ACADEMIC YEAR (2022-2023)							
	J.K.K.MUNIRAJAH COLLEGE OF TECHNOLOGY T.N.Palayam(po),Gobi(tk)-638506, Erode(dt).						Metric No 1.3.2
S.No	Name of the course	Course code	programme offering	project work	field work	internship	Number of students
(2022-2023) Regulation-2017							
1	Project Work	ME8811	MECHANICAL ENGINEEREING	✓			5
2	Engineering Thermodynamics	ME8391	MECHANICAL ENGINEEREING	✓			7
3	Fluid Mechanics and Machinery	CE8394	MECHANICAL ENGINEEREING	✓		✓	6
4	Manufacturing Technology - I	ME8351	MECHANICAL ENGINEEREING	✓		✓	8
5	Kinematics of Machinery	ME8492	MECHANICAL ENGINEEREING	✓			5
6	Manufacturing Technology – II	ME8451	MECHANICAL ENGINEEREING	✓			8
7	Engineering Metallurgy	ME8491	MECHANICAL ENGINEEREING	✓		✓	4
8	Strength of Materials for Mechanical Engineers	CE8395	MECHANICAL ENGINEEREING	✓			7
9	Thermal Engineering- I	ME8493	MECHANICAL ENGINEEREING			✓	7
10	Design of Machine Elements	ME8593	MECHANICAL ENGINEEREING	✓		✓	5
11	Design of Transmission Systems	ME8651	MECHANICAL ENGINEEREING	✓			8
12	Computer Aided Design and Manufacturing	ME8691	MECHANICAL ENGINEEREING	✓		✓	4

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ME8391	ENGINEERING THERMODYNAMICS	L TPC 3 2 0 4

OBJECTIVE:

- To familiarize the students to understand the fundamentals of thermodynamics and to perform thermal analysis on their behavior and per formance.
  (Use of Standard and approved Steam Table, Mollier Chart, Compressibility Chart and Psychrometric Chart permitted)

UNITI BASIC CONCEPTS ANDFIRSTLAW **9+6**

Basic concepts - concept of continuum, comparison of microscopic and macroscopic approach.Path and point functions.Intensive and extensive, total and specific quantities. System and their types.Thermodynamic Equilibrium State, path and process. Quasi-static, reversible and irreversible processes. Heat and work transfer, definition and comparison, sign convention. Displacement work and other modes of work .P-V diagram. Zeroth law of thermodynamics – concept of temperature and thermal equilibrium– relationship between temperature scales –new temperature scales. First law of thermodynamics –application to closed and open systems – steady and unsteady flow processes.

UNITII SECOND LAW ANDAVAILABILITYANALYSIS **9+6**

Heat Reservoir, source and sink. Heat Engine, Refrigerator, Heat pump. Statements of second law and its corollaries. Carnot cycle Reversed Carnot cycle, Performance. Clausius inequality. Concept of entropy, T-s diagram, Tds Equations, entropy change for - pure substance, ideal gases - different processes, principle of increase in entropy. Applications of II Law. High and low grade energy. Available and non-available energy of a source and finite body.Energy and irreversibility. Expressions for the energy of a closed system and open systems. Energy balance and entropy generation. Irreversibility. I and II law Efficiency.

UNITIII PROPERTIES OF PURE SUBSTANCE AND STEAMPOWERCYCLE **9+6**

Formation of steam and its thermodynamic properties, p-v, p-T, T-v, T-s, h-s diagrams. p-v-T surface. Use of Steam Table and Mollier Chart. Determination of dryness fraction. Application of I and II law for pure substances. Ideal and actual Rankine cycles, Cycle Improvement Methods - Reheat and Regenerative cycles, Economiser, preheater, Binary and Combined cycles.

UNITIV IDEAL AND REAL GASES,THERMODYNAMICRELATIONS **9+6**

Properties of Ideal gas- Ideal and real gas comparison- Equations of state for ideal and real gases- Reduced properties.Compressibility factor-.Principle of Corresponding states. -Generalised Compressibility Chart and its use-. Maxwell relations, Tds Equations, Difference and ratio of heat capacities, Energy equation, Joule-Thomson Coefficient, ClausiusClapeyron equation, Phase Change Processes. SimpleCalculations.

UNITV GAS MIXTURES ANDPSYCHROMETRY **9+6**

Mole and Mass fraction, Dalton's and Amagat's Law. Properties of gas mixture – Molar mass, gas constant, density, change in internal energy, enthalpy, entropy and Gibbs function. Psychrometric properties, Psychrometric charts. Property calculations of air vapour mixtures by using chart and expressions. Psychrometric process – adiabatic saturation, sensible heating and cooling, humidification, dehumidification, evaporative cooling and adiabatic mixing. Simple Applications

TOTAL : 75 PERIODS

OUTCOMES:

Upon the completion of this course the students will be able to

- Apply the first law of thermodynamics for simple open and closed systemsunder steady , Apply second law of thermodynamics to open and closed systems and calculate entropy , Apply Rankinecycle to steam power plant and compare few cycle improvement methods, Derive simple thermodynamic relations of ideal and realgases, Calculate the properties of gas mixtures and moisair and its use in psychometric processes

TEXT BOOKS :

1. R.K.Rajput, "A Text Book Of Engineering Thermodynamics ",FifthEdition,2017.
2. Yunus a. Cengel & michael a. Boles, "Thermodynamics", 8th edition2015.

REFERENCES:

1. Arora C.P, "Thermodynamics", Tata McGraw-Hill, New Delhi,2003.
2. Borgnakke & Sonnatag, "Fundamental of Thermodynamics", 8th Edition ,2016.
3. Chattopadhyay, P, "Engineering Thermodynamics", Oxford University Press, 2016.
4. Michael J. Moran, Howard N. Shapiro, "Fundamentals of Engineering Thermodynamics", 8thEdition.
5. Nag.P.K.,"EngineeringThermodynamics",5th Edition,TataMcGraw-Hill,NewDelhi,2013.

ME8493	THERMAL ENGINEERING - I	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To integrate the concepts, laws and methodologies from the first course in thermodynamics into analysis of cyclic processes
- To apply the thermodynamic concepts into various thermal application like IC engines, Steam.
- Turbines, Compressors and Refrigeration and Air conditioning systems

(Use of standard refrigerant property data book, Steam Tables, Mollier diagram and Psychrometric chart permitted)

UNIT I GAS AND STEAM POWER CYCLES 9

Air Standard Cycles - Otto, Diesel, Dual, Brayton – Cycle Analysis, Performance and Comparison – Rankine, reheat and regenerative cycle.

UNIT II RECIPROCATING AIR COMPRESSOR 9

Classification and comparison, working principle, work of compression - with and without clearance, Volumetric efficiency, Isothermal efficiency and Isentropic efficiency. Multistage air compressor with Intercooling. Working principle and comparison of Rotary compressors with reciprocating air compressors.

UNIT III INTERNAL COMBUSTION ENGINES AND COMBUSTION 9

IC engine – Classification, working, components and their functions. Ideal and actual : Valve and port timing diagrams, p-v diagrams- two stroke & four stroke, and SI & CI engines – comparison. Geometric, operating, and performance comparison of SI and CI engines. Desirable properties and qualities of fuels. Air-fuel ratio calculation – lean and rich mixtures. Combustion in SI & CI Engines – Knocking – phenomena and control.

UNIT IV INTERNAL COMBUSTION ENGINE PERFORMANCE AND SYSTEMS 9

Performance parameters and calculations. Morse and Heat Balance tests. Multipoint Fuel Injection system and Common Rail Direct Injection systems. Ignition systems – Magneto, Battery and Electronic. Lubrication and Cooling systems. Concepts of Supercharging and Turbocharging – Emission Norms.

UNIT V GAS TURBINES 9

Gas turbine cycle analysis – open and closed cycle. Performance and its improvement - Regenerative, Intercooled, Reheated cycles and their combinations. Materials for Turbines.

TOTAL:45 PERIODS

OUTCOMES:

Upon the completion of this course the students will be able to

CO1 Apply thermodynamic concepts to different air standard cycles and solve problems. CO2 Solve problems in single stage and multistage air compressors

CO3 Explain the functioning and features of IC engines, components and auxiliaries. CO4 Calculate performance parameters of IC Engines.

CO5 Explain the flow in Gas turbines and solve problems.

TEXT BOOKS:

1. Kothandaraman.C.P., Domkundwar. S,Domkundwar. A.V., "A course in thermal Engineering", Fifth Edition, "Dhanpat Rai & sons , 2016
2. Rajput. R. K., "Thermal Engineering" S.Chand Publishers, 2017

REFERENCES:

1. Arora.C.P, "Refrigeration and Air Conditioning ," Tata McGraw-Hill Publishers 2008
2. Ganesan V.." Internal Combustion Engines" , Third Edition, Tata Mcgraw-Hill 2012
3. Ramalingam. K.K., "Thermal Engineering", SCITECH Publications (India) Pvt. Ltd., 2009.
4. Rudramoorthy, R, "Thermal Engineering ",Tata McGraw-Hill, New Delhi,2003
5. Sarkar, B.K,"Thermal Engineering" Tata McGraw-Hill Publishers, 2007

CE8394 **FLUID MECHANICS AND MACHINERY** **L T PC**
4 0 0 4

OBJECTIVES

- The properties of fluids and concept of control volume are studied
- The applications of the conservation laws to flow through pipes are studied.
- To understand the importance of dimensionalanalysis
- To understand the importance of various types of flow inpumps.
- To understand the importance of various types of flow inturbines.

UNITI FLUID PROPERTIES ANDFLOWCHARACTERISTICS **12**

Units and dimensions- Properties of fluids- mass density, specific weight, specific volume, specific gravity, viscosity, compressibility, vapor pressure, surface tension and capillarity. Flow characteristics – concept of control volume - application of continuity equation, energy equation and momentumequation.

UNITII FLOW THROUGHCIRCULAR CONDUITS **12**

Hydraulic and energy gradient - Laminar flow through circular conduits and circular annuli- Boundary layer concepts – types of boundary layer thickness – Darcy Weisbach equation –friction factor- Moody diagram- commercial pipes- minor losses – Flow through pipes in series andparallel.

UNITIII DIMENSIONALANALYSIS **12**

Need for dimensional analysis – methods of dimensional analysis – Similitude –types of similitude - Dimensionless parameters- application of dimensionless parameters – Model analysis.

UNITIV PUMPS **12**

Impact of jets - Euler's equation - Theory of roto-dynamic machines – various efficiencies– velocity componentsatentryandexitoftherotor-velocitytriangles-Centrifugalpumps–workingprinciple
- work done by the impeller - performance curves - Reciprocating pump- working principle – Rotary pumps – classification.

UNITV TURBINES **12**

Classification of turbines – heads and efficiencies – velocity triangles.Axial, radial and mixed flow turbines.Pelton wheel, Francis turbine and Kaplan turbines- working principles - work done by waterontherunner– drafttube.Specificspeed-unitquantities–performancecurvesforturbines
– governingofturbines.

TOTAL: 60 PERIODS

OUTCOMES:

Upon completion of this course, the students will be able to

- Apply mathematical knowledge to predict the properties and characteristics of afluid.
- Can analyse and calculate major and minor losses associated with pipe flow in piping networks.
- Can mathematically predict the nature of physicalquantities
- Can critically analyse the performance ofpumps
- Can critically analyse the performance ofturbines.

TEXT BOOK:

1. Modi P.N. and Seth, S.M. "Hydraulics and Fluid Mechanics", Standard Book House, New Delhi 2013.

REFERENCES:

1. Graebel. W.P, "Engineering Fluid Mechanics", Taylor & Francis, Indian Reprint,2011
2. Kumar K. L., "Engineering Fluid Mechanics", Eurasia Publishing House(p) Ltd., New Delhi 2016
3. Robert W.Fox, Alan T. McDonald, Philip J.Pritchard, "Fluid Mechanics and Machinery",2011.
4. Streeter, V. L. and Wylie E. B., "Fluid Mechanics", McGraw Hill Publishing Co.2010

ME8351 **MANUFACTURING TECHNOLOGY–I** **L T P C**
3 0 0 3

OBJECTIVE:

- To introduce the concepts of basic manufacturing processes and fabrication techniques, such as metal casting, metal joining, metal forming and manufacture of plasticcomponents.

UNITI METALCASTINGPROCESSES **9**

Sand Casting : Sand Mould – Type of patterns - Pattern Materials – Pattern allowances –Moulding sand Properties and testing – Cores –Types and applications – Moulding machines– Types and applications; Melting furnaces : Blast and Cupola Furnaces; Principle of special casting processes : Shell - investment – Ceramic mould – Pressure die casting - Centrifugal Casting - CO_2 process – Stir casting; Defects in Sandcasting

UNITII JOININGPROCESSES **9**

Operating principle, basic equipment, merits and applications of: Fusion welding processes: Gas welding - Types – Flame characteristics; Manual metal arc welding – Gas Tungsten arc welding
- Gas metal arc welding – Submerged arc welding – Electro slag welding; Operating principle and applications of: Resistance welding - Plasma arc welding – Thermit welding – Electron beam welding – Friction welding and Friction Stir Welding; Brazing and soldering; Weld defects: types, causes andcure.

UNITIII METALFORMINGPROCESSES **9**

Hot working and cold working of metals – Forging processes – Open, impression and closed die forging – forging operations. Rolling of metals– Types of Rolling – Flat strip rolling – shape rolling operations – Defects in rolled parts. Principle of rod and wire drawing – Tube drawing – Principles of Extrusion – Types – Hot and Cold extrusion.

UNITIV SHEETMETALPROCESSES **9**

Sheet metal characteristics – shearing, bending and drawing operations – Stretch forming operations – Formability of sheet metal – Test methods –special forming processes-Working principle and applications – Hydro forming – Rubber pad forming – Metal spinning– Introduction of Explosive forming, magnetic pulse forming, peen forming, Super plastic forming – Microforming

UNITV MANUFACTURE OF PLASTIC COMPONENTS **9**

Types and characteristics of plastics – Moulding of thermoplastics – working principles and typical applications – injection moulding – Plunger and screw machines – Compression moulding, Transfer Moulding – Typical industrial applications – introduction to blow moulding –Rotational moulding – Film blowing – Extrusion – Thermoforming – Bonding of Thermoplastics.

TOTAL: 45 PERIODS

OUTCOMES:

CO1 Explain different metal casting processes, associated defects, merits and demerits CO2
Compare different metal joiningprocesses.
CO3 Summarize various hot working and cold working methods of metals. CO4
Explain various sheet metal making processes.
CO5 Distinguish various methods of manufacturing plasticcomponents.

TEXT BOOKS:

1. HajraChouldhary S.K and HajraChoudhury. AK., "Elements of workshop Technology", volume I and II, Media promoters and Publishers Private Limited, Mumbai,2008
2. Kalpakjian. S, "Manufacturing Engineering and Technology", Pearson Education India Edition, 2013

REFERENCES:

1. Gowri P. Hariharan, A.SureshBabu, "Manufacturing Technology I", Pearson Education,2008
2. PaulDegarma E, Black J.T and Ronald A. Kosher, "Materials andProcesses, in Manufacturing" Eight Edition, Prentice – Hall of India,1997.
3. Rao, P.N. "Manufacturing Technology Foundry, Forming and Welding", 4th Edition, TMH-2013
4. Roy. A. Lindberg, "Processes and Materials of Manufacture", PHI / Pearson education,2006
5. Sharma, P.C., "A Text book of production Technology", S.Chand and Co. Ltd.,2014.

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ME8492 **KINEMATICS OF MACHINERY** **L T P C**
3 0 0 3

OBJECTIVES:

- To understand the basic components and layout of linkages in the assembly of a system machine.
- To understand the principles in analyzing the assembly with respect to the displacement, velocity, and acceleration at any point in a link of amechanism.
- To understand the motion resulting from a specified set of linkages, design few linkage mechanisms and cam mechanisms for specified outputmotions.
- To understand the basic concepts of toothed gearing and kinematics of gear trains and the effects of friction in motion transmission and in machinecomponents.

UNITI BASICSOFMECHANISMS **9**

Classification of mechanisms – Basic kinematic concepts and definitions – Degree of freedom, Mobility – Kutzbach criterion, Gruebler's criterion – Grashof's Law – Kinematic inversions of four-bar chain and slider crank chains – Limit positions – Mechanical advantage – Transmission Angle – Description of some common mechanisms – Quick return mechanisms, Straight line generators, Universal Joint – rockermechanisms.

UNITII KINEMATICS OF LINKAGE MECHANISMS **9**

Displacement, velocity and acceleration analysis of simple mechanisms – Graphical method– Velocity and acceleration polygons – Velocity analysis using instantaneous centres – kinematic analysis of simple mechanisms – Coincident points – Coriolis component of Acceleration – Introduction to linkage synthesis problem.

UNITIII KINEMATICS OFCAMMECHANISMS **9**

Classification of cams and followers – Terminology and definitions – Displacement diagrams – Uniform velocity, parabolic, simple harmonic and cycloidal motions – Derivatives of follower motions – Layout of plate cam profiles – Specified contour cams – Circular arc and tangent cams – Pressure angle and undercutting – sizing ofcams.

UNITIV GEARS ANDGEARTRAINS **9**

Law of toothed gearing – Involutes and cycloidal tooth profiles –Spur Gear terminology and definitions –Gear tooth action – contact ratio – Interference and undercutting. Helical, Bevel, Worm, Rack and Pinion gears [Basics only]. Gear trains – Speed ratio, train value – Parallel axis gear trains – Epicyclic Gear Trains.

UNITV FRICTION INMACHINEELEMENTS **9**

Surface contacts – Sliding and Rolling friction – Friction drives – Friction in screw threads – Bearings and lubrication – Friction clutches – Belt and rope drives – Friction in brakes- Band and Blockbrakes.

TOTAL: 45 PERIODS

OUTCOMES:

Upon the completion of this course the students will be able to

CO1 Discuss the basics ofmechanism
CO2 Calculate velocity and acceleration in simple mechanisms CO3 Develop CAMprofiles
CO4 Solve problems on gears and gear trains CO5 Examine friction in machineelements

TEXTBOOKS:

1. F.B. Sayyad, "Kinematics of Machinery", MacMillan Publishers Pvt Ltd., Tech-maxEducational resources,2011.
2. Rattan, S.S, "Theory ofMachines",4th Edition, Tata McGraw-Hill,2014.
3. Pennock G.R and Shigley, J.E., "Theory of Machines andMechanisms",

REFERENCES:

1. Allen S. Hall Jr., "Kinematics and Linkage Design", Prentice Hall,1961
2. Cleghorn. W. L, "Mechanisms of Machines", Oxford University Press,2014
3. Ghosh. A and Mallick, A.K., "Theory of Mechanisms and Machines", 3rd Edition Affiliated East-West Pvt. Ltd., New Delhi,2006.
4. John Hannah and Stephens R.C., "Mechanics of Machines", Viva Low-Prices Student Edition, 1999.
5. Thomas Bevan, "Theory of Machines", 3rd Edition, CBS Publishers and Distributors,2005.

ME8451	MANUFACTURING TECHNOLOGY – II	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the concept and basic mechanics of metal cutting, working of standard machine tools such as lathe, shaping and allied machines, milling, drilling and allied machines, grinding and allied machines andbroaching.
- To understand the basic concepts of Computer Numerical Control (CNC) of machine tools and CNCProgramming

UNITI THEORY OFMETALCUTTING **9**

Mechanics of chip formation, single point cutting tool, forces in machining, Types of chip, cutting tools– nomenclature, orthogonal metal cutting, thermal aspects, cutting tool materials, tool wear, tool life, surface finish, cutting fluids andMachinability.

UNITII TURNINGMACHINES **9**

Centre lathe, constructional features, specification, operations – taper turning methods, thread cutting methods, special attachments, machining time and power estimation. Capstan and turret lathes- tool layout – automatic lathes: semi automatic – single spindle : Swiss type, automatic screw type – multispindle:

UNITIII SHAPER, MILLING AND GEARCUTTINGMACHINES **9**

Shaper - Types of operations. Drilling ,reaming, boring, Tapping. Milling operations-types of milling cutter. Gear cutting – forming and generation principle and construction of gear milling ,hobbing and gear shaping processes – finishing ofgears.

UNITIV ABRASIVE PROCESSAND BROACHING **9**

Abrasive processes: grinding wheel – specifications and selection, types of grinding process– cylindrical grinding, surface grinding, centreless grinding and internal grinding- Typical applications

– concepts of surface integrity, broaching machines: broach construction – push, pull, surface and continuous broachingmachines

UNITV CNCMACHINING **9**

Numerical Control (NC) machine tools – CNC types, constructional details, special features, machining centre, part programming fundamentals CNC – manual part programming – micromachining – wafer machining.

TOTAL : 45 PERIODS

OUTCOMES:

Upon the completion of this course the students will be able to

CO1 Explain the mechanism of material removalprocesses.

CO2 Describe the constructional and operational features of centre lathe and other special purposelathes.

CO3 Describe the constructional and operational features of shaper, planner, milling, drilling, sawing and broachingmachines.

CO4 Explain the types of grinding and other super finishing processes apart from gear manufacturing processes.

CO5 Summarize numerical control of machine tools and write a partprogram.

TEXT BOOKS:

1. HajraChoudhury, "Elements of Workshop Technology", Vol.II., Media Promoters2014
2. Rao. P.N "Manufacturing Technology - Metal Cutting and Machine Tools", 3rd Edition, Tata McGraw-Hill, New Delhi,2013.

REFERENCES:

1. Richerd R Kibbe, John E. Neely, Roland O. Merges and Warren J.White "Machine Tool Practices", Prentice Hall of India,1998
2. GeofreyBoothroyd, "Fundamentals of Metal Machining and Machine Tools", McGraw Hill, 1984
3. HMT, "Production Technology", Tata McGraw Hill,1998.
4. Roy. A.Lindberg, "Process and Materials of Manufacture," Fourth Edition, PHI/Pearson Education2006.

ME8491	ENGINEERING METALLURGY	L	T	P	C
		3	0	0	3

OBJECTIVE:

- To impart knowledge on the structure, properties, treatment, testing and applications of metals and non-metallic materials so as to identify and select suitable materials for various engineeringapplications.

UNITI ALLOYS ANDPHASEDIAGRAMS 9

Constitution of alloys – Solid solutions, substitutional and interstitial – phase diagrams, Isomorphous, eutectic, eutectoid, peritectic, and peritectoid reactions, Iron – carbon equilibrium diagram. Classification of steel and cast Iron microstructure, properties andapplication.

UNITII HEATTREATMENT 9

Definition – Full annealing, stress relief, recrystallisation and spheroidising – normalising, hardening and Temperingof steel. Isothermal transformation diagrams – cooling curves superimposed on I.T. diagram CCR – Hardenability, Jominy end quench test - Austempering, martempering – case hardening, carburizing, Nitriding, cyaniding, carbonitriding – Flame and Induction hardening – Vacuum and Plasma hardening. .

UNITIII FERROUS ANDNON-FERROUSMETALS 9

Effect of alloying additions on steel- α and β stabilisers– stainless and tool steels – HSLA, Maraging steels–CastIron-Grey,white,malleable,spheroidal–alloycastirons,Copperandcopperalloys – Brass, Bronze and Cupronickel – Aluminium and Al-Cu – precipitation strengthening treatment – Bearing alloys, Mg-alloys, Ni-based super alloys and Titaniumalloys.

UNITIV NON-METALLICMATERIALS 9

Polymers – types of polymer, commodity and engineering polymers – Properties and applications of various thermosetting and thermoplastic polymers (PP, PS, PVC, PMMA, PET,PC, PA, ABS, PI, PAI, PPO, PPS, PEEK, PTFE, Polymers – Urea and Phenol formaldehydes)- Engineering Ceramics – Properties and applications of Al_2O_3, SiC, Si_3N_4, PSZ and SIALON –Composites- Classifications- Metal Matrix and FRP - Applications ofComposites.

UNITV MECHANICAL PROPERTIES ANDDEFORMATIONMECHANISMS 9

Mechanisms of plastic deformation, slip and twinning – Types of fracture – Testing of materials under tension, compression and shear loads – Hardness tests (Brinell, Vickers and Rockwell), hardness tests, Impact test Izod and charpy, fatigue and creep failuremechanisms.

TOTAL: 45 PERIODS

OUTCOMES

Upon the completion of this course the students will be able to

CO1 Explain alloys and phase diagram, Iron-Iron carbon diagram and steelclassification.

CO2 Explain isothermal transformation, continuous cooling diagrams and different heat treatment processes.

CO3 Clarify the effect of alloying elements on ferrous and non-ferrous metals CO4 Summarize the properties and applications of non metallicmaterials.

CO5 Explain the testing of mechanical properties..

TEXT BOOKS:

1. Avner, S.H., "Introduction to Physical Metallurgy", McGraw Hill BookCompany,1997.
2. Williams D Callister, "Material Science and Engineering" Wiley India Pvt Ltd, Revised Indian Edition2014

REFERENCES:

1. Kenneth G.Budinski and Michael K. Budinski, "Engineering Materials", Prentice Hall of India Private Limited,2010.
2. Raghavan.V, "Materials Science and Engineering", Prentice Hall of India Pvt. Ltd.,2015.
3. U.C.Jindal : Material Science and Metallurgy, "Engineering Materials and Metallurgy", First Edition, Dorling Kindersley,2012
4. Upadhyay. G.S. and AnishUpadhyay, "Materials Science and Engineering", Viva Books Pvt. Ltd., New Delhi, 2006.

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CE8395	STRENGTH OF MATERIALS FORMECHANICAL ENGINEERS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the concepts of stress, strain, principal stresses and principalplanes.
- To study the concept of shearing force and bending moment due to external loads in determinate beams and their effect onstresses.
- To determine stresses and deformation in circular shafts and helical spring due totorsion.
- To compute slopes and deflections in determinate beams by variousmethods.
- To study the stresses and deformations induced in thin and thickshells.

nodynamics

UNITI STRESS, STRAIN AND DEFORMATIONOF SOLIDS

Rigid bodies and deformable solids – Tension, Compression and Shear Stresses – Deformation of simple and compound bars – Thermal stresses – Elastic constants – Volumetric strains –Stresses on inclined planes – principal stresses and principal planes – Mohr's circle of stress.

UNITII TRANSVERSE LOADING ON BEAMS AND STRESSESIN BEAM

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Beams – types transverse loading on beams – Shear force and bending moment in beams – Cantilevers – Simply supported beams and over – hanging beams. Theory of simple bending– bending stress distribution – Load carrying capacity – Proportioning of sections – Flitched beams – Shear stressdistribution.

UNITIII TORSION

Torsion formulation stresses and deformation in circular and hollows shafts – Stepped shafts– Deflection in shafts fixed at the both ends – Stresses in helical springs – Deflection of helical springs, carriagesprings.

UNITIV DEFLECTIONOFBEAMS

Double Integration method – Macaulay's method – Area moment method for computation of slopes and deflections in beams - Conjugate beam and strain energy – Maxwell's reciprocal theorems.

UNITV THIN CYLINDERS, SPHERES ANDTHICKCYLINDERS

Stresses in thin cylindrical shell due to internal pressure circumferential and longitudinal stresses and deformation in thin and thick cylinders – spherical shells subjected to internal pressure – Deformation in spherical shells – Lame's theorem.

TOTAL: 45 PERIODS

OUTCOMES

Students will be able to

- Understand the concepts of stress and strain in simple and compound bars, the importance of principal stresses and principalplanes.
- Understand the load transferring mechanism in beams and stress distribution due to shearing force and bendingmoment.
- Apply basic equation of simple torsion in designing of shafts and helicalspring
- Calculate the slope and deflection in beams using differentmethods.
- Analyze and design thin and thick shells for the applied internal and externalpressures.

TEXT BOOKS:

1. Bansal, R.K., "Strength of Materials", Laxmi Publications (P) Ltd.,2016
2. Jindal U.C., "Strength of Materials", Asian Books Pvt. Ltd., New Delhi,2009

REFERENCES:

1. Egor. P.Popov "Engineering Mechanics of Solids" Prentice Hall of India, New Delhi,2002
2. Ferdinand P. Been, Russell Johnson, J.r. and John J. Dewole "Mechanics of Materials", Tata McGraw Hill Publishing 'co. Ltd., New Delhi,2005.
3. Hibbeler, R.C., "Mechanics of Materials", Pearson Education, Low Price Edition,2013
4. Subramanian R., "Strength of Materials", Oxford University Press, Oxford Higher Education Series,2010.

ME8593	DESIGN OF MACHINE ELEMENTS	L	T	P	C
		3	0	0	3

OBJECTIVES

- To familiarize the various steps involved in the DesignProcess
- To understand the principles involved in evaluating the shape and dimensions of a component to satisfy functional and strengthrequirements.
- To learn to use standard practices and standarddata
- To learn to use catalogues and standard machinecomponents
- (Use of P S G Design Data Book ispermitted)

UNITI STEADY STRESSES AND VARIABLE STRESSES INMACHINEMEMBERS 9

Introduction to the design process - factors influencing machine design, selection of materials based on mechanical properties - Preferred numbers, fits and tolerances – Direct, Bending and torsional stress equations – Impact and shock loading – calculation of principle stresses for various load combinations, eccentric loading – curved beams – crane hook and 'C' frame- Factor of safety - theories of failure – Design based on strength and stiffness – stress concentration – Design for variableloading.

UNITII SHAFTSAND COUPLINGS 9

Design of solid and hollow shafts based on strength, rigidity and critical speed – Keys, keyways and splines - Rigid and flexible couplings.

UNITIII TEMPORARY ANDPERMANENTJOINTS 9

Threaded fastners - Bolted joints including eccentric loading, Knuckle joints, Cotter joints – Welded joints, riveted joints for structures - theory of bondedjoints.

UNITIV ENERGY STORING ELEMENTS ANDENGINECOMPONENTS 9

Various types of springs, optimization of helical springs - rubber springs - Flywheels considering stresses in rims and arms for engines and punching machines- Connecting Rods and crank shafts.

UNITV BEARINGS 9

Sliding contact and rolling contact bearings - Hydrodynamic journal bearings, Sommerfeld Number, Raimondi and Boyd graphs, -- Selection of Rolling Contactbearings.

TOTAL: 45 PERIODS

OUTCOMES:

Upon the completion of this course the students will be able to

CO1 .Explain the influence of steady and variable stresses in machine component design. CO2 Apply the concepts of design to shafts, keys andcouplings.

CO3 Apply the concepts of design to temporary and permanent joints.

CO4 Apply the concepts of design to energy absorbing members, connecting rod and crank shaft.

CO5 Apply the concepts of design tobearings.

TEXT BOOKS:

1. Bhandari V, "Design of Machine Elements", 4th Edition, Tata McGraw-Hill Book Co,2016.
2. Joseph Shigley, Charles Mischke, Richard Budynas and Keith Nisbett "Mechanical Engineering Design", 9th Edition, Tata McGraw-Hill,2011.

REFERENCES:

1. Alfred Hall, Halowenko, A and Laughlin, H., "Machine Design", Tata McGraw-Hill BookCo.(Schaum's Outline), 2010
2. AnselUgural, "Mechanical Design Co, 2003. An Integral Approach",1st Edition, Tata McGraw-Hill Book
3. P.C. Gope, "Machine Design – Fundamental and Application", PHI learning private ltd, New Delhi, 2012.
4. R.B. Patel, "Design of Machine Elements", MacMillan Publishers India P Ltd.,

ME8651	DESIGN OF TRANSMISSION SYSTEMS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To gain knowledge on the principles and procedure for the design of Mechanical power Transmissioncomponents.
- To understand the standard procedure available for Design of Transmission of Mechanical elements
- To learn to use standard data and catalogues (Use of P S G Design Data Book permitted)

UNITI DESIGN OFFLEXIBLEELEMENTS 9

Design of Flat belts and pulleys - Selection of V belts and pulleys – Selection of hoisting wire ropes and pulleys – Design of Transmission chains andSprockets.

UNITII SPUR GEARS AND PARALLEL AXISHELICALGEARS 9

Speed ratios and number of teeth-Force analysis -Tooth stresses - Dynamic effects – Fatigue strength - Factor of safety - Gear materials – Design ofstraight tooth spur & helical gears based on strength and wear considerations – Pressure angle in the normal and transverse plane- Equivalent number of teeth-forces for helicalgears.

UNITIII BEVEL, WORM AND CROSSHELICALGEARS 9

Straight bevel gear: Tooth terminology, tooth forces and stresses, equivalent number of teeth. Estimating the dimensions of pair of straight bevel gears. Worm Gear: Merits and demerits- terminology. Thermal capacity, materials-forces and stresses, efficiency, estimating the size of the worm gear pair. Cross helical: Terminology-helix angles-Estimating the size of the pair of cross helical gears.

UNITIV GEAR BOXES 9

Geometric progression - Standard step ratio - Ray diagram, kinematics layout -Design of sliding mesh gear box - Design of multi speed gear box for machine tool applications - Constant mesh gear box - Speed reducer unit. – Variable speed gear box, Fluid Couplings, Torque Converters for automotive applications.

UNITV CAMS, CLUTCHESAND BRAKES 9

Cam Design: Types-pressure angle and under cutting base circle determination-forces and surface stresses. Design of plate clutches –axial clutches-cone clutches-internal expanding rim clutches- Electromagnetic clutches. Band and Block brakes - external shoe brakes – Internal expanding shoe brake.

TOTAL : 45 PERIODS

OUTCOMES:

Upon the completion of this course the students will be able to

CO1 apply the concepts of design to belts, chains and rope drives.
CO2 apply the concepts of design to spur, helicalgears.
CO3 apply the concepts of design to worm and bevel gears. apply the
CO4 concepts of design to gear boxes .

TEXT BOOKS:

1. Bhandari V, "Design of Machine Elements", 4th Edition, Tata McGraw-Hill Book Co,2016.
2. Joseph Shigley, Charles Mischke, Richard Budynas and Keith Nisbett "Mechanical Engineering Design", 8th Edition, Tata McGraw-Hill,2008.

REFERENCES:

1. Merhyle F. Spotts, Terry E. Shoup and Lee E. Hornberger, "Design of Machine Elements" 8th Edition, Printice Hall,2003.
2. OrthweinW, "Machine Component Design", Jaico Publishing Co,2003.
3. Prabhu. T.J., "Design of Transmission Elements", Mani Offset, Chennai, 2000.th
4. Robert C. Juvinall and Kurt M. Marshek, "Fundamentals of MachineDesign",4 Edition,Wiley, 2005
5. Sundararajamoorthy T. V, Shanmugam .N, "Machine Design", Anuradha Publications, Chennai,2003.

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ME8691 COMPUTER AIDED DESIGN AND MANUFACTURING **L T P C**
3 0 0 3

OBJECTIVES:

- To provide an overview of how computers are being used in mechanical componentdesign
- To understand the application of computers in various aspects of Manufacturing viz., Design, Proper planning, Manufacturing cost, Layout & Material Handlingsystem.

UNITI INTRODUCTION **9**

Product cycle- Design process- sequential and concurrent engineering- Computer aided design – CAD system architecture- Computer graphics – co-ordinate systems- 2D and 3D transformations- homogeneous coordinates - Line drawing -Clipping- viewing transformation-Brief introduction to CAD and CAM – Manufacturing Planning, Manufacturing control- Introduction to CAD/CAM –CAD/CAM concepts —Types of production - Manufacturing models and Metrics – Mathematical models of Production Performance

UNITII GEOMETRIC MODELING **9**

Representation of curves- Hermite curve- Bezier curve- B-spline curves-rational curves-Techniques for surface modeling – surface patch- Coons and bicubic patches- Bezier and B-spline surfaces. Solid modeling techniques- CSG andB-rep

UNITIII CAD STANDARDS **9**

Standards for computer graphics- Graphical Kernel System (GKS) - standards for exchange images- Open Graphics Library (OpenGL) - Data exchange standards - IGES, STEP, CALS etc. - communication standards.

UNITIV FUNDAMENTAL OF CNC ANDPART PROGRAMING **9**

Introduction to NC systems and CNC - Machine axis and Co-ordinate system- CNC machine tools- Principle of operation CNC- Construction features including structure- Drives and CNC controllers- 2D and 3D machining on CNC- Introduction of Part Programming, types - Detailed Manual part programming on Lathe & Milling machines using G codes and M codes- Cutting Cycles, Loops, Sub program and Macros- Introduction of CAMpackage.

UNITV CELLULAR MANUFACTURING ANDFLEXIBLE MANUFACTURINGSYSTEM(FMS) **9**

Group Technology(GT),Part Families–Parts Classification and coding–Simple Problems in Opitz Part Coding system– Production flow Analysis–Cellular Manufacturing–Composite part concept–Types of Flexibility - FMS – FMS Components – FMS Application & Benefits – FMS Planning and Control– Quantitative analysis in FMS

TOTAL : 45 PERIODS

OUTCOMES:

Upon the completion of this course the students will be able to

CO1	Explain the 2D and 3D transformations, clipping algorithm, Manufacturing models and Metrics
CO2	Explain the fundamentals of parametric curves, surfaces and Solids CO3 Summarize the different types of Standard systems used inCAD
CO4	Apply NC & CNC programming concepts to develop part programme for Lathe & MillingMachines
CO5	Summarize the different types of techniques used in Cellular Manufacturing andFMS

TEXT BOOKS:

1. Ibrahim Zeid "Mastering CAD CAM" Tata McGraw-HillPublishingCo.2007
2. Mikell.P.Groover "Automation, Production Systems and Computer Integrated Manufacturing", Prentice Hall of India,2008.
3. Radhakrishnan P, SubramanyanS.andRaju V., "CAD/CAM/CIM", 2nd Edition, New Age International (P) Ltd, NewDelhi,2000.

REFERENCES:

1. Chris McMahon and Jimmie Browne "CAD/CAM Principles", "Practice and Manufacturing management " Second Edition, Pearson Education,1999.
2. Donald Hearn and M. Pauline Baker "Computer Graphics"'. Prentice Hall,Inc,1992.
3. Foley, Wan Dam, Feiner and Hughes - "Computer graphics principles & practice" Pearson Education -2003
4. William M Neumann and Robert F.Sproul "Principles of Computer Graphics", McGraw Hill Book Co. Singapore, 1989.

ME8811	PROJECT WORK	L	T	P	C
		2	0	1	0

OBJECTIVE:

- To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same. To train the students in preparing project reports and to face reviews and viva voceexamination.

The students in a group of 3 to 4 works on a topic approved by the head of the department under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction of the supervisor. The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of thesemester. The project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of theDepartment.

TOTAL: 30 PERIODS

OUTCOME:

