.Rogers, P.H.I.H.Saravanamuttoo HeritagePublishers,
3. GasTurbinesandRotarycompressors,KhajuriaandDubey,DhanpatRai&Co.
4. ThermalEngineering:R.K.Rajput,LaxmiPublication.
5. RenewableEnergy;GodbfreyBoyle,OxfordUniversityPress.

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7ME05PROFESSIONALELECTIVE–II

7ME05 (i)COMPUTERINTEGRATEDMANUFACTURING

CourseLearningObjectives:

1-Apply technical knowledge of manufacturing processes to the fabrication ofmechanicalparts.

2-Toproduce knowledgeableusersofCADsystems.

3-UnderstandthevariousCAD/CAMandCNCprocesses.

4-Tounderstandtheassociativitybetweendesignandmanufacturing

CourseOutcomes:

1- Ableto Specifyaqualitycontrol methodforanalyzingafinishedproduct.

2- Todevelopa strategyfor implementing computerintegratedmanufacturing.3-

Tosynthesizeand applythe concepts learnt

4-Describe various operation in numerical control system and part programming5-DescribeCNC machiningand interfaces of CAM and CNC

6-Undertake,undersupervision,laboratoryexperimentstodesigninCAD andtoprogramin CAM formachining.

SECTIONA

Unit I- Computer aided design,Fundamentals of CAD, Design process, Application ofcomputer for Design, The design of workstation, Function of graphic package , constructingthe geometry, Transformation (2D), wire frame , Surface , Solid modeling, Benefits ofCAD.**(7-Hrs)**

Unit II-Computer aided manufacturing:- Automation and its types, Numerical control,Basic concept, NC Control- point to point, Straight line, Continuous path control, Machinecontrol unit, Drives in NC/CNC-Servo and Stepper motors, CNC & DNC types. **(7-Hrs)Unit III-CNC Part Programming**: Part programming manual, Computer assisted partprogramming, Programming formats, Programming codes, Programming for drilling,milling,turning.

Programming with APT: MACRO statements, Subroutine and loops in programming. **(7-Hrs)**

SECTIONB

Unit IV-Robotics: Technical features of robots, Geometric configurations of robots, Robotanatomy, Arm geometry, End effectors, Drives system, sensors- tactile, proximity rangefinder, machine vision, work cell controller and interlocking sensor commands,programming technique for robot, Application of robots in manufacturing, Economicjustificationofrobots(Payback, ReturnsonInvestmentmethods).**(7-Hrs)**

UnitV-FlexibleManufacturingSystem:

Basicconcept,

grouptechnology,partfamilies,partclassificationandcodingsystem,GTmachinecells,TypesofFMS,FMSlayoutconfigurations,Planningof FMS,Typesof

CAPP.**(7-Hrs)**

UnitVI-ComputerIntegratedManufacturing:
Concept, Elements of CIM system, Structure of CIM data base system, CIM wheel, CIMshopfloorcontrol andprocess monitoring, Automation.
Inspectionandtesting:-Onlineandofflineinspection,Distributed inspection.
ASRSandits elements,AGVS,Guidance,routingandtrafficcontrolin AGV.**(7-Hrs)**

BooksRecommended:
TextBooks:

1) RoboticsbyRajput
2) CAD/CAM byP.N. Rao

ReferenceBooks:

3) Computeraided Designand ManufacturingbySadhu Singh
4) Productionsystem,AutomationandCIM,MikhalGroover,PearsonPublication.
5) CNCMachines:M.Aditham&B.S.Pabla,NewAge International

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7ME05 PROFESSIONALELECTIVE–II
(ii) AUTOMOBILEENGINEERING

CourseLearningObjectives(CLOs):

1) Tostudytypesofautomobiles,chassisandenginetypes,engineparts,firingordersformulticylinderengines,generalconsiderations of enginebalancing.
2) Tostudythefuelfeedsystems,fuelpump,fuelfilters,airfilters,MPFIandCRDIsystems,types ofcooling systems, antifreezemixtures.
3) Tostudy electricalsystem,battery capacity andratings,startermotordrives,ignitionsystems,ignitiontiminganditseffectonengineperformance,ignitionadvancemechanisms.
4) Tostudythetransmissionsystem,typesofclutchesandgearboxes,overdrive,propellershaft,differentialgear,rear axle drives,automatictransmission.
5) Tostudybrakingsystem,typesofbrakes,steeringsystem,steeringgears,steeringgearratio,wheel balancingand alignment, power steering.
6) Tostudysuspensionsystems,shockabsorbers,differentlubricantsandtheirproperties,enginelubrication systems, oilpumps, chassis lubrication,crankcaseventilation.

COURSEOUTCOMES(COs):

1. Understandthebasicsof automobileengineeringanditscomponents.
2. Ideacreationofcoolingsystem,electricalsystem andignitionsystem.
3. Analysis oftransmissionsystemandtypesof gearsbox.
4. Designanddevelopmentofsuspensionandlubrication.

SECTION–A

Unit I : Classification of automobiles, chasis types, Power Unit- Functions and locationspower for propulsion, engine parts- types, construction and functions, Multiplecylinderengines,Generalconsiderationsofenginebalancing,firingorder.(7-Hrs)

Unit II : Lubrication system: Purpose, types of lubricants, Types of lubricating system-splash,pressure and drysump lubricatingsystem.

Fuelsupplysystem:typesoffuelsupplysystem,componentsoffuelsupply

system,M.P.F.I.andC.R.D.I.

Coolingsystem–purpose,types,bypassrecirculationsystemandantifreezemixture.(6-Hrs)

Unit III:Ignition system- types of ignition system- Battery and Electronic ignition system,Ignitiontiming,Ignitionadvancemechanism– centrifugalandvaccumtypeadvancedmechanism.

Startingsystem-Purpose,startingdrives-Bendixdrive.(7Hrs)

SECTION–B

Unit IV :Transmission system : Clutches, Single plate & multiplate, Gear Boxes :- Slidingmesh,constantmeshand synchromeshgearbox, Automaticgearbox.

Differential-Constructionandworking.

Suspensionsystem-types,telescopictype,shock absorber.

(8Hrs)

UnitV:Brakingsystem:-Mechanical,Hydraulic,Vaccumandairbrakesystem,Antibraking system. Steering system:- Layout, steering gears, wheel alignment,steeringgeometry,camber,caster,kingpininclinationandtoeinandout,

Powersteering-Principleandworking..(7-Hrs)

Unit VI : Electric &Hybrid vehicles. Introduction to electric components used in hybridandelectricvehicles,ConfigurationandcontrolofDCMotordrives,ConfigurationandcontrolofInductionMotordrives.EnergyStorage:Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles,Battery based energy storage and its analysis, Fuel Cell based energy storage anditsanalysis, Hybridization ofdifferentenergystoragedevices (8 Hrs)

BooksRecommended:

TEXTBOOKS:

1. AutomobileEngineering-Vol.I&II,KirpalSingh,StandardPublishersDistributors
2. AutomobileEngineering–R.K.Rajput;Laxmipublications,NewDelhi.
3. Iqbal Hussain, "Electric & Hybrid Vehicles – Design Fundamentals", Second Edition,CRCPress, 2011.

REFERENCEBOOKS:

1. AutomotiveMechanics;Crouse&Anglin,TMH.
2. Automotive Mechanics;J Heitner;EastWestPress
3. AutomotiveMechanics;S.Srinivisan;TMH.
4. James Larminie, "ElectricVehicleTechnologyExplained", John Wiley& Sons, 2003

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7ME05PROFESSIONALELECTIVE–II
(iii) DESIGN OF TRANSMISSION SYSTEMCOURSELEARNINGSOBJECTIVES:

1-Togainknowledgeontheprinciplesandprocedureforthedesignof MechanicalpowerTransmissioncomponents.

2-TounderstandthestandardprocedureavailableforDesignofTransmissionofMechanicalelements.

3-Tolearn touse/selection ofstandard dataand catalogues from databook.

COURSEOUTCOMES:

Upon the completion of this course the students will be able to design of transmissionsystemsforengines andmachineselements includes-

1. Slectionofbelts, chainsandropedrives
2. FailuretheoriesGears &designofspurgear
3. Interprettheconceptsofdesignoffluidcouplingsandtorqueconverters
4. Designof gearboxes
5. Designofdesignofcams,brakesand clutches

SECTION-

AUNITI-DESIGNOFFLEXIBLEELEMENTS

a) Design&SelectionofFlatbelts,
b) SelectionofVbelts,
c) Selectionofhoistingwireropes ,
d) Selection of transmission roller chains and Sprockets.(07Hrs.)

UNITII-SPURGEAR

Speedratiosandnumberofteeth,Forceanalysis, Toothstresses,Dynamiceffects,Fatiguestrength,Factor ofsafety,Gear materials, Designofstraight tooth spur.
(06Hrs.)

UNITIII–FLUIDCOUPLINGANDTORQUE CONVERTER

a) Fluid Coupling- Fluid Coupling Diagram, Working Of Fluid Coupling, Application ofFluidCoupling.

b) Torque Converters – Torque Converter Diagram ,working of Torque converter ,ApplicationofTorqueConverter.DifferencebetweenFluidCouplingandTorqueConverter.
(06Hrs.)

SECTION-B

UNITIVGEARBOXES

Geometric progression ,Standard step ratio , Ray diagram, kinematics layout, Design ofslidingmeshgear box ,workingofconstantmeshgear box,workingof multispeedgear boxs.
(07Hrs.)

UNITVCAMS

CamDesign:Types,pressureangle andunder cuttingbase circledetermination,forcesandsurfacestresses.
(06Hrs.)

UNITVICLUTCHESANDBRAKES

a) Design of plate clutches, axial clutches, cone clutches, internal expanding rim clutches,Concept&workingof Electromagneticclutches.
b) Design of Band and Block brakes, external shoe brakes, Internal expanding shoe brake.(07Hrs.)

BooksRecommended:

TextBooks-

1) MachineDesign-R.S.Khurmiand GuptaJ.K., Published byS Chand.
2) MachineDesign-Dr.P.C.Sharma,D.K.Agrawal,S.K.KatariaandSon'sPublications.
3) Prabhu.T.J.,"Design ofTransmissionElements",ManiOffset,Chennai

ReferenceBooks-

1) MachineDesignExercises -S.N.Trikha,KhannaPublications,Delhi
2) MachineDesign-An Integrated Approach -RobertL.Norton -PearsonEducationAsia.
3) Maitra G.M., Prasad L.V., "Hand book of Mechanical Design", II Edition, TataMcGrawHill.
4) MachineDesignfundamentals–Mechanicaldesignerworkbook,J.E.Shigley,Publishedby

McGrawhill.
5) DesignofMachineElements-V BBhandari,McGrawhill.
6) MachineElementsinMechanicalM.F.Spotts,prenticehallindia,
7) MachineDesign, BlackP.H., PublishedbyMc Graw Hill.
8) DesignDataBookby-P.S.G.Coimbatore,
9) DesignData BookbyV.B.Bhandari,

(Useof anydatabookfromtheabovewill bepermitteddduringtheexamination).

7ME05PROFESSINALELECTIVE-II

7ME05(iv)COMPUTATIONALFLUIDDYNAMICS

CourseLearningObjectives:

- Tonumerically **solve**governingpartialdifferentialequationsforphysicalproblemsinfluidmechanics and heattransfer.
- To**analyze**differentmathematicalmodelsandcomputationalmethodsfortransportprocesses.
- To**study**,and**apply**discretizationmethods&schemesandanalyzeitseffectontheaccuracyo f numerical solution and computational time.
- To**demonstrate**theabilitytousemodern CFD softwaretools.

CourseOutcomes:

Oncompletionofthecourse, studentwillbe ableto

- Numerically **solve** the governing partial differential equations of fluid flow and heattransferproblems.
- **Construct** and solve the different mathematical models and computational methodsforfluid flows.
- **Apply**thediscretizationmethods tosolvefluidflowandheattransfer problems.
- **Choose**andjustifytheCFD schemesforthe respectivefluidflow/transportphenomenaproblem.
- **Perform**verificationand validationofnumerical model.
- **Demonstrate**theabilityto usemodernCFD softwaretools.

Section– A

Unit–I:

GoverningequationsandBoundaryconditions:

IntroductiontoComputationalFluidDynamics,Governingequationsoffluiddynamics:Continuity, momentum and energy equations, Classification of partial differential equations:parabolic, elliptic, hyperbolic.Boundary and initial conditions; physical behaviour, overviewoffinitedifference,finiteelementandfinitevolumemethods.Overviewofnumericalmethods.(7-Hrs)

Unit–II:

Finite Difference Method - Derivation of finite difference equations – Simple Methods –General Methods for first and second order accuracy- explicit, implicit, stability requirement,boundaryconditions. Convergence, Errors andanalysisof stability.

Methods of Solution: Solution of finite difference equations Solution procedures: direct anditerativemethods. (7-Hrs)

Unit–III:

Finite volume method: fundamental concepts, discretization of 1-D steady state and 1-Dunsteady state diffusion problems, explicit and implicit schemes, consistency, stability andconvergence, discretization of 1-D and 2-D diffusion problems. Difference between the FDMandFVM methods. (7-Hrs)

Section -B

Unit–IV:

GridGenerationMethod: Definitionandtypesofgrid,Transformationofequation,MatricesandJacobians, Stretched Grids, EllipticGrids, Adaptivegrids.
Numericalsolutionoftheflowfield:QUICKandSIMPLEalgorithm.(7-Hrs)

Unit–V:

Turbulencemodels: ReynoldsAverageNavier-Stokesequation,RANSturbulenceModels,twoequation(k-Є)models,LargeEddySimulation.(Elementarytreatmentonly)(7-Hrs)**Unit–VI:**

IntroductiontoCFDsoftwareandApplications:

ApplicationofmodernCFDsoftwareOpenFOAM/ANSYS/FLUENT/STAR-CCM+/MATLAB: analysis for fluid and heat transfer problems. Heat transfer analysis in adouble pipe heat exchanger. Internal fluid flow and heat transfer study in a centrifugal pump.Heat conduction study in 2D flat plate. Simulation of a generic convection-diffusion transportequation with forced/natural convention over flat plat/in pipe. External flow analysis overairfoiland overcylinder.(7-Hrs)

Books

Recommended:-

TextBooks:

1. Anderson,D.,Tannehill,J.C.,&Pletcher,R.H.(2016).Computationalfluidmechanicsand heat transfer. CRC Press.
2. Patankar,Suhas.Numericalheattransferandfluid flow.Taylor &Francis,2018.
3. Introduction to Computational Fluid Dynamics Anil W. Date Cambridge UniversityPress,2005.
4. Ghoshdastidar,P.S.,ComputerSimulationofflowandheattransfer,Tata McGraw

Referencebooks:

1. IntroductiontoComputationalFluidDynamics:TheFiniteVolumeMethod,Versteeg,H.K. andMalalasekara,W.,SecondEdition(IndianReprint)PearsonEducation,2008.
2. Muralidhar, K., &Sundarajan, T. (2003). Computational fluid flow and heat transfer.AlphaScienceInternational.
3. Chung,T.J. (2010).Computationalfluid dynamics.Cambridgeuniversitypress.
4. ProdipNiyogi, Chakrabarty .S.K., Laha .M.K. Introduction to Computational FluidDynamics,Pearson Education, 2005.

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7ME06 MECHATRONICS–LAB.

CourseLearningObjectives:

1. Understandkeyelementsof Mechatronicssystem,representationintoblockdiagram
2. Understandconceptoftransferfunction,reductionandanalysis
3. Understand principles of sensors, its characteristics, interfacing with DAQmicrocontroller
4. UnderstandtheconceptofPLCsystemanditsladderprogramming,andsignificanceofPLCsystems in industrial application
5. Understandthe systemmodelingandanalysisin timedomain andfrequencydomain.
6. UnderstandcontrolactionssuchasProportional,derivativeandintegralandstudyitssignificancein industrialapplications.

CourseOutcomes:

1 - Identificationofkeyelementsofmechatronicssystemanditsrepresentationintermsofblockdiagram.

2 - UnderstandingtheconceptofsignalprocessinganduseofinterfacingsystemssuchasADC,DAC, digitalI/O .

3 - InterfacingofSensors, ActuatorsusingappropriateDAQ micro-controller.

4 -TimeandFrequencydomainanalysis ofsystemmodel(forcontrol application).5-

PIDcontrol implementation on realtimesystems.

6-DevelopmentofPLC ladderprogrammingandimplementationofreallifesystem.

ListofPracticals(Any-5):

1. Studyofpneumaticsystem
2. StudyofPLCandimplementation ofreallifesystem.
3. Studyof Pick&Placerobot.
4. Studyofbottlingplant
5. Studyof digital to analogconverter
6. Studyof D.C.motor controlunit.
7. Tostudyapplicationsofsensorsandactuators

***PracticalExamination:**

PracticalExaminationshall consistofvivavocebasedontheterm workandsyllabus.

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7ME07ENERGYCONVERSION II–LAB.

CourseLearningObjectives:

1-Tostudyperformance ofareciprocatingcompressor.
2-Tostudytheconstruction, working andoverall performanceof arotarycompressor.
3-Tostudythevapourcompressionrefrigerationsystemwithreferencetodomesticrefrigerator.
4-Tostudyvarious typesofair conditioningsystems.
5-Tostudygas turbineplantwith differenttechniquesto improveitsperformance.

CourseOutcomes: Students areable to-

1-Understandtheworkingofdifferenttypes ofcompressors.
2-Analyze,handleandresolvethe problems relatedtoworkingof aircompressor.
3-Understandtheprincipleofworkingofrefrigerationsystems,airconditioninganditsapplications.
4-Understandvariousnuclearreactionsandissuesrelatedtoworkingandmaintenanceofnuclearpowergeneration.

ListofExperiments(any8):

Anysixofthefollowing:-

1. Trialonreciprocatingcompressor.
2. Trialon centrifugalblower.
3. Studiesofdomesticrefrigerator.
4. COPcalculationofvapourcompressionsystem.
5. Studyof vapourabsorption system

6. Studyofroomairconditioner.
7. Studyofgasturbinewiththehelpofmodels.
8. Studyof generallayoutofconventionalautomobileanditssubsystems
9. Studyofthe generallayout ofelectricvehicle

*PracticalExaminationshallconsistofvivavocebasedonabovetermwork.

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PROFESSIONALELECTIVE–II`

7ME08 (i)COMPUTERINTEGRATEDMANUFACTURING-LAB.

CourseLearnigObjectives:

1-Apply knowledge of manufacturing processes .2-

knowledgeableusers ofCADsystems.

3-UnderstandthevariousCAD/CAMandCNCprocesses.

4-UnderstandtheapplicationbasedconceptualknowledgedesignandmanufacturingforC OE

CourseOutcomes:

1- Ableto Specifyaqualitycontrol&analyzing afinishedproduct.

2- ToApplystrategyforimplementing computerintegratedmanufacturing.3-

Tosynthesizeand applythe concepts learnt

4-To Understandlaboratory experiments to design in CAD and to program inCAMformachining.

Listof Practicals(Any6):

1. PreparationofManual partprogram.
2. PreparationofCNCpartprogram.
3. Studyof anatomy,configuration ofindustrial robot.
4. SimulationofCNCMachining.
5. PerformanceonNC andCNCm/c.
6. Studyof programming methods of industrial robots.
7. Creation of 2D Drawing (Sketching module) of any mechanical machinecomponent usinganymodeling/draftingsoftware.
8. Creation of 3D drawing (part Module) of any mechanical machine parts using anymodelingsoftware.

*PracticalExaminationshallconsistofvivavocebasedonabovetermwork.

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7ME08 PROFESSIONALELECTIVE–II
(ii) AUTOMOBILEENGINEERINGLab

CourseLearningObjectives(CLOs):

1) Tostudytypes ofautomobilesandits parts functioning.
2) Tostudythe fuelfeedsystems,cooling.
3) Tostudyelectricalsystem, batterycapacityandratings.
4) Tostudythe transmission system

5) To studybrakingsystem

6) Tostudyand understandsuspension systems

COURSEOUTCOMES(COs):

1. Applybasicprinciplesandknowledgeofautomobileengineeringanditscomponentsforproper functioning.
2. Analysisconceptofcoolingsystem,electricalsystemandignitionsystem.
3. Interpretbasicconceptoftransmissionsystemandtypesofgearsbox.
4. Rememberthe concept ofsuspension andlubrication.

ListofPracticals(Any6):-

1) ClassificationofAutomobiles&AutomobileChassis

2) StudyofDifferentialMechanismofan Automobile.

3) Study& ApplicationofMultipleClutchofanAutomobile

4)Study,workingand operationofBrakingSystem(Hydraulic/AirBrake)

5) Studyand Demonstrationofdifferentcircuitofcarburetor

6) Checkingthesparkplugandsettingtheportandchecktheignitioninthesparkplug

7) Study&DemostraionofElectricalSystemofanAutomobile

8) StudytheassemblyofCarEngine

9) StudyanddemonstrationofEvehicle.

10) StudyoftypesofBatteriesandBatteriesmaintenanceusedinEvehicle.

11) Tostudythesteppermotorandtoexecutemicroprocessorcomputerbasedcontrolofthesamebychanging numberofsteps, thedirectionofrotationand speedE vehicle.

*PracticalExaminationshallconsistofvivavocebasedonabovetermwork.

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7ME08PROFESSIONALELECTIVE-II

(iii) DESIGNOFTRANSMISSIONSYSTEMS-

LAB.COURSELEARNINGSOBJECTIVES:

1-To **apply**standard design procedure available for Design of Transmission of Mechanicalelements.

2-**learnt**touse/selection ofstandard datafromcatalogues/databook.

COURSEOUTCOMES:

Uponthecompletionofthis coursethe students willbe able :

1. to**implement** and**selection** ofbelts,chainsand ropedrives
2. to**identify**failurespurgear anddesignitsdimensions.
3. to**study**ideaoffluid couplingsandtorqueconverters
4. to**interpret**designofgearboxes
5. to**analyze**failuretheoriesofcams,brakesandclutches

Listof Exercises forTermWork

1) Sheet1:DesignofFlexibleElements(anyone–flatbeltdrive,VbeltdriveorWirerope).
2) Sheet2:DesignandSelectionofRollerChainwithsprocket.
3) Sheet3:Designofspurgear.
4) Sheet4:DesignFluid Coupling.
5) Sheet5:DesignofTorqueConverter.
6) Sheet6:Designofslidingmesh gear box.

7) Sheet7:DesignofPlaneflatRadial Cam.

8) DesignofClutch(anyone-plateclutches,axialclutches,coneclutches,internalexpandingrim clutches)

9) Designof Brake(anyone-external shoebrakesor Internalexpandingshoebrake).

Note: -Minimum5termworkshouldbesubmittedforlab work

***PracticalExamination:-**shallconsistofViva-voceontheabovesyllabusandsubmissionof term work .

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7ME08ProfessionalElective–II

(iv) COMPUTATIONAL FLUID DYNAMICS - LAB.COURSEOBJECTIVES

- Toutilizethevariouscomputationaltoolstounderstandthefluidflow.
- Toemploythevariouscomputational toolstocomprehendheattransfer problems.
- Toapplytheknowledgeofseveralnumericalschemestosolvethegoverningequationsof physical systems.
- Tounderstandandsimulateseveralflowsituationswithforced/naturalconvectionwithInternal andexternal flows.
- Tovalidatethesimulationresultswith thatofexistingexperimental/analyticalresults.

COURSEOUTCOMES

Oncompletionofthecourse, studentwillbe ableto

- **Understand** thecomputational softwaretoolsto analysethefluid flowproblems.
- **Utilize**variouscomputationaltoolstocomprehend heattransferproblems.
- **Classify**andevaluate thephysicsof problemsandapplythe appropriate discretizationschemes.
- **Analyze**andunderstandtheresultsthroughpost-processingfor a givenproblem.
- **Compare**thesimulationresultswiththatofexistingexperimental/analyticalresults.

LISTOFEXPERIMENTS:(Anysixexperiments)

1. Performnumericalanalysisonflowthroughpipe withvaryingReynoldsNumber.
2. Tocalculatehydrodynamiclengthandboundarylayerthicknessforpipeflownumerically.
3. Tocalculatelift anddragco-efficient for acylinderbyusingnumericalanalysis.
4. Externalflowanalysisoverairfoilfordifferentangleofattacks.
5. Fluidflowandheat transferanalysisina doublepipeheatexchanger.
6. PerformNumericalanalysisoncompressibleflowinnozzle.
7. PerformNumericalanalysisonheatconductionthrough wall.
8. Couetteflowanalysisfor eitherexplicitorimplicitformulation(Parabolic equation).
9. Heatconductionin2Dflatplatewithexplicitandimplicitformulation(Ellipticequation).
10. PerformNumericalanalysisonsteadyflowpasta cylinder
11. StudyofdifferentturbulentmodelstoanalyzetheflowinapipeforvariousReynoldsnumber.
12. PerformNumericalanalysisonconvectiveheattransfer.

*PracticalExaminationshallconsistofvivavocebasedonabovetermwork.

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7ME09TECHNICALSEMINAR&PROJECT

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SYLLABUSPRESCRIBEDFORBACHELOROFMECH ANICALENGINEERING
SEMESTERPATTERN(CHOICEBASEDCREDITGRADESYSTEM)

SEMESTER:EIGHTH

8ME01OPERATIONRESEARCHTECHNIQUESCOURSELEARNIO NGOBJECTIVES(CLOs):

1. Tostudyoperationresearchmodelsandlinearprogrammingmethods.
2. Tounderstandtransportationmodelsandassignmentmodels.
3. Tostudywaitinglinemodelsandunderstandtheconceptofsequencing.
4. Tostudyreplacementmodelsandsimulationmodels.
5. Tounderstandtheconceptnetworkmodels,CPMandPERTanalysis.

COURSEOUTCOMES(CO):

1. Understandthe knowledgeof ORand ORmodels.
2. Analyzethetransportationproblemsandrelatedissues.
3. Understandthe conceptnetworkmodels,CPMandPERTanalysis.
4. Understandtheconceptreplacementmodelsandsolvetheproblemonsimulationtechniques.

SECTION–A

UNITI:OperationsResearch: Introduction,characteristics,Phases,Limitations,Modelsandclas sificationofO.R.Models.

LinearProgramming: Formulation,StandardForm,Graphicalandsimplexmethods,Primal-Dualrelationship.(8Hrs)

UNITII:**TransportationModels:Introduction**,LPFormulationoftransportationproblems, Methods forfindinginitial solution,MODImethod.

AssignmentModels:Introduction,Mathematicalstatementandsolutionmethodsofassignm.Problems,va riationsofassignmentProblems. (6Hrs)

UNITIII:**NetworkModels:**Networkconstruction,PERTanalysis,CPManalysis,costanalysis & Crashing the network, Updating resources smoothing and leveling.(6Hrs)

SECTION-B

UNITIV:Waiting line models : Introduction, characteristics, classification, analysis ofM/M/1andM/M/smodels.

Sequencing:processingofnjobsthroughtwomachines,njobs throughmmachines,twojobsthroughmmachines**.**(7Hrs)

UNIT V:**Replacementmodels:**introduction, valueof money,individual andgroupreplacementpolicies.

` **Simulation :** introduction, Monte Carlo simulation, advantages and limitations,applicationsofsimulationtoqueuingmodels,inventorymodels,maintenancemodels,etc. (7Hrs)

UNITVI: **Dynamic programming**: introduction, characteristics, applications of dynamicprogramming tocapitalbudgeting,production scheduling, travelling sales men,cargoloading problems,etc.(6Hrs)

RECOMMENDEDBOOKS:

TEXTBOOKS:

1. Operations Research and Theory applications- II ed.J.K.Sharma;Macmilan BusinessBooks
2. OperationsResearch;PremkumarGupta,D.S.Hira;S.Chand&Co.ltd.

REFERENCE BOOKS:

1. InroductiontoResearchOperation,7th Edition;Hiller/Lieberman;TataMacgrawHills.
2. OperationsResearch:AnIntroduction,7th Edition,H.A.Taha;PHI.
3. OperationsResearch:Principlesandpractices;2nd Edition,Ravindran,Philips,Solberg,JohnWilley&Sons.
4. OperationsResearch:Kapoor.

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8ME02I.C.ENGINES

COURSELEARNINGOBJECTIVES (CLOs):

1. Tostudybasicofengines,Airstandardcycles,Fuelaircycle,actualcycleandreviewofotherlosses inIC engines.
2. Tostudyconventionalfuels,requirement,properties,fueladditiveandlimitationsoffossilfuels.
3. To studystagesofcombustion,factorsinfluencingvariousstages,Detonation,Factorsandeffect of detonation, ratingof fuel andcombustionchambers.
4. Tostudydelayperiod,dieselknock,cetanerating,requirementsofcombustionchamberand methods ofgeneratingturbulence.
5. ToEvaluateperformanceofEnginesbyusingheatbalancesheet,excessaircalculationand determinationoffrictionpower, effect ofsupercharging.
6. TostudyEmissionfromEngines,EUROemissionnormsandRecenttrendsinEngines.

COURSEOUTCOMES(COs):

1. Rememberfundamentalsof I.C.engines,theirtypesandcycleanalysis.
2. Remembertheknowledgeoffuelsandalternative fuels, studyof fuel injectionpump.
3. Remembertheconceptof combustion ofCIengine.
4. Understandthe conceptofsuperchargingitsobjectives,advantagesandlimitations.

Section-A

UNITI: **Introduction to IC Engines and cycle analysis:** Basic of I.C. Engines , Detailsof two stroke and four stroke engines, Air standard cycles, Fuel air cycle andactual cycle. Variation in specific heat, Dissociation and their effect on engineperformance.Reviewofotherlossesin ICengines.(7Hrs)

UNITII:Fuels and alternative fuels : Conventional fuels for IC engines, requirement, properties,fueladditive,limitationsoffossilfuels.Reviewofvariousalternative/non-conventionalfuels.Studiesoffuelinjectionsystems :Fuelpump

and their working, differenttypes of fuel feed systems, studies of injectors nozzles,Boschtypefuel pump. (8Hrs)

UNITIII: **Combustion SI Engine:-** Stages of combustion, factors influencing variousstages, Normal and abnormal combustion, Detonation, Factors responsible fordetonation.Effectofdetonation.Octaneratingoffuel,Requirementofcombustion chambers for SI engines, important types, relative advantages anddisadvantagesandapplication. (8Hrs.)

SECTION-B

UNITIV:Combustionin CI.Engines:- StagesofcombustioninCIEngines,Delayperiod,factoraffectingdelayperiod,dieselknock,cetane rating,RequirementsofcombustionchamberforCIEngines.Methodsofgeneratingturbulenceincombustionchamber.TypesofcombustionchambersforCIEngies.(8Hours)

UNITV:**PerformancetestingofICEngines:**Evaluationofvariousperformanceparameters of IC Engines including heat balance, sheet and excess air calculation.Methods of determination of friction power. Supercharging : Basic principles,objectives, arrangements for super charging, advantages and limitations of supercharging.(8Hours)

UNITVI: **Emission from IC Engines :**review, their effect on human health, cause offormation and approaches to control this pollutants. Studyof BIS, EURO emissionnorms, IC Engines: Recent trends: Microprocessor basedengines,managementmulti-point fuel injection engines, common rail direct injections engines, variablevalvetimingengines.(8Hours)

BooksRecommended:

TEXTBOOKS:

1. Internal combustionEngines- M.L.Mathur&Sharma Dhanpatrai&Sons.
2. Internalcombustion Engines–V.Ganeshan,TataMcgrawHills.

REFERENCEBOOKS:

1. InternalcombustionEnginesFundaments-JohnB.Heywood,McgrawHillsInternalcombustionEngines&AirPollution-ObertE.F.IntextEducational.

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8ME03PROFESSIONALELECTIVE–III
(i) ENERGYCONSERVATION&MANAGEMENT

CourseLearningObjectives:

Students are expected to learn the importance and the need for conserving the Energy andapply the knowledge gain through methodologies and the management techniques in theenergyconservation.

CourseOutcome:

Afterlearningthecourse thestudents shouldbe able:

1. To understand the basic knowledge of different terms & principles of energyconservation,audit andmanagement.
2. ToEvaluatetheenergysaving&conservationindifferentmechanical utilities
3. Tounderstandefficient heat&electricityutilization,savingand recoveryin differentthermaland electrical system.
4. To prepareenergyaudit report fordifferent energyconservation instances.

Section -A

Unit-I:EnergyScenarioandimportanceofenergyconservation

EnergyScenario:ClassificationofEnergy,Indianenergyscenario,Sectorialenergyconsumption (domestic, industrial and other sectors), energy needs of growing economy,energyintensity,longtermenergyscenario,energypricing,energysecurity,energyconservationanditsimportance,energy strategy for the future.Energy ConservationAct2001 and related policies: Schemes of Bureau of Energy Efficiency (BEE), State DesignatedAgencies,ElectricityAct2003. CleanDevelopment Mechanism (CDM).(7-Hrs)

Unit-II:ThermalSystems:BoilersandIndustrialfurnaces

EnergyconservationopportunitiesinBoilers,efficiencytesting,excessaircontrol,performanceevaluation,analysisoflosses,feedwatertreatment,blowdown,energyconservation opportunities. Boiler efficiency calculation, evaporation ratio and efficiency forcoal, oil and gas. Steam distribution & use – steam traps, condensate recovery, flash steamutilization.

Electrical,Inductionfurnaces-Energysavingmeasures.(7-Hrs)

Unit-III:ThermalSystems:Fans,BlowersandHVAC

EnergyconservationinPumps,Fans(flowcontrol)andblowers,PumpsandPumpingsystems-Classification,Performance,Factorsaffectingpumpperformance,efficiency.Compressed Air Systems, Performance monitoring and compressed air-distribution system.Factorsaffectingcooling tower performanceandEnergysavingopportunities

Refrigeration and air conditioning systems – Waste heat recovery recuperators, heat sheets,heatpipes, heat pumps. Energyconservation methods.(7-Hrs)

Section -B

Unit-IV:ElectricalSystems

AC / DC current systems, Demand control, power factor correction, load management, Motordrives:motorefficiencytesting,energyefficientmotors,motorspeedcontrol,electricaldistribution systems – Transformers – Power quality – harmonic distortion. Reduction oflosses– Powerfactor.Lighting: lightinglevels, efficient options.(7-Hrs)

Unit-V:Energyauditing

Definition, energy audit, need, types of energy audit. Energy management (audit) approach-understanding energy costs, Bench marking, energy performance, matching energy use torequirement, maximizing system efficiencies, optimizing the input energy requirements, fuelandenergysubstitution, energyaudit instrumentsand metering.(7-Hrs)

Unit-VI:EnergyManagementandEconomics

Energy resource management – Energy Management information systems (EMIS) – EnergyMonitoringandTargeting:Definingmonitoring&targeting,elementsofmonitoring&targeting.

Energyeconomics–discountrate,paybackperiod,internalrateofReturn,lifecyclecosting –Financingenergyconservation Projects.(7-Hrs)

Books

Recommende:-

TextBooks:

1. L.C.Witte,P.S.Schmidt,D.R.Brown,IndustrialEnergyManagementandUtilisation,HemispherePubl, Washington, 1988.
2. O.Callaghn,P.W.DesignandManagementforEnergyConservation,PergamonPress,Oxford, 1981.
3. IDryden,I.G.C.TheEfficientUseofEnergy,Butterworths, London,1982

REFERENCESBOOKS:

1Turner,W.C.EnergyManagementHandBook,Wiley,NewYork,1982.

2. 4Murphy,W.R.and McKAY, G.EnergyManagement,Butterworths,London1987.

3.EnergyConservationGuidebook,DaleRPatrick,StephenWFardo,2ndEdition,CRCPress.
4. HandbookofEnergyAudits,Albert Thumann, 6thEdition, TheFairmont Press

5.Trivedi,P.R,JolkaK.R.,EnergyManagement,
CommonwealthPublication,Newelhi,1997.

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8ME03 PROFESSIONALELECTIVE–III
(ii) RODUCTION PLANNING AND CONTROLCOURSELEARNING OBJECTIVES(CLOs);

1. Tounderstandtheimportanceofproductionplanningandcontrol,itsfunctions,advantages.
2. Toapplytheskillsofcalculatingforsalesforecastsusingvariousforecastingmethods.
3. Torememberconceptofmachinecapacity,loadingofmachinesandmanmachineactivitych arts.
4. Tostudytheconceptofinventorycontrol&variouscasesofinventorysystemandmoderntech niques/philosophiesofmanagementlikeCIM,JIT,MRP-IandMRP-II.

COURSEOUTCOMES(COs):

1. Understandtheimportanceofproductionplanningandcontrol,itsfunctions,advantages.
2. Applythe skills of calculatingfor sales forecastsusingvarious forecastingmethods.
3. Rememberconceptofmachinecapacity,loadingofmachinesandmanmachineactivitychart s.
4. Understandconceptofinventorycontrol&variouscasesofinventorysystemandmoderntec hniques/philosophiesofmanagementlikeCIM,JIT,MRP-Iand MRP-II.

SECTION–A

UnitI:-INTRODUCTION

ObjectivesandAdvantagesofPPC,Productionprocedure,functionsofPPC,production consumptions cycle, centralised & decentralised PPC, Pre-requisite ofPPC.(7-Hrs)

UnitII:-PRODUCTIONFORCASTING:-

Introduction,definitionandimportanceofforecasts,Qualitative model: Delphitechniques,Quantitativemodels:-Simplemoving average,weightedmovingaverage,simpleexperimentalsmoothing. Forecasingerrorandselectionofforecastingmodel.Typesofforecaste:Constant,linear cycle forecaster, Verification and conrolling, The moving rangechart,AverageMR,outofcontrolconditions.(8-Hrs)

UnitIII: PRODUCTION PLANNING : - The production order, Procedure for formulatingProduction order, masier Program, Basic problemsin production planning, Quantitiesin batch production, criteria for batch, size determination, minimum cost batch size,production range, Maximum profit Batch size, Maximum return, Rate of return,EconomicBatchsize.(7-Hrs)

SECTION–B

UnitIV:MACHINEOUTPUT:

Machineoutput,multimachinesupervisionbyoneoperator, Machineinterference,Ashcroftlabels,averagenumberofconsecutiveservicingtask,theAshcraft Number.(7-Hrs)

UnitV:ANALYTICAL STRUCTUREOFINVENTORY:-Definition

of inventory, Types of inventory and the classification, structure ofinventoryproblems and its analysis, the relevant cost, objectives of carrying inventories,selective inventory analysis. Static Model :- General characteristic, incrementalanalysis,opportunitycost,costofrisk,decisioncriteriaunderuncertaincy.(7-Hrs)

UnitVI:A) DYNAMICMODEL:-CERTAINITYCASE;-General characteristic,optimumlotsizemodelwinconstantdemand,quntitydiscounts.RiskCase:-Generalcharacteritics,P-systemandQ-system.

B) Material Requirment planning (MRP) :- Introduction to MRP, ManufacturingResource Planning (MRP-IT), just in time (JIT), comparison of MRP, MRP-II,EntrepreneurshipResourcePlanning(ERP). (8Hrs.)

BooksRecommended:

TEXTBOOKS:

1. Elements of ProductionPlanning andControlby SimuelEilon– UniversalPublishingCorporationltd.Mumbai
2. ProductionControl–JohnE.Biegal-PrenticeHallofIndia.
3. Inventorycontrol,Theory&Practice-Start&Miller

REFERENCEBOOKS:

1. Production Planningandcontrol andManagement:- K.C.Jain &L.N.Agrawal.
2. Production&OperationMgmt.;-E.E.Adam,Jr.R.J.Ether,PrenticsHallofIndia.
3. IndustrialEngineeringandProductionManagement-M.Mahajan-DhanpatRai.

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8ME03PROFESSIONALELECTIVE–III

(iii) PRODUCTDESIGN&DEVELOPMENT

CourseLearning Objectives:

This course aims at introducing the students to the basic concepts of engineering designand product development with focus on the front-end processes. At the end of this coursethe student is expected to demonstrate an understanding of the overview of all the productdevelopmentprocessesand knowledgeof conceptgenerationandselectiontools.

CourseOutcomes:

Aftersuccessfullycompletion of this coursestudents will be able to:

1. Managethedevelopmentofanideafromconceptthroughtoproduction.
2. Employresearchandanalysismethodologiesasitpertainstotheproductdesignproces s,meaning,and user experience.
3. Apply creative process techniques in synthesizing information, problem-solving andcriticalthinking.
4. Demonstrate,apply, explain,andrecognizebasicengineering,mechanical,andtechnicalprinciplesfordecision making
5. Usesustainablematerialsand manufacturingprocesses &Carryoutcost andbenefitanalysisthrough variouscost models.

Section-

AUNITI Introductionto product design:

The morphology of design, Primary design phases & flowcharting, Role of allowance,Process capability and tolerance in detailed design and assembly, detailed design phase. (6-Hrs)

UNITIIProductdesignpractices:

Product strategies, time to market, analysis of the product, the Three S's, standardization,Renard series, Simplification, Designer and his role, Basic design consideration, Proceduresand problems faced by industrial designer, Role of aesthetics in product design, functionaldesignpractice. (6-Hrs)

UNITIIIProductdesignconsideration:

Principal stress trajectories, balanced design, criteria and objectives of design, materialtoughness:resilience,designingforuniform strength,tensionvis-à-vis compression.
Pure struts and pure columns, mapping of principal stresses, buckling and instability, theoryof long columns, hollow columns, plastic design, practical ideas for material saving in design,ribs,corrugation, laminated, membranes.(6-Hrs)

Section-B

UNITIVDesign forproduction:

Producibilityrequirement,forgingdesign,pressed componentdesign,castingdesign,designfor machining ease, the role of process engineer, ease of location and clamping, die castingandspecialcasting,designofpowdermetallurgicalparts,expandedmetalandwireforms.
Introduction, properties & classification of plastics, phenolformaldehyde and ureaformaldehyde resin products, compression moulding, transfer moulding, injection moulding,high-pressurelaminates,forminganddrawingofplasticsheets,designofplasticparts,natural & artificial rubber, engineering properties of rubber, Glass & ceramics.Plastic bushbearings, gears & fasteners in plastic, Design recommendation for rubber parts, Distortion inrubber, dimensional effects and tolerances, design factors for ceramics and glass parts, Wood.(6-Hrs)

UNITVOptimization&economicsindesign:

Siddal's classification of design approach, Optimization by differential calculus, Langrangemultipliers, Linear programming, geometric programming, Johnson's method of optimumdesign.
Product value, design for safety, reliability and environmental considerations, manufacturingoperations in relation to design, economic analysis, profit & competitiveness, break-evenanalysis,economics ofanew product design.(6-Hrs)

UNITVIHuman engineering, value engineering & role of computer in product designHuman being vas applicator of forces, Anthropometry, design of controls& displays,man/machine information exchange, workplace layout from ergonomic consideration, noise,heatingand ventilating, lighting.

Introduction to value, maximum value, normal degree of value, importance of value,creativity,stepstoproblemsolvingandvalueanalysis,valueanalysistests,valueengineering idea generation check-list, cost reduction through value engineering, material andprocessselection in valueengineering.

Introductiontoproductcycle&CAD/CAM,roleofcomputersinmanufacturingandd esign,creationofamanufacturingdatabase,CIM,communication networks, GT, production flow analysis, MRP, FMS, JIT.**(7-Hrs)**

BooksRecommended:

TextBooks:

1. Anita Goyal, Karl T Ulrich, Steven D Eppinger, "Product Design andDevelopment ", 4th Edition, 2009, Tata McGraw-Hill Education, ISBN-10-007-14679-9.

2. CliveL.Dym,PatrickLittle,"EngineeringDesign:AProject-basedIntroduction", 3rdEdition, JohnWiley&Sons, 2009,ISBN978-0-470-22596-7

ReferenceBooks:

1. GeorgeE.Dieter,LindaC.Schmidt,"EngineeringDesign",McGraw-HillInternationalEdition, 4thEdition, 2009,ISBN 978-007-127189-9

2. KevinOtto,KristinWood,"ProductDesign",IndianReprint2004,PearsonEducation,ISBN 9788177588217

3. YousefHaik,T.M.M.Shahin,"EngineeringDesignProcess",2ndEditionReprint, CengageLearning, 2010,ISBN0495668141

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8ME03PROFESSINALELECTIVE-III
8ME03(iv)ARTIFICIALINTELLIGENCE

CourseLearningObjectives(CLOs):

1. TounderstandthebasicconceptsofArtificialIntelligence.
2. TounderstandthebasicconceptsofExpertSystem.
3. Tostudythemethodsofknowledgerepresentation.
4. TounderstandtheExpertsystemTools,knowledgebaseeditors,procedureorientedmethods,object-orientedmethods,logic-basedmethods,access-orientedmethods.
5. Tostudythemethods of Buildinganexpert system.
6. TounderstandtheconceptofFuzzyEngineering&applicationsoffuzzyexpertsystems fordesignofindustrialcontrollers.

CourseOutcomes(COs):

1. Understandthe conceptofknowledgeandknowledgebase.
2. Applythe skills of development ofexpert systemforindustrial problems.
3. Rememberthedesignpre-requisitesanddesignprocedureofexpertsystem.
4. Understandtheconceptof fuzzylogic and will tryto implement inproject work.

SECTION–A

Unit-I : Introduction to Artificial Intelligence (AI) – Overview of AI, definition andimportance of knowledge based systems, representation of knowledge, knowledgeorganization,knowledgemanipulation,acquisitionofknowledge.(6Hours)

UnitII:IntroductiontoExpertSystems-
Featuresofexpertsystems,knowledgeengineering,basisexpertsystemterminology,humanexpertsandartificialexperts,

algorithmic nd heuristic methods, difference between conventional programs andexpertsystems,Architectureofexpertsystems. (8Hours)

Unit III: Knowledge Representation– Rule based methods, rule execution, forwardchainingandbackward chaning,knowledgerepresentationusingsemanticnets,structureofsemanticnets,Frame-basedmethods. (8Hours)

SECTION–B

UnitIV:ExpertsystemTools–
Typesoftoolsforexpertsystembuilding,systembuildingaids,supportfacilities,debuggingaids,I/Ofacilities,explanationfacilities,knowledgebaseeditors,stages inthedevelopmentofexpertsystemtools,procedureorientedmethods,object-orientedmethods,logic-basedmethods,access-orientedmethods. (7Hours)

Unit V : Building an expert system – Development phased in expert system building,developmentconstraints,reliability,maintainability,examplesofexpertsystems,difficulties in developmentofexpertsystems.(7 Hours)

Unit VI: Fuzzy Engineering - Fuzzy logic, fuzzy expert systems, fuzzy sets, membership functions,fuzzy rulesfor approximate reasoning,fuzzy inferencegeneration,deffufication, development of rules matrix, applications of fuzzy expert systemsfordesignofindustrialcontrollers. (7 Hours)

RECOMMENDEDBOOKS:

TEXTBOOKS:

1. AguidetoExpertSystemsbyDonalda.Waterman,Pearson
2. Introduction toArtificialintelligence&ExpertSystems byDanW. Peterson,PHI
3. FuzzyLogicbyJohnYen,RezaLangari,Pearson

REFERENCEBOOKS:

1) ExpertSystems–Theory&Practice,ByErmine,JeanLouis,PHI
2) ExpertsystemsinEngineering,ByD.T.Pham.JFSPub.
3) ExpertsystemapplicationbySumitVadera,Sigmapress
4) ArtificialIntelligencebyWinstonP.H.,Pearson

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8ME04PROFESSIONALELECTIVE–IV

(i) REFRIGERATION & AIR

CONDITIOINGCOURSELEARNINGOBJECTIVES(CLOs):

1. Illustrate the fundamental principles and applications of refrigeration and airconditioning system Learning the fundamental principles and different methods ofrefrigerationandair conditioning.
2. Comparative study of different refrigerants with respect to properties, applicationsand environmental issues. Study the numbering system of Refrigerants and itsclassification.
3. Identify the basic components of a refrigeration cycle.Study of various refrigerationcycles and evaluate performance using P-H chart, Mollier charts and/ or refrigerantproperty tables. Obtain cooling capacity and coefficient of performance by conductingteston vapourcompression refrigeration systems
4. Understand the basic air conditioning processes on psychometric charts, calculatecoolingloadforitsapplicationsincomfortandindustrialairconditioning.Operateandanalyzethe refrigeration andair conditioningsystems.
5. Study of the various equipment-operating principles, operating and safety controlsemployedin refrigerationair conditioningsystems.

COURSEOUTCOMES:

1. Understandthefundamentalbasicsofsimplevapourcompressionsystem,typesofrefrigerantused in refrigeration system.
2. Understandthemultistagepressuresystem,itstypesandelementarytreatmentofrefrigerationsystem.
3. Applytheknowledgeof refrigerationsystemand itscontrols,defrosting.
4. Applytheconceptairconditioningsystemaswinter,summerairconditioningsystemapplicationsand its related issues.

SECTION–A

Unit I :**Introduction to automotive airconditioning**- Vapourcompression system:-Analysisofsimplevapourcompressionsystem.Useofpressureenthalpy.Temperature entropy charts. Effect of operating conditions such as evaporation andcondesionpressure,superheatingandsubcoolingActualvapourcompressionsystem, Refrigerants :-classification: primary & secondary refrigerants, desirableproperties of refrigerants; merits & demerits of commonly used refrigerants such asAmmoniaR-12,R-22andtheirselectionsandecofriendlyrefrigeration134a,HFC.(8-Hours)

Unit II:**Multi stage pressure systems**- multistage compression: choice of intermediatepressure,completemulti-stagecompressions.Multievaporatorsystems;singlecompressionindividualexpansionvalue,singlecompressionmultiexpansionvalve,individualcompressormultiexpansionvalves,cascadesystems,itsapplicationstocryogenicsAirliquefactionprocesses-Linde-Hampson(Nonumericaltreatmenttoairliquefactionsystem) (7-Hours)

Unit III :**Refrigeration systems components & controls**:- brief study of refrigerantscompressor,condensers,evaporators,expansionvalves,drier,fillers,selectioncriteriaforthecomponentsofvapourscompressionsystemsFlowcontrols,temperature controls,pressure controlsandsafety devices.Defrosting systems,testing&chargingofrefrigerationsystems,leakdetection.(Noanalyticaltreatmentisexpected) (7-Hours)

SECTION–B

UnitIV:Psychromericpropertiesofmoisairpsychrometricchart,conceptofthermodynamic wet –bulb temperature, representations of Psychromeric process onPsychromericcharts,mixingofair,evaporatingcooling,airwashers.Humancomfort:-metabolism ofhumanbody,factorsinfluencingcomfort,conceptofeffectivetemperature,optimumeffectivetemperature&comfortcharts. (7Hours)

UnitV:**Classificationofairconditioningsystems&applications**.Unitarysystempackage,window type & split type air conditioning. Central system:-System components,types:-directexpansionsystem,allwatersystem&allairsystem.Water,summers&year round air conditioning. Transmission & distribution. Types of supply air ducts,considerationforselection& locationof outlet, distributionpartnersof outlet,locationofreturn airopening&introductiontoductdesign. (*Nonumericaltreatmentisexpected*). (7Hours)

Unit VI : Load calculation & applied Psychromety-basic consideration atheat gains/lossessensible&latent,heatduetooccupancylightening,appliances,products,process, air conditioning systems, safety factor cooling load estimates, heatingload estimates. Sensible heat factor by pass factor, apparatus dew point, effectivesensibleheatfactor. (7Hours)

BOOKSRECOMMENDED:

TEXTBOOKS:

1. Refrigeration&airconditioning;C.P.Arora;TataMcgrawHillPublication.
2. Refrigeration &airconditioning;Arora,Domkundwar;DhanpatRaiPublication.

REFERENCEBOOKS:

1. Principles ofRefrigeration;J.Dossat;PearsonEducation,Asiapublication
2. Refrigeration&air conditioning-P.L.Balaney
3. Refrigeration&airconditioning-ManoharPrasad.

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8ME04PROFESSIONALELECTIVE–IV

(ii) FINITE ELEMENT

ANALYSISCOURSELEARNING OBJECTIVES(CLOS):

1. Tostudythe concept ofFEMandvarious methods in it.
2. TounderstandtheknowledgeofapplicationofMatrixAlgebra&GausianElimination.
3. Tostudythefiniteelementmodelingapproachesandunderstandtheconceptofboundaryconditions.
4. Tostudy2DproblemsforConstantstraintriangle,temperatureeffects,problemmodelingandboundaryconditions.
5. Tostudytheconcept ofheat transferandfluidflow.

COURSEOUTCOMES:

1. Applytheknowledgeofprincipalof FEA,itstypes,governingequation,fundamentalconcep tof solid mechanics.
2. Rememberthemathematicalunderstandingrequiredfor FEAandfinitedifferencetechnique s.
3. Understandtheknowledgeofapplicationof FEAsuchasrelatedtostressonbeams,threedime nsional frames, heat transfer.
4. Applythe knowledgeof FEA inproject work.

SECTION-A

Unit I : Introduction : Application, Advantages, Steps of FEM, Stress and Equilibrium,Boundary conditions, Strain Displacement Relations, Stress-strain Relations, Vonmisesstress,Temperature effect,PotentialEnergy&Equilibrium,Gelerkin'sMethod,stiffness(Displacement)Method.(7Hrs)

Unit II : **Matrix Algebra & Gausian Elimination :** Matrix Multiplication, Transposition,DiagonalMatrix,SymetricMatrix,UpperTriangular Matrix, Determinant ofMatrix,MatrixInversionEligenvalues&Elgenvectors,Gaussianelimination. (7Hrs)

Unit III : **IDProblems:**FiniteElement modeling,coordinateShapefunction, Thepotential Energy approah, The Galerkin'sApproach,assemblies of theglobalstiffness matrixandloacvectors, Properties of stiffness Matrix, Treatment ofboundaryconditions,quadraticShapeFunctions,TemperatureEffects.(7Hrs)

SECTION–B

Unit IV : **2D Problems for CST :** Constant strain triangle, isoperimetric Representation ,potentialEnergyenergyapproach,elementstiffness,galaerkin'sapproach,temperature effects,problem modelingandboundaryconditions.(7Hrs)

Unit V :**Development of equations:** Truss equations, derivation of the stiffness, matrixfor a bar element in local coordinate, global stiffness matrix, beam equation.Beamstiffness,example assemblage of beamstiffness matrix, plain stress &plainstress stiffness equations, basic concept of plainstress and plainstrain,derivationof the CSTstiffnessmatrixandequationsTreatment ofbodyandsurfaceforces. (7Hrs)

Unit VI :**Heat Transfer :** Derivation of the basic differential equations, Heat transferwith conduction,radiation,IDFormulationusingvariationalmethod.

Fluid Flow : Derivation of the basic differential equations, Id Finite Elementformulation, Computer Implementation (prepossessing,post processing,inputdatafile,meshgeneration) (7 Hrs)

BOOKSRECOMMENDED:

TEXTBOOKS:

1. Introduction toFiniteElementEngineering–T.R.Chandrupatla,Belegunda;PHI
2. A First course in Finite Element Method- Darya Logon, ThompsonLearning (TLPublisher)

REFERENCE BOOKS:

1. TheFiniteElementMethodinEngineering-S.S.Rao,ElsveirPub.,4th Edition.
2. FundamentalsofFiniteElementMethodanalysis–D.V.Huttan,TataMcgrawHill
3. Concept&ApplicationsofFiniteElementAnalysis–RobertD.Cook
4. Finite&BoundaryElementMethodinEngineering–O.P.Gupta
5. AnIntroductiontoFiniteElementMethod-J.N.Reddy,TataMcgrawHill,2nd Edition,2005.

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8ME04PROFESSIONALELECTIVE–IV

(iii) ROBOTICS&INDUSTRIAL APPLICATIONSCOURSELEARNING OBJECTIVES:

1. Tounderstandbasicsofrobotics,evolutionofrobotsandtheirroleinindustrialautomation.
2. TostudytheRobot'sanatomy,jointstypes,wristconstruction,robotstandardconfigurations and theirworkspaces..
3. Tostudythe constructionandworkingofdifferenttypes of endEffectors.
4. Tostudyvarious robot drives, robot motion control andits levels.
5. Tounderstandvarious methodsof teachingandprogrammingthe robots.
6. Tostudyprincipleofworkingandapplications of different typesof robotsensors.
7. Tostudyrobotkinematics viz. forward, reverse andhomogeneous transformation.
8. Tostudydifferentapplicationsofrobotsinmanufacturingandtounderstandimportanceofrobotfeatures for a particularapplication.
9. TostudydifferentQuantitativemethodstoperformeconomicevaluationofrobotproject.

COURSEOUTCOMES:

1. Understandthe conceptofrobotics,itshistory.
2. Rememberrobotanatomyandvariousconfigurationsfordifferentindustrialapplications
3. Understandthe conceptofkinematicanalysisofrobots.
4. Remembertheconceptrobotprogramming,itsmethodsandprogramminglanguages.

SECTION–A

Unit I : Fundamentals of Robotics- Introduction, Automation & Robotics- robot applicationsroboticsystems,robotanatomyandrobotconfigurations,Jointtypesusedinrobots, robot wrists, jointnotationschemes,workvalueforvariousrobotanatomies,robotSpecifications**.** (8Hrs.)

Unit II : Robots end-effectors-classification of end-effectors, mechanical grippers, hookingor Lifting grippers, grippers for molten metal , plastics, vacuum cups, magneticgrippers Electrostatic grippers, multiple grippers, internal & external grippers, drivesystems for gripers,active & passive grippers. Design consideration in gripper,gripperanalysis. (7Hrs.)

Unit III: Robot drives & control-pneumatic power drives, hydraulic systems, electricdrives, robot controllers-servo and non servo systems, motioncontrol of robots,point to point and continuous path control, teaching of robots, robot programmingmethods. (7Hrs.)

SECTION–B

Unit IV:Robot Sensors: Features, Contact type sensors:- wrist force sensor, binary &analogtouchsensor,

Artificialskins,force,torque,encoders,position,velocitysensors,

Noncontacttypesensors;-visionsensor,proximity,rangesensors,safetymeasuresinrobot.(7Hrs.)

UnitV:RobotKinematics-
Forward&reversekinematics,forwardandreversetransformationoftwoDOF&threeDOF2-Dmanipulator,homogeneoustransformations.(6-Hrs)

Unit VI: Quantitative Techniques for economic performance of robots- Robot investmentcoats, robot operating expenses. Methods of economic evaluation, method of pay-backperiod,return oninvestmentmethod,discountedcashflowmethod.

VALCommand:robotprogramminginVal&RAIL.(7Hrs.)

RECOMMENDEDBOOKS:

TEXTBOOKS:

1) RoboticsTechnology&FlexibleAutomationbyS.RDeb,TataMcGrawHill.
2) IndustrialRoboticsbyM.P.Groover,McGrawHill.

REFERENCEBOOKS:

1. RoboticsforEngineering,KoreanYoram,McGrawHill.
2. Robots&ManufacturingautomationbyAsfahal,C.Ray,JohnWiley.
3. RoboticEngineeringbyRichardD.Klafter,PHI.

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8ME04PROFESSIONALELECTIVE-IV

(iv) RAPID

PROTOTYPINGCOURSELEARNING

OBJECTIVES(CLOS):

1- Understandthe fundamentals of Rapid Prototyping Techniques.2-Understand

themethodologyforprocessingofRP Cad models.

3- Selection of appropriate RP fabrication techniques for the prototyping.4-Studyof

prototypingtechniquesforReverse engineering.

5-ToaquirethenecessaryknowledgeregardingRPsoftwares.

COURSEOUTCOMES(CO):

1-**Create**anddevelopoverallawarenessfordesignofRapidprototype.2-**Apply** fundamentals of RP techniques.

3- **Design and develop** the RP Toolings for using suitable rapid prototypingtechnique.

4- **Synthesis**ofRPtechniquesforreverseengineering.

Section-A

Unit-I.IntroductiontoProductDesign:Designdefinitions;Briefhistory ofIndustrialdesigns. Industrial Design chronology, stages in Product development.Cost associated invariousstages of Productdevelopment.

Prototyping: What is Prototype?, Types of Prototype, Principles of Prototyping, PrototypingTechnologies.(7-Hrs)

Unit-II .Basics of Rapid Prototyping: Rapid Prototyping: Working Principles and types ofRapid Prototyping machines. Input devices, Contact and non-contact type digitizers such asCoordinatemeasuringmachines,Laser and White light scanners.

FieldsofApplication ofRP: Idustrial,medical,etc.(7-Hrs)

Unit-III.RP Process: Photo polymerization (Stereo lithography (SL), Microstereolithography),Powder Bed Fusion (Selective laser Sintering (SLS), Electron Beam melting (EBM)), Extrusion-Based RP Systems (Fused Deposition Modeling (FDM)), 3D Printing, Sheet Lamination(Laminated Object Manufacturing (LOM), Ultrasonic Consolidation (UC)), Beam Deposition(LaserEngineered Net Shaping(LENS), DirectMetalDeposition (DMD)).

(8-Hrs)

Section-B

Unit-IV.Physicsof RPProcess:

Process Physics, Tooling, Process Analysis, Material and technological aspects, Applications,limitations and comparison of various rapid manufacturing processes. Classification of RPMethods.

Pre and Post processing: Pre-processing for RP,Post-processing of RP parts, Errors in RPparts,Part buildingerrorsin FDM,STL,LOM, SLS Parts.

.(6-Hrs)

Unit-V. Rapid Tooling: What isRapid tooling?, Types of Rapid toolings. Benifits of Rapidtooling.

Silicon rubber tooling, Aluminium filled epoxy tooling, Spray metal tooling, Cast kirksite,3Q keltool, etc. Direct Rapid Tooling Direct. AIM. Quick cast process, Copper polyamide,RapidTool,DMILS,Prometal,Sandcastingtooling, LaminatetoolingsoftToolingvs.hardtooling.

.(6-Hrs)

Unit-VI. Overview of RP Software: STL files, Overview of Solid view, magics, imics,magic communicator,etc.Internet basedsoftware,Collaborationtools. .(6-Hrs)

Books Recommended:-

TextBooks:

1-Rapid Prototyping by Amitabha Ghosh ,affiliated East –west press pvt.ltd.,New Delhi.2- Rapid Prototyping by Adithan M.Edition 2018,Atlantic Publishers & distributer pvt.ltd.3-AdditiveManufacturingbyC.P.Paul &A.N.Jinoop McGrawHill 1st Edition 2021

4- Product Design & Development by Karl T.Ulrich & Steven D.Eppinger.,Tata McGrawHillPublishing.

5- RapidPrototypingDataFormatsbyV.V.PrathibhaBharathi. Notionpress publishing.

ReferenceBooks:

1-CAD & Rapid Prototyping for product design, Dauglas Bryden, Laurence KingPublishing.

2-RapidPrototyping (Principleand Application),Rafiq Noorani byWileyPublishing.

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8ME05I.C.ENGINES-

LAB.COURSELEARNING OBJECTIVES(CLOs):

1. Tostudybasicofengines,Airstandardcycles,Fuelaircycle,actualcycleandreviewofotherlosses inIC engines.
2. To
3. ToEvaluateperformanceofEnginesbyusingheatbalancesheet,excessaircalculationand determinationoffrictionpower, effect ofsupercharging.
4. TostudyEmissionfromEngines,EUROemissionnormsandRecenttrendsinEngines.

COURSEOUTCOMES(COs):

1. Rememberfundamentalsof I.C.engines,theirtypesandcycleanalysis.
2. Applytheknowledgeof amulti-cylinderpetrolengine.
3. EvaluateperformanceofEngines byusingheat balancesheet
4. Studyof fuel injection pump and injectors.

ListofExperiments(AnySix):

Anysixofthefollowingpracticalshouldbeperformedand

1. Performanceteston asinglecylinderdieselengine.
2. Performancetestonasinglecylinderpetrolengine.
3. Evaluationoftheheatbalanceforsinglecylinderdieselengine.
4. Performancetestonamulti-cylinderpetrolengine.
5. Morstestonmulti-cylinderpetrolengine.
6. Trialonpetrol/dieselenginetoplotp-0andp-Vdiagram.
7. Measurementofexhaustgasemission fromS.I.engine
8. MeasurementofsmokedensityofCIengineexhaust.

9. StudyofBoschtypesingleplungerfuelpump.
10. Studyofvarioustypesoffuelinjectorsandnozzles.

*Itshallconsistofviva-vocebasedontermworkandsyllabus.

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8ME06PROFESSIONALELECTIVES-IV

(i) REFRIGERATION &AIRCONDITIONING-

LAB.COURSELEARNINGOBJECTIVES(CLOs):

1. Illustrate the fundamental principles and applications of refrigeration and airconditioning system Learning the fundamental principles and different methods ofrefrigerationandair conditioning.
2. Identify the basic components of a refrigeration cycle. Obtain cooling capacity andcoefficient of performance by conducting test on vapour compression refrigerationsystems
3. Study of various types of refrigeration systems for various applications like ice plant,watercooler etc.
4. Understandthebasicair conditioningprocesses.
5. Study of the various equipment-operating principles, operating and safety controlsemployedin refrigerationair conditioningsystems.

COURSEOUTCOMES(CO):

1. Understandthefundamentalbasicsofsimplevapourcompressionsystem,typesofrefrigeran tused in refrigeration system.
2. Applytheknowledgeof different applicationsofrefrigerationsystems.
3. Applytheknowledgeof refrigerationsystemand itscontrols,defrosting.
4. Applythe conceptairconditioningsystem.

ListofPracticals:-

Any**six**ofthefollowingshouldbeconductedandareportthereofshouldbesubmitted

1. TrialonVapourcompressionsystem.
2. TrialonAir-conditioningsystem.
3. StudyofElectroluxsystem.
4. StudyofWatercooler.
5. StudyofwindowAirconditioner.
6. Studyofhouseholdrefrigerator.
7. Studyofdesertcooler.
8. Studyofcoldstorageplant.
9. Testing andchangingofrefrigerationsystem.
10. Studyofdefrostingsystem.
11. Study/trialoficeplant.
12. Studyofvarious refrigerationandair-conditioningcontrols.

***PracticalExamination:shallconsistofviva-vocebasedontermworkreportandsyllabus.**

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8ME06PROFESSIONALELECTIVE-IV

(ii) FINITEELEMENT ANALYSIS-

LAB.COURSELEARNING OBJECTIVES(CLOS):

1-TounderstandtheknowledgeofapplicationofMatrixAlgebra&GausianElimination.

2-Designoffiniteelementmodelingapproachesandunderstandtheconceptofboundaryconditions.

3-Formulationof2DproblemsforConstantstraintriangle,temperatureeffects,problemmodelingand boundaryconditions.

4-Understand conceptFEAappliedforheattransferandfluidflow.

COURSEOUTCOMES:

1-ApplytheknowledgeofprincipalofFEA,itstypes,governingequation,fundamentalconcepto f solid mechanics.

2-RememberthemathematicalunderstandingrequiredforFEAandfinitedifferencetechniques.

3-ApplicationofFEAsuchasrelatedtostressonbeams,threedimensionalframes.4-Applytheknowledgeof FEA inheat transfer and fluid flow.

Listof Practicals(Any-5):

1. Studyof aFEA modeling &FEA packages.
2. StressAnalysisofbars having

i) Constantcrosssectionarea

ii) Taperedcrosssectionarea

iii) Steppedbar.

3. StressAnalysisofbeam(SimplysupportedorCantilever)carryingpointloadand uniformlydistributedload.
4. Solveanyone2D problem on CSTelement.
5. Solveanyoneproblem on truss element
6. Solveanyoneproblem onaxi-symmetricelement
7. Solve anyoneproblemon steadystate heatcondition

***PRACTICALEXAMINATION:**-shallconsistofviva-voce basedontermworkreportandsyllabus.

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8ME06PROFESSIONALELECTIVE-IV

(iii) ROBOTICS & INDUSTRIAL APPLICATIONS-

LABCourseLearning Objectives:

1) TounderstandthebasicconceptsassociatedwiththerobotfunctioningandapplicationsofRobots.

2) Tostudyabout therobot motion analysisof robot.

3) To studyabout thedrives andcontrol system used in Robots.

4) Tounderstandthe conceptsofendeffectors,sensors andvisionsystemusedinrobots

5) Tolearn aboutrobotprogramming.

CourseOutcomes:

Aftersuccessfullycompletion ofthis coursestudentswill beable to:

1) Toknowabout fundamentalknowledgeabouttherobot
2) Toknowaboutrobotmotion analysis.
3) Toknowaboutdrivesand controlsystem used inrobots.
4) Toknowaboutend effectors,sensors andvisionsystem.
5) Toknowaboutrobotprogrammingmethodsandlanguages.

ListofPrcticals:(Any-5)

1-StudyofcomponentsofarealRobot&itsDHParameters.2-DemostrationofRobotwith2DOF,3DOF,4DOF,etc.

3-Studyofpositioningandorientationof Robotarm.

4-ProgrammingoftheRobotforIndustrialApplication(actualtrialonrobot,ifavailableortrialonsimulationsoftware).

5-RoboticControlExperimentdemonstrationusingavailablehardwareorsoftware.

6-Integrationofassortedsensors(IR,Potentiometer,staringages,etc.)microcontrollers&ROS(RobotOperatingSystem)inaRoboticsystem.

7- IndustrialRobotapplication(AnyoneMiniproject)

8-StudyofRobotSimulationSoftware(onanyoneapplication).

PracticalExaminationshallconsistofvivavocebasedonabovetermwork.

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8ME06PROFESSIONALELECTIVE-IV

(iv) RAPID PROTOTYPING-LAB.COURSELEARNING OBJECTIVES (CLOS):

1- Studythe fundamentals ofRapid Prototyping Techniques.
2- Understand the use of techniques for processing of Cad models for RP.3-Useof suitableRP fabrication techniques forprototyping.
4-Use of prototyping techniques for reverse engineering.5-To gettheintroduction regardingRP software.

COURSEOUTCOMES (CO):

1-Create anddevelopoverallawarenessfordesignofRapidprototype.2-Applyfundamentals of RP techniques.
3- Selection of appropriate tooling for rapid prototyping process.4-Synthesis of RP techniques forreverseengineering.

Listof Practical (Any-5):

1-Tocreatea3-Dmodelofamachine componentforRP
2- Generation of a Process Plan for fabrication of a product on the basis ofCADModel.
3- Fabricationofparton availableRP setup.
4- Post processing of fabricated Additive Manufactured product/prototype.5-Inspection of fabricated product/prototype for dimensional accuracy anddefects.
6- Post processing of CAD model and generation of .stl file using suitablesoftware.
7- Study of principles of various pixel generation techniques and forms ofrawmaterials in RP.

***PRACTICAL EXAMINATION:-**shall consist of viva-voce based on termworkreport and syllabus.

*****8ME07PROJECT**

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2.Academic Calendar of the University:

SANT GADGE BABA AMRAVATI UNIVERSITY GAZETTE

Official Publication of Sant Gadge Baba Amravati University

PART- TWO

(असाधारण)

बुधवार, दिनांक ११ जानेवारी, २०२३

अधिसूचना

क्रमांक : ०८/२०२३ दिनांक: ११/१/२०२३

विषय : शैक्षणिक नियामिका .... शैक्षणिक वर्ष २०२३-२०२४

Subject: Academic Calendar.... Academic Year 2023-2024

सर्व संबंधितांच्या माहिती करीता अधिसूचित करण्यात येते की, शैक्षणिक वर्ष २०२३-२०२४ ची शैक्षणिक नियामिका खालील प्रमाणे राहील.

It is notified for all concerned that, the Academic Calendar for the Academic Session 2023-2024 shall be as under:

तक्ता -१

(Table-1)

अ. क्र. (S. N)	कृती/कार्यक्रम (Activity)	प्रारंभ (Commencement)	समाप्ती (Cessation)	एकूण दिवस (Total Days)
१.	शैक्षणिक सत्र (प्रथम सत्र) Academic Session (First Session)	सोमवार, दि. ३ जुलै, २०२३ Monday, 3rd July, 2023	मंगळवार, दि. ७ नोव्हेंबर, २०२३ Tuesday, 7th November, 2023	104
२.	प्रवेश प्रक्रीया Admission Process	सोमवार, दि. ३ जुलै, २०२३ Monday, 3rd July, 2023	अध्यादेश क्रमांक ०२/१९९७, ०४/१९९७ आणि १८/१९९८ मध्ये दर्शविल्याप्रमाणे राहील.	--
३.	अभिक्रम प्रक्रिया (प्रथम वर्ष प्रवेशित विद्यार्थ्यांकरिता) Induction Programme (For 1st Year Students)	मंगळवार, दि. ११ जुलै, २०२३ Tuesday, 11th July, 2023	शुक्रवार , दि. १४ जुलै, २०२३ Friday, 14th July, 2023	04
४.	शैक्षणिक दिवस (विषम सत्र) Teaching Days (Odd Semesters)	शनिवार, दि. १५ जुलै, २०२३ Saturday, 15th July, 2023	मंगळवार, दि. ७ नोव्हेंबर, २०२३ Tuesday, 7th November, 2023	90
५.	प्रथम सत्र अवकाश (First Term Vacation)	बुधवार, दि. ०८ नोव्हेंबर, २०२३ Wednesday, 8th November, 2023	सोमवार, दि. २७ नोव्हेंबर, २०२३ Monday, 27th November, 2023	20
६.	विषम सत्रांची विद्यापीठीय परीक्षा University's Odd Semesters Examinations	बुधवार, दि. ०८ नोव्हेंबर, २०२३ Wednesday, 8th November, 2023	शनिवार, दि. ३० डिसेंबर, २०२३ Saturday, 30th December, 2023	39
७.	शैक्षणिक सत्र (द्वितीय सत्र) Academic Session (Second Session)	मंगळवार, दि. २८ नोव्हेंबर, २०२३ Tuesday, 28th November, 2023	शनिवार, दि. २७ एप्रिल, २०२४ Saturday, 27th April, 2024	121

८.	अशैक्षणिक दिवस Non-instructional days (For N.S.S., Gathering etc.)	सोमवार, दि. १ जानेवारी, २०२४ Monday, 1st January, 2024	गुरुवार, दि. ४ जानेवारी, २०२४ Thursday, 4th January, 2024	04
९.	शैक्षणिक दिवस (सम सत्र) Teaching Days (Even Semesters)	शुक्रवार, दि. ५ जानेवारी, २०२४ Friday, 5th January, 2024	शनिवार, दि. २७ एप्रिल, २०२४ Saturday, 27th April, 2024	90
१०.	सम सत्रांची विद्यापीठीय परीक्षा Even Semesters University Examination	सोमवार, दि. २९ एप्रिल, २०२४ Monday, 29th April, 2024	सोमवार, दि. १० जून, २०२४ Monday, 10th June, 2024	35
११.	द्वितीय सत्र अवकाश (Second Term Vacation)	सोमवार, दि. २९ एप्रिल, २०२४ Monday, 29th April, 2024	सोमवार, दि. १० जून, २०२४ Monday, 10th June, 2024	43
१२.	पुढील शैक्षणिक सत्राचा २०२४-२०२५ चा प्रारंभ Commencement of Next Academic Session 2024-2025	मंगळवार, दि. ११ जून, २०२४ Tuesday, 11th June, 2024		

% **सर्व विद्याशाखांच्या पदवी आणि पदव्युत्तर अभ्यासक्रमांसाठी विद्यापीठ अनुदान आयोग/ए.आय.सी.टी.ई./शिखर संस्था, महाराष्ट्र शासन आणि विद्यापीठाने वेळोवेळी निर्गमित केलेल्या निर्देशानुसार प्रवेश प्रक्रिया राबविण्यात यावी.**
(% Admission Procedure should be continued as per the directions issued by UGC/AICTE/Appenx Bodies, Government of Maharashtra and University from time to time for all degrees and post graduate programmes of all faculties.)

<u>विशेष सुचना: (Special Note):</u>

विद्यापीठाचा दीक्षांत समारंभ सक्षम प्राधिकारिणीच्या निर्देशानुसार घेण्यात येईल.

University Convocation will be organized as per the direction of competent Authority of the University.

१. ही शैक्षणिक नियामिका विद्यापीठाचे शैक्षणिक विभाग/ घटक महाविद्यालये/ संलग्नित महाविद्यालये यांना लागू राहील.
(This Academic Calendar shall be applicable to all University Teaching Departments/ University Constituent Colleges/Affiliated Colleges of Sant Gadge Baba Amravati University.)

२. विद्यापीठाच्या शैक्षणिक विभागांतील / घटक महाविद्यालयातील/ संलग्नित महाविद्यालयांतील शिक्षक व शैक्षणिक कर्मचाऱ्यांना तक्ता-२ मध्ये दर्शविण्यात आलेल्या सुट्ट्यांव्यतिरिक्त राज्य शासनाने जाहीर केलेल्या इतर सुट्या अथवा जिल्हाधिकाऱ्यांनी जाहीर केलेल्या सुट्या उपभोगता येणार नाहीत. तथापि, यासंदर्भात अनुषंगिक निर्णय घेण्याचे अधिकार मा. कुलगुरु यांना राहतील.
(The Teaching Departments of the University/ University Constituent Colleges/ Affiliated Colleges of the University shall have holidays as per Table-2 and shall not avail the holidays declared by the State Government or the District Collector. However, the Hon'ble Vice-Chancellor shall have the power to take decision in this regard.)

३. अभिक्रम प्रक्रिया : शिखर संस्थांच्या (ए.आय.सी.टी.ई., यु.जी.सी. इत्यादी) मार्गदर्शक तत्त्वांनुसार विद्यापीठाच्या शैक्षणिक विभागाद्वारे/ घटक महाविद्यालयाद्वारे/ संलग्नित महाविद्यालयांद्वारे अभिक्रम प्रक्रिया अंतर्गत विविध उपक्रम राबविण्यात यावेत.
Induction Programme: Activities shall be performed as per guidelines of the apex bodies (A.I.C.T.E., U.G.C. etc.) by the University teaching departments/ constituent / affiliated colleges.

तक्ता -२

(Table – 2)

अ. क्र. (Sr.No.)	सण/सुट्या (Festivals/Holidays)	दिवस व दिनांक (Day & Date)
१.	मोहरम Moharum	शनिवार, दि. २९ जुलै, २०२३ Saturday, 29th July, 2023
२.	स्वातंत्र्य दिन Independence Day	मंगळवार, दि. १५ ऑगस्ट, २०२३ Tuesday, 15th August, 2023
३.	पारशी नूतनवर्ष (शहेनशाही) Parsi New Year (Shahenshahi)	बुधवार, दि. १६ ऑगस्ट, २०२३ Wednesday, 16th August, 2023
४.	रक्षाबंधन Rakshabandhan	बुधवार, दि. ३० ऑगस्ट, २०२३ Wednesday, 30th August, 2023
५.	श्रीगणेश चतुर्थी ShriGanesh Chaturthi	मंगळवार, दि. १९ सप्टेंबर, २०२३ Tuesday, 19th September, 2023
६.	गौरीपूजन Gouri Poojan	शुक्रवार, दि. २२ सप्टेंबर, २०२३ Friday, 22nd September, 2023
७.	अनंत चतुर्दशी/ईद-ए-मिलाद Anant Chaturdashi/Id-E-Milad	गुरूवार, दि. २८ सप्टेंबर, २०२३ Thursday, 28th September, 2023
८.	महात्मा गांधी जयंती Mahatma Gandhi Jayanti	सोमवार, दि. २ ऑक्टोबर, २०२३ Monday, 2nd October, 2023
९.	दसरा Dasara	मंगळवार, दि. २४ ऑक्टोबर, २०२३ Tuesday, 24th October, 2023
१०.	ख्रिसमस Christmas	सोमवार, दि. २५ डिसेंबर, २०२३ Monday, 25th December, 2023
११.	प्रजासत्ताक दिन Republic Day	शुक्रवार, दि. २६ जानेवारी, २०२४ Friday, 26th January, 2024
१२.	छत्रपती शिवाजी महाराज जयंती Chatrapati Shivaji Maharaj Jayanti	सोमवार, दि. १९ फेब्रुवारी, २०२४ Monday, 19th February, 2024
१३.	महाशिवरात्री Mahashivratri	शुक्रवार, दि. ८ मार्च, २०२४ Friday, 8th March, 2024
१४.	होळी (दुसरा दिवस) Holi (Second Day)	सोमवार, दि. २५ मार्च, २०२४ Monday, 25th March, 2024
१५.	गुड फ्रायडे Good Friday	शुक्रवार, दि. २९ मार्च, २०२४ Friday, 29th March, 2024
१६.	गुढीपाडवा Gudhi Padwa	मंगळवार , दि. ९ एप्रिल, २०२४ Tuesday, 9th April, 2024
१७.	रमझान ईद (ईद-उल-फितर) Ramzan Id (Id-Ul-Fitar)	गुरूवार , दि. ११ एप्रिल, २०२४ Thursday, 11th April, 2024
१८.	श्रीराम नवमी Shriram Navmi	बुधवार , दि. १७ एप्रिल, २०२४ Wednesday, 17th April, 2024

स्वा/-
(डॉ.टी.आर.देशमुख)
कुलसचिव,
संत गाडगे बाबा अमरावती विद्यापीठ

3.Academic Time Table with the name of the Faculty members handling the Course:

ShriSant Gajanan Maharaj College of Engineering, Shegaon
Department of Mechanical Engineering
Session:2023-2024 (Autumn)
Time-Table

Class Room: E1 **Class: 2M** **Semester – Autumn** **w.e.f.: 18/07/2023**

Day	11.00AM 12.00PM	12.00PM 01.00PM	01.00PM 01.15PM	01.15PM 02.15 PM	02.15 PM 03.15 PM	03.15 PM 03.45 PM	03.45 PM 04.45 PM	04.45 PM 05.45 PM
Mon	FM (KVC)	MOM (ASB)	**BREAK**	M-III (KPD)	MP (SPT)	**RECESS**	ET (VTM)	ET (VTM)
Tue	FM (KVC)	MOM (ASB)		M-III (KPD)	MP (SPT)		MP / MOM / FM / MD (D / A / B / C) SPT / ASB / KVC / VTM	
Wed	FM (KVC)	MOM (ASB)		M-III (KPD)	MP (SPT)		MP / MOM / FM / MD (A / B / C / D) SPT / ASB KVC / VTM	
Thu	ET (VTM)	MOM (ASB)		M-III (KPD)	MP (SPT)		MP / MOM / FM / MD (B / C / D / A) KRD / ASB / KVC / VTM	
Fri	ET (VTM)	MOM (ASB)		FM (KVC)	EVS (RMK)		MP / MOM / FM / MD (C / D / A / B) KRD / ASB / KVC / JGK	
Day	08.30 AM 09.30 AM	09.30 AM 10.30 AM	10.30AM 10.45AM	10.45 AM 11.45 AM	11.45AM 12.45 AM			
Sat	Skill Development/ Professional Training/ Tech Talk/Webinar		**BREAK**	Skill Development/ Professional Training/ Tech Talk/Webinar				

Subject & Code:

Code	Name of Subject (Full Name)	Name of Faulty
3ME01	Mathematics-III	Prof. Ms. K. P. Deshmukh
3ME02	Manufacturing Processes	Prof. Dr. S. P. Trikal
3ME03	Mechanics of Materials	Prof. A. S. Bharule
3ME04	Engg. Thermodynamics	Prof. V. T. Mhaske
3ME05	Fluid Mechanics	Prof. K. V. Chandan
4ES06	Environmental Studies	Prof. Dr. R. M. Kharate

Practical:

Code	Name of Subject	Name of Lab
3ME07	Manufacturing Processes Lab.	Workshop
3ME08	Mechanics of Materials Lab.	MOM Lab.
3ME09	Fluid Mechanics Lab.	FP Lab.
3ME10	Machine Drawing Lab	Drawing Hall

Practical Batches

Batch	A	B	C	D
Roll No.	01-20	21-40	41-62	63-Onwards

Date: 27 / 07 / 2023

Time Table Coordinator Head of Department Dean (Academics) Principal

ShriSant Gajanan Maharaj College of Engineering, Shegaon

Department of Mechanical Engineering

Session:2023-2024 (Autumn)

Time-Table

Class Room: E3 **Class: 3M** **Semester – Autumn** **w.e.f.: 18/07/2023**

Day	11.00AM 12.00PM	12.00PM 01.00PM	01.00PM 01.15PM	01.15PM 02.15 PM	02.15 PM 03.15 PM	03.15 PM 03.45 PM	03.45 PM 04.45 PM	04.45 PM 05.45 PM
Mon	HT (MBB)	MQC (NHK)	**B R E A K**	MS (SPJ)	KOM (KDG)	**R E C E S S**	HT / MS / MQC / KOM (D / A / B / C) MBB / ASB / NHK / KDG	
Tue	HT (MBB)	MQC (NHK)		MS (SPJ)	KOM (KDG)		OPEN ELECTIVE-I	MS (SPJ)
Wed	HT (MBB)	MQC (NHK)		HT / MS / MQC / KOM (A / B / C / D) MBB / VTM /NHK /KDG			OPEN ELECTIVE-I	KOM (KDG)
Thu	MS (SPJ)	KOM (KDG)		HT / MS / MQC / KOM (B / C / D / A) MBB / VTM /NHK /KDG			OPEN ELECTIVE-I	HT (MBB)
Fri	MS (SPJ)	MQC (NHK)		HT (MBB)	KOM (KDG)		HT / MS / MQC / KOM (C / D / A / B) SQS / VTM /NHK /KDG	
Day	08.30 AM 09.30 AM	09.30 AM 10.30 AM	10.30AM 10.45AM	10.45 AM 11.45 AM	11.45AM 12.45 AM			
Sat	Skill Development/ Professional Training/ Tech Talk/Webinar		**BREAK**	Skill Development/ Professional Training/ Tech Talk/Webinar				

Subject & Code:

Code	Name of Subject (Full Name)	Name of Faulty
5ME01	Heat Transfer	Prof. M. B. Bhambere
5ME02	Metrology & Quality Control	Prof. Dr. N. H. Khandare
5ME03	Kinematics of Machines	Prof. K. D. Gadgil
5ME04	Measurement Systems	Prof. S. P. Joshi

Practical:

Code	Name of Subject	Name of Lab
5ME01	Heat Transfer Lab.	HT/ KOM Lab.
5ME02	Metrology & Quality Control Lab.	PT/MS Lab.
5ME03	Kinematics of Machines Lab.	HT/ KOM Lab.
5ME04	Measurement Systems Lab.	PT/MS Lab.

Practical Batches

Batch	A	B	C	D
Roll No.	01-19	20-38	39-57	58-76

Date: 27 / 07 / 2023

Time Table Coordinator Head of Department Dean (Academics) Principal

ShriSant Gajanan Maharaj College of Engineering, Shegaon

Department of Mechanical Engineering

Session:2023-2024 (Autumn)

Time-Table

Class Room: E4 **Class: 4M** **Semester – Autumn** **w.e.f.: 11/07/2023**

Day	11.00AM 12.00PM	12.00PM 01.00PM	01.00PM 01.15PM	01.15PM 02.15 PM	02.15 PM 03.15 PM	03.15 PM 03.45 PM	03.45 PM 04.45 PM	04.45 PM 05.45 PM
Mon	AE/CFD (JGK/KDG)	IMC (NBB)	**B R E A K**	EC-II (SQS)	PT (NHK)	**R E C E S S**	EC-II / MECHX/AE (A/ B / C) SQS / VKT / JGK	
Tue	EC-II (SQS)	IMC (NBB)		MECHX (VKT)	PT (NHK)		EC-II / MECHX/AE (D / A / B) SQS / VKT / JGK	
Wed	AE/CFD (JGK/KDG)	IMC (NBB)		MECHX (VKT)	EC-II (SQS)		EC-II / MECHX/AE (B / C / D) SQS / VKT / JGK	
Thu	AE/CFD (JGK/MBB)	PT (NHK)		MECHX (VKT)	EC-II (SQS)		EC-II / MECHX/AE (C / D/ A) SQS / VKT / JGK	
Fri	AE/CFD (JGK/MBB)	IMC (NBB)		MECHX (VKT)	PT (NHK)		CFD (MBB)	
Day	08.30 AM 09.30 AM	09.30 AM 10.30 AM	10.30AM 10.45AM	10.45 AM 11.45 AM	11.45AM 12.45 AM			
Sat	PROJECT & SEMINAR		**BREAK**	PROJECT & SEMINAR				

Subject & Code:

Code	Name of Subject (Full Name)	Name of Faulty
7ME01	Mechatronics	Prof. Dr. V. K. Thute
7ME02	Productivity Techniques	Prof. Dr. N. H. Khandare
7ME03	Industrial Management & Costing	Prof. N. B. Borkar
7ME04	Energy Conversion-II	Prof. S. Q. Syed
(Professional Elective-II)		
7ME05	Automobile Engineering	Prof. Dr. J. G. Khan
7ME05	Computational Fluid Dynamics	Prof. M. B. Bhambere / Prof. K. D. Gadgil

Practical:

Code	Name of Subject	Name of Lab
7ME06	Mechatronics Lab.	Mechatronics Lab.
7ME07	Energy Conversion-II Lab.	EC Lab.
7ME08	Automobile Engineering Lab.	EC Lab.
7ME08	Computational Fluid Dynamics Lab.	CFD Lab.

Practical Batches

Batch	A	B	C	D
Roll No.	01-19	20-38	39-57	58-76

Date: 27 / 07 / 2023

Time Table Coordinator Head of Department Dean (Academics) Principal

2M Subject & Code		
Code	**Name of Subject (Full Name)**	**Name of Faulty**
3ME01	Mathematics-III	Prof. Ms. K. P. Deshmukh
3ME02	Manufacturing Processes	Prof. Dr. S. P. Trikal
3ME03	Mechanics of Materials	Prof. A. S. Bharule
3ME04	Engg. Thermodynamics	Prof. V. T. Mhaske
3ME05	Fluid Mechanics	Prof. K. V. Chandan
4ES06	Environmental Studies	Prof. Dr. R. M. Kharate
Code	**Name of Subject**	**Name of Lab**
3ME07	Manufacturing Processes Lab.	Workshop
3ME08	Mechanics of Materials Lab.	MOM Lab.
3ME09	Fluid Mechanics Lab.	FP Lab.
3ME10	Machine Drawing Lab	Drawing Hall
3M Subject & Code		
5ME01	Heat Transfer	Prof. M. B. Bhambere
5ME02	Metrology & Quality Control	Prof. Dr. N. H. Khandare
5ME03	Kinematics of Machines	Prof. K. D. Gadgil
5ME04	Measurement Systems	Prof. S. P. Joshi
Code	**Name of Subject**	**Name of Lab**
5ME01	Heat Transfer Lab.	HT/ KOM Lab.
5ME02	Metrology & Quality Control Lab.	PT/MS Lab.
5ME03	Kinematics of Machines Lab.	HT/ KOM Lab.
5ME04	Measurement Systems Lab.	PT/MS Lab.
4M Subject & Code		
7ME01	Mechatronics	Prof. Dr. V. K. Thute
7ME02	Productivity Techniques	Prof. Dr. N. H. Khandare
7ME03	Industrial Management & Costing	Prof. N. B. Borkar
7ME04	Energy Conversion-II	Prof. S. Q. Syed
(Professional Elective-II)		
7ME05	Automobile Engineering	Prof. Dr. J. G. Khan
7ME05	Computational Fluid Dynamics	Prof. M. B. Bhambere / Prof. K. D. Gadgil
Code	**Name of Subject**	**Name of Lab**
7ME06	Mechatronics Lab.	Mechatronics Lab.
7ME07	Energy Conversion-II Lab.	EC Lab.
7ME08	Automobile Engineering Lab.	EC Lab.
7ME08	Computational Fluid Dynamics Lab.	CFD Lab.

4.Teaching Load of each Faculty:

SESSION 2023-24 (AUTUMN SEM)

SN	Name of Faculty	Sem	Subject Allotted		Teaching Load			Remark (Additional Load)	Sign
			Code	Abbr.	Theory	Practical	Total Load		
1	Dr. S. P. Trikal	III	3ME02	MP	4	4	08		
2	Dr. V. K. Thute	VII	7ME01	MECHX	4	8	12		
3	Prof. M. B. Bhambere	V VII	5ME02 7ME05	HT CFD	4 2	6 2	14		
4	Prof. C. V. Patil	I V	1A3 5ME05	EM OE-IRA	5 3	8 -	16	ME-CADE (4+2)	
5	Dr. J. G. Khan	VII III	7ME05 3ME10	AE MD	4 -	8 2	14	ME-AMP (4+2)	
6	Prof. A. S. Bharule	III V	3ME03 5ME03	MOM MS	4 -	8 2	14	ME-AMD (4)	
7	Prof. N. B. Borkar	I VII	1A4 7ME04	EG IMC	5 4	6 -	15	ME-DMHE (4)	
8	Dr. N. H. Khandare	V VII	5ME01 7ME02	MQC PT	4 4	8 -	16	ME-LM (4)	
9	Prof. S. Q. Syed	VII V	7ME02 5ME02	EC-II HT	4 -	8 2	14		
10	Prof. P. T. Patokar	I	1A5	WP	-	24	24		
11	Prof. K. D. Gadgil	VII V	7ME05 5ME04	CFD KOM	2 4	- 8	14		
12	Prof. K V Chandan	III III	3ME03 1A3	FM EM	4 -	8 4	16		
13	Prof. K.R.Dudhe	I III	1A4 3ME09	EG MP	5 -	6 4	15		
14	Prof.S.P.Joshi	I V	1A4 5ME03	EG MS	5 4	6 -	15		
15	Prof. P.A. Dalke	I	1A5	WP	-	12	12		
16	Prof. V. T. Mhaske	III V III	3ME04 5ME03 3ME10	ET MS MD	4 - -	- 6 6	16		
17	Prof. G. S. Wahile	I V	1A3 5ME05	EM OE-IRA	5 3	6 -	14		

ME LOAD

CLASS	SUB	TH	PR	
ME	AMP	4	2	JGK
ME	AMD	4	-	ASB
ME	CADE	4	2	CVP
ME	DMHE	4	-	NBB
ME	LM	4	-	NHK

FIRST YEAR LOAD

CLASS	SUB	TH	PR					
FY	ED	15	18	NBB 5+6	KRD 5+6	SPJ 5+6		
FY	EM	15	18	SBS 5+0	CVP 5+6	GSW 5+8	KVC 0+4	
FY	WP	-	36	PTP 0+36				

LOAD ALLOTED TO OTHER DEPTT

DEPTT	CLASS	SUB	TH	PR	
ASH	2M	M-III	5	-	KPD
ASH	2M	ENV	2	-	RMK

Date: 12/07/2023

(Dr. S. P. Trikal)
Head of Department

Copy to: - Principal Office
Dean Office

ShriSant Gajanan Maharaj College of Engineering, Shegaon
Department of Mechanical Engineering
Session:2023-2024 (Spring)

Time-Table

Class Room: E1 **Class: 2M** **Semester – IV** **w.e.f.: 22/01/2024**

Day	11.00AM 12.00PM	12.00PM 01.00PM	01.00PM 01.15PM	01.15PM 02.15 PM	02.15 PM 03.15 PM	03.15 PM 03.45 PM	03.45 PM 04.45 PM	04.45 PM 05.45 PM
Mon	EC-I (SQS)	HPS (MBB)	**B R E A K**	BEDC (BSR)	MT (SPT)	**R E C E S S**	MS (VTM)	EVS (RMK)
Tue	MT/ MS / HPS / BEDC (A / B / C / D) SPT / VTM / MBB / BSR			BEDC (BSR)	MT (SPT)		HPS (MBB)	MS (VTM)
Wed	MT/ MS / HPS / BEDC (B / C / D / A) SPT / VTM / MBB / BSR			BEDC (BSR)	MT (SPT)		EC-I (SQS)	EVS (RMK)
Thu	MT/ MS / HPS / BEDC (C / D / A / B) SPT / VTM / MBB / BSR			EC-I (SQS)	MT (SPT)		HPS (MBB)	MS (VTM)
Fri	MT/ MS / HPS / BEDC (D / A / B / C) NBB/ VTM / MBB / BSR			BEDC (BSR)	EC-I (SQS)		HPS (MBB)	MS (VTM)
Day	08.30 AM 09.30 AM	09.30 AM 10.30 AM	10.30AM 10.45AM	10.45 AM 11.45 AM	11.45AM 12.45 AM			
Sat	Skill Development/ Professional Training/ Tech Talk/Webinar		**BREAK**	Skill Development/ Professional Training/ Tech Talk/Webinar				

Subject & Code:

Code	Name of Subject (Full Name)	Name of Faulty (Theory/Practical)
4ME01	Material Science	Prof. V. T. Mhaske
4ME02	Energy Conversion – I	Prof. S. Q. Syed
4ME03	Manufacturing Technology	Dr. S. P. Trikal
4ME04	Basic Electrical Drives & Control	Prof. B. S. Rakhonde
4ME05	Hydraulic & Pneumatic Systems	Prof. M. B. Bhambere
4ES06	Environmental Studies	Dr. R. M. Kharate

Practical:

Code	Name of Subject	Name of Lab
4ME07	Material Science Lab.	Metallurgy Lab
4ME08	Manufacturing Technology Lab.	Workshop (Machine Shop)
4ME09	Basic Electrical Drives & Control Lab.	Machine Lab (ELPO DEPT)
4ME10	Hydraulic & Pneumatic Systems Lab	Fluid Power Lab

Practical Batches

Batch	A	B	C	D
Roll No.	01-18	19-36	37-54	55-74

Date: 16/ 01 / 2024

Time Table Coordinator Head of Department Dean (Academics) Principal

ShriSant Gajanan Maharaj College of Engineering, Shegaon
Department of Mechanical Engineering
Session:2023-2024 (Spring)

Time-Table

Class Room: E3 **Class: 3M** **Semester – VI** **w.e.f.: 01/01/2024**

Day	11.00AM 12.00PM	12.00PM 01.00PM	01.00PM 01.15PM	01.15PM 02.15 PM	02.15 PM 03.15 PM	03.15 PM 03.45 PM	03.45 PM 04.45 PM	04.45 PM 05.45 PM
Mon	DOM (VKT)	DME (ASB)	**B R E A K**	CSE (RZF)	NES/LM (GSW/JGK)	**R E C E S S**	DME / DOM / CADS / RSL (A / B / C / D) ASB / VKT / SPJ / SQS	
Tue	DOM (VKT)	DME (ASB)		CSE (RZF)	OPEN ELECTIVE-II		DME / DOM / CADS / RSL (C / D / A / B) ASB / VKT / JGK / SQS	
Wed	DME (ASB)	NES/LM (GSW/JGK)		CSE (RZF)	OPEN ELECTIVE-II		DME / DOM / CADS / RSL (B / C / D / A) ASB / VKT / SPJ / MBB	
Thu	DOM (VKT)	DME (ASB)		NES/LM (GSW/JGK)	OPEN ELECTIVE-II		DME / DOM / CADS / RSL (D / A / B / C) ASB / VKT / JGK / SQS	
Fri	DOM (VKT)	DME (ASB)		CSE (RZF)	NES/LM (GSW/JGK)			
Day	08.30 AM 09.30 AM	09.30 AM 10.30 AM	10.30AM 10.45AM	10.45 AM 11.45 AM	11.45AM 12.45 AM			
Sat	Skill Development/ Professional Training/ Tech Talk/Webinar		**BREAK**	Skill Development/ Professional Training/ Tech Talk/Webinar				

Subject & Code:

Code	Name of Subject (Full Name)	Name of Faulty (Theory/Practical)
6ME01	Design of Machine Elements	Prof. A. S. Bharule
6ME02	Dynamics of Machines	Dr. V. K. Thute
6ME03	Control System Engineering	Prof. R Z Fulare
6ME08	Computer Aided Design & Simulation Lab	Dr. J. G. Khan / Dr. S. P. Joshi
6ME09	Research Skill Lab	Prof. M. B. Bhambere / Prof. S. Q. Syed
(Professional Elective-I)		
6ME04	Lean Manufacturing	Dr. J. G. Khan
6ME04	Non-Conventional Energy Systems	Prof. G. S. Wahile

Practical:

Code	Name of Subject	Name of Lab
6ME06	Design of Machine Elements Lab	DME Lab
6ME07	Dynamics of Machines Lab	DOM Lab
6ME08	Computer Aided Design & Simulation Lab	CAD-CAM Lab
6ME09	Research Skill Lab	Research Skill Lab

Practical Batches

Batch	A	B	C	D
Roll No.	01-18	19-36	37-53	54-70

Date: 27 / 12 / 2023

Time Table Coordinator Head of Department Dean (Academics) Principal

ShriSant Gajanan Maharaj College of Engineering, Shegaon
Department of Mechanical Engineering
Session:2023-2024 (Spring)

Time-Table

Class Room: E4 **Class: 4M** **Semester – VIII** **w.e.f.: 01/01/2024**

Day	11.00AM 12.00PM	12.00PM 01.00PM	01.00PM 01.15PM	01.15PM 02.15 PM	02.15 PM 03.15 PM	03.15 PM 03.45 PM	03.45 PM 04.45 PM	04.45 PM 05.45 PM
Mon	ICE (KVC)	AI / PPC (CVP/JGK)	**B R E A K**	RIA / ICE (B / C) (NHK / SQS)		**R E C E S S**	PROJECT	
Tue	ICE (KVC)	AI / PPC (CVP/JGK)		RIA / ICE (C / D) (NHK / SQS)			PROJECT	
Wed	ICE (KVC)	ORT (KRD)		RIA / RAC (NHK/ VTM)	AI / PPC (CVP/JGK)		PROJECT	
Thu	ORT (KRD)	RIA / RAC (NHK/ VTM)		RIA / ICE (D / A) (NHK / KVC)			PROJECT	
Fri	ORT (KRD)	RIA / RAC (NHK/ VTM)		RIA / ICE (A / B) (NHK / KVC)			PROJECT	
Day	08.30 AM 09.30 AM	09.30 AM 10.30 AM	10.30AM 10.45AM	10.45 AM 11.45 AM	11.45AM 12.45 AM			
Sat	ICE (KVC)	AI / PPC (CVP/JGK)	**BREAK**	RIA / RAC (NHK/ VTM)	ORT (KRD)			

Subject & Code:

Code	Name of Subject (Full Name)	Name of Faulty (Theory/Practical)
8ME01	Operation Research Techniques	Prof. K. R. Dudhe
8ME02	I.C. Engines	Prof. K. V. Chandan / Prof. S. Q. Syed
(Professional Elective-III)		
8ME03	Production Planning & Control	Dr. J. G. Khan
8ME03	Artificial Intelligence	Prof. C. V. Patil
(Professional Elective-IV)		
8ME04	Robotics & Industrial Applications	Dr. N. H. Khandare
8ME04	Refrigeration & Air Conditioning	Prof. V. T. Mhaske

Practical:

Code	Name of Subject	Name of Lab
8ME02	I.C. Engines Lab	IC Engines Lab
8ME06	Robotics & Industrial Applications Lab	RIA Lab
8ME06	Refrigeration & Air Conditioning Lab	RAC Lab

Practical Batches

Batch	A	B	C	D
Roll No.	01-19	20-38	39-57	58-75

Date: 27 / 12 / 2024

Time Table Coordinator Head of Department Dean (Academics) Principal

LOAD ALLOCATION(Session 2023-24, Spring Sem)

SN	Name of Faculty	Sem	Subject Allotted		Teaching Load			Remark (Additional Load)	Sign
			Code	Abbr.	Theory	Practical	Total Load		
1	Dr. S. P. Trikal	IV	4ME04	MT	4	6	10		
2	Dr. V. K. Thute	VI ME-II	6ME02 2MMD1	DOM MSD	4 3	8 4	12+7		
3	Prof. M. B. Bhambere	IV VI	4ME05 6ME09	HM RS LAB	4 -	8 2	14		
4	Prof. C. V. Patil	II VIII	1A3 8ME03	EM AI	5 4	6 -	15		
5	Dr. J. G. Khan	VI VI VIII ME-II	6ME09 6ME04 8ME03 2MMD4	CADS LM PPC RPT	- 4 4 3	4 - - -	12+3		
6	Prof. A. S. Bharule	VI ME-II	6ME01 2MMD2	DME ESA	4 3	8 4	12+7		
7	Prof. N. B. Borkar	II IV	1B4 4ME04	EG MT	5 -	6 2	13		
8	Dr. N. H. Khandare	VIII ME-II	8ME02 2MMD3	RIA AMT	4 3	8 -	12+3		
9	Prof. S. Q. Syed	IV VIII VI	4ME03 8ME02 6ME09	EC-I ICE RS LAB	4 - -	- 4 6	14		
10	Prof. P. T. Patokar	II	1A5	WP	-	24	24		
11	Prof. K. V. Chandan	VIII II	8ME02 1A3	ICE EM	4 -	4 6	14		
12	Prof. K.R.Dudhe	II VIII	1B4 8ME01	EG ORT	5 4	6 -	15		
13	Prof.S.P.Joshi	II VI	1B4 6ME09	EG CADS	5 -	6 4	15		
14	Prof. V. T. Mhaske	VI IV VII	6ME05 4ME01 8ME02	AEEV MS RAC	3 4 4	- 8 2	21		
15	Prof. G. S. Wahile	II VI	1A3 6ME04	EM NES	5 4	6 -	15		
16	Prof. P. A. Dalke	II	1A5	WP	-	12	12		
				TOTAL LOAD			**224+20**		

ME-FIRST YEAR LOAD				
CLASS	SUB	TH	PR	TEACHER
ME	MSD	3	4	VKT
ME	ESA	3	4	ASB
ME	AMT	3	-	NBB
ME	RPT	3	-	JGK

FIRST YEAR LOAD BY OUR DEPTT							
CLASS	SUB	TH	PR				
FY	EG	15	18	KRD 5+6	SPJ 5+6	NBB 5+6	
FY	EM	15	18	SBS 5+0	CVP 5+6	GSW 5+6	KVC 0+6
FY	WP	-	36	PTP 0+24	PAD 0+12		

TAKEN BY OTHER DEPTT					
DEPTT	CLASS	SUB	TH	PR	TEACHER
ELPO	2M	BEDC	4	8	BSR
ASH	2M	ENV	2	-	RMK
ELPO	3M	CSE	4	-	RZF

Date: 14/12/2023

(Dr. S. P. Trikal)
Head of Department

Copy to:-

01. Principal Office
02. Dean Office

5. Internal Continuous Evaluation System and place:

Shri Sant Gajanan Maharaj College of Engineering, Shegaon

Notification

Date: 09/08/2023

Sessional Marks Evaluations scheme for UG /PG: Session 2023-2024 & onward

It is notified to all concern students, faculty, and staff members that the theory internal marks for each course will be evaluate as per the table shown below:

UG: B. E. 1st, 2nd, 3rd, and 4th Year: Two Class Tests and TEC (All Branches)

S N	Item(s)	Duration for Conduction	Evaluation Scale: Marks and Syllabus		Weightage (Out of 20 Marks)
01	Class Test I and Class Test II	One hour for each Class Test	**30** 02Units for each Class Test		**60/6 = 10**
02	Teacher Evaluation Component (TEC) **Any one TEC to each student/subject**	Throughout the semester	**30**		**30/6 = 05**
03	Attendance	Throughout the semester	95 – 100% 90 – 94.99 % 85 – 89-99 % 80 – 84.99 % 75 – 79.99 % Below 75%	05 04 03 02 01 00	**05**

PG: M. E. (EPS/ Digital Electronics /Computer Engg. /AM&MSD)

S.N.	Items/Syllabus:	Duration for Conduction	Evaluation Scale (Marks)	Weightage (Out of 20 Marks)
01	Class Test I (50 % of syllabus)	One & half hour for Each Class Test	**40**	**80/8 = 10**
02	Class Test-II / (Remaining 50 % of syllabus)		**40**	
03	Teacher Evaluation Component (TEC) **Any one TEC to each student/subject**	Throughout the semester	**40**	**40/4 = 10**

Please Note: **Attendance in UG & PG should be min. 75% for the term grant. Subject Teacher will identify and open min. two & max. four TEC per subject.**

List of Teacher Evaluation Components (TECs):

1. Tutorials/**Assignments** on Syllabus points
2. Presentation/Seminar on extension of the course
3. Mini/Term/Short Projects (Design/Fabrication/ Simulation/ Software / Hardware Development / Survey / Case Studies etc.)
4. New Experiment development and testing
5. Open book test
6. Surprise test
7. Quiz / Group Discussion
8. Field/Industrial work
9. Industrial visit and report writing

Note: If any student missed either CT1 or CT2 due to off Campus college activities approved by concern HOD, then it is mandatory for them to appear for retest.

Prof. D. L. Bhombe	Prof. V. M. Umale	Dr. S. B. Somani
Dean (Academics)	**Dean (Exams)**	**Principal**

Copy to:
1. The Principal for kind information
2. All HODs for circulation to all concern and necessary action
3. M.R.ISO/ Exam Section for necessary noting

Assignmentshaveitsownimportanceinengineeringeducation.Assignmentsintheformofvariouscomponents (TEC) such as mini/term/short projects (Design/Fabrication/ Simulation/ Software / HardwareDevelopment) / Survey / Case Studies, New Experiment development and testing, Presentation/Seminar onextension of the course, Quiz / Group Discussion, Industrial visit and report writing, Tutorials on Syllabuspoints are given to students for each course, to check and evaluate their understanding and to enhance theirsubject knowledge.

Every teacher decides the assignment components in the beginning of each semester and gets it approved byHODandthenconveysittotheDean(Academics)andstudents.Studentsworkonthesecomponentsthroughout the semester which helps them to attain the course outcomes. The continuous monitoring andevaluationis done bytheteacher for assuringthequality. .

Variouscomponentsofassignment

Component	**AssessmentProcess**
Mini / Term / ShortProjects(Design/ Fabrication/Simulation /Software / HardwareDeve lopment)	Thiscomponenthelpsstudentstogainexpertiseintheirsubject.Studentscollectand extract the information related with the topic from different online and offlinesources.Studentsdemonstratetheirpresentationsskillsbypresentingtheinformatio n. They learn to communicate effectively and express their ideas andopinion about the project work. Students form a group of 2 or 3 and based on theirinterestselectaminiprojecteitherhardwareorsoftwarebased.Theyaccessinformation through various resources and summarize the main idea. Evaluation isdone by the course teacher after completion of the work based on the specifiedrubrics.
Survey/Casestudies	Case studies help to increase students‘ critical thinking and problem-solving skillsandmotivatethemtowardslearningattitude.Casestudyisfoundtobebeneficialfor students in terms of actively engaging them and allowing them to learn theapplications of engineering techniques to solve real world problems. Thus, use ofcase studies is a pedagogical technique that allows students to apply their theoreticalknowledge to practical situations. Students are asked to work upon a case study andevaluationis done bythefacultyusingspecifiedrubrics.
Industrialvisit/fieldwork andreportwriting	Industryvisit/fieldworkmeanssendingthestudentstocertainworkplaces,Industriesfordoi ngsomepractical work. Mainobjectivesof fieldworkare: • Toprovideopportunitiestothethestudentsforpracticalexperienceintheorganization. • Tomake themawareabouttherecenttechnologiesused byindustries • Toremovethefear ofproject work • Toenablestudentstounderstandprofessionaldutiesandresponsibilitiesoftheperson nelinthefield. • Togetgoodpracticalknowledge/exposure Assessmentisdoneonthebasisofvivaandreportsusingtherubricsdesignedforthesame.
New Experiment development andtesting	Main objective of introducing this component as assignment is that it helps thestudents to acquire practical knowledge and increases the utilization of departmentalfacilities(Software,Interfacing/Computing/LaboratoryEquipment‘s).Ithel pstodevelop logical skills and technical manuscript writing skills in students. Studentsdesignnewexperimentwhichisnotincludedintheirexperimentallist.Theyidentif y the experiment, develop outline of experiment (circuit diagram, flowchart,algorithm, etc), perform the experiment and then analyze the results. Evaluation isdoneonthebasis of rubrics.
Tutorial	Tutorialisanimportantteaching-learningtool.Ithelpslearnersenhancetheirintellectual,communicationandsocialskills.Tu torialsprovideaninteractivelearningenvironmentwherestudentscanclarifyandextend,thr oughreadings,discussions and other activities, what they learn from the lectures. Tutorial is givento the students based on the topics covered in theory lecture and evaluation is donebythe facultybasedon thesolution oftheproblem.

Quiz	Quizzeshelps toexpand students‘knowledgeand helps toexplorenewskills.Quizzes are designed in such a manner that to solve that, it requires critical thinkingandextensiveresearch.Quiz isbasedoncomplete courseandquizscoresarecalculated based on the number of points assigned to each quiz question. Quiz in theform of MCQ are also assigned to students. MCQs are found to be flexible tovarious levels of learning outcomes from simple recall of content to more complexlevelsuchasstudents‘abilitytoexaminefacts,understandingconceptsandprincipl es. MCQs are designed to test quickly and effectively students‘knowledgeabout a particular idea or concept. Assessment tool used here is direct and marksareawarded tostudents onthe basis ofcorrectanswers.
Group discussion (GD)	Groupdiscussiononstudytopicsplaysavitalroleinunderstandingthetopic.Discussingtheto picamong classmateshelpsinlearningatopicwithperfection. Variousbenefitsof GDforstudentsare: • It enhancesthesubject knowledge. • It helps inexploringmoreideasaboutthetopic. • It helpsstudentstorealizetheirmistakesandweakness • Itbuildsselfconfidenceandimproves communicationskills. • Evaluationofstudentsisdonebythefacultyonthebasisof Rubrics
Openbooktest	Openbooktestisanassessmentmethodthatallowsstudentstorefertheirnotes,text books orother approved materialwhileansweringthe questions. Questionsdevisedinopenbooktestaresuchthathelpstoassesstheinterpretationof knowledge, comprehension skills and critical thinking skills. Assessment of openbooktestisdone on the basis of Rubrics.
Presentation/seminar	Presentations of topics in classroom are most valuable to students to share theirknowledge, improve their communication skills and to boost their self-confidence.These skills play an important role in their engineering course and also help them intheir career advancement. Students give presentation on technical topic of theirinterest which is relevant to their course. Faculty evaluates students on variousaspectsand marks areawarded based onrubrics.

Allthecomponentsofassignments covertheentiresyllabus

Continuousassessmentinthelaboratory

As per university scheme, subjects having practical sessions are conducted in respective laboratories.Practical sessions are evaluated for 50 marks (25-internal evaluation and 25-external evaluation).25internalmarks aredivided as given below

- ContinuousEvaluationMarks:20
- Laboratorytest Marks: 05

Continuousassessmentsystemisimplementedforassessmentoflaboratorywork.Afterthecompletion of the experiment, assessment is done on the basis of submission of laboratory records onregular basis, understanding of the experiment through oral viva voce questions and participation inperforming the experiment. Neatness of the laboratory record book is also given due weightage in theassessment.Afterthecompletion ofallthe experiments, laboratorytestis also conducted.

6. Student‘sassessmentofFaculty,Systeminplace

Student‘sassessmentoffacultymechanismiswellorganizedsysteminthecollegeforallcourses.Duringeverysemester, threestudent feedbacks aretaken. Thesefeedbacksaretaken by:

(i) DeansandtheHOD

(ii) Externalagency,SandKAssociates.

(iii) Computerizedfeedback (onlinefeedback)

- Lectures are monitored by Deans and HOD. They give constructive comments to improve thequality of teaching andthe teaching-learningprocess.Academic monitoring committee islookingafter theteachinglearningprocess.
- Counseling is provided by the respective HOD for those faculty members who have secured lowscores and negative comments, if any, in the feedback. This motivates them to improve theirskillsand abilities.
- If required, training / orientation programs are conducted by professional experts to master theskills of the faculty members in the nuances of teaching, thus improving the efficiency ofteaching-learningprocess.
- External agency, S and K Associates conducts the independent feedback process. They submittheir reports to the authority and accordingly the steps are taken to improve the quality ofteachingas well as the teaching-learningprocess.
- Around twenty days before the end of the semester, all the studentsare required to fill acomputerized feedback for apprising the faculty using a scale of 5 (high) to 0 (low).Teachersperformanceappraisalanalysissheetispreparedforboththetheoryaswellaspracticalsubjects.
- Theory appraisal sheet consists of total fifteen questions whereas the practical appraisal sheetconsistsof ten questions.
- The hard copy of the theory and practical performance appraisal analysis sheets duly signed andapprovedbythe HOD and theDean (Academics) isgiven tothe concernedfacultymembers.
- Allthecoursesmentionedinthefeedback formwillbeanalyzedasgiveninTable

Feedback assessmentprocess

Step-1	Collectionoffeedbackformsforallthesubjectsfromthestudentsbasedonparametersspecifiedin questionnaire.
Step-2	Estimationofaverageforalltheparametersandcalculationofaverageperformancerating

Step-3	Preparationofteachersperformanceappraisalanalysissheet
Step-4	PerformanceappraisalanalysissheetapprovedbyDean(academics)andHOD
Step-5	Distribution of performance appraisal analysis sheets to the respective teachers.If he /she receives average or below average performance, he / she gets counselling and allowsthemto get correct theirperformances.

Questionnaire for computerized feedback is shown in
TableQuestionnairefor computerized feedback

Que.No.	**Questions**(Rankingon thescale offive)
1	Whetherthelectureswerewellprepared,organizedandcoursematerialiswellstructured?
2	WastheBlackboard writing/ audio visualaidsareclearandorganized?
3	Were the lectures delivered with emphasis on fundamental concepts and with illustrativeexamples?
4	WhethertheTeacher engages classes regularly& maintainsthediscipline.
5	Whetherdifficulttopicsweretaught withadequateattentionandease?
6	DidtheFacultyprovide younew knowledge andhascommandover thesubject?
7	Wastheinstructorenthusiasticaboutteaching?
8	Wastheteacherabletodeliverlectureswithgoodcommunicationskills?
9	Wereyou encouragedto askQuestions,tomakelecturesinteractiveandlively?
10	Didthecourseimproveyourunderstandingof concepts,principlesinthisfieldandmotivatedyou to think and learn?
11	Whethertheteacher waseffectiveinpreparingstudentsforexams?
12	Wastheunittestswerechallenging?
13	WastheevaluationfairandImpartial?Anddidithelpyoutoimprove?
14	Did teacher give additional technical / non-technical inputs by referring to INTERNET /additionalbooks?
15	Whetherteacherwasalwaysaccessibletothestudentsforcounselling, guidance andsolvingqueries offthe classroom hours?

CorrectiveMeasures

The institute conducts oral feedback and written feedback once a semester for all faculties and allsubjects. In the same, weak points or poor performance of the faculty is taken under consideration byDean Academics. The report of the same is sent to Head of Department and the Principal by DeanAcademics. Head of the Department does counseling of the faculty and discuss on the measures withthefaculty.Thefacultyisaskedforimprovement.LecturesaremonitoredbyHODandacademicmonitoring committee of the department; they give constructive comments to improve the quality ofteaching and learning process. Faculty is promoted and encouraged to attend the faculty developmentprogrammer (FDPs) related to effective teaching methodologies. Principal seeks explanation fromconcernedHOD.

- Thefacultyis askedfor Explanationincaseofinappropriate result
- Counselingisgiven to theconcernedfacultybyHOD
- Promotingand encouragingfacultytoattend thefacultydevelopment programs(FDP)related to effectiveteachingmethodologies.
- LecturesaremonitoredbyHODandacademicmonitoringcommitteeofthe department.
- Theygiveconstructive comments to improvethe qualityof teachingandlearningprocess.
- Principalseeksexplanationfromconcerned HOD andadvice.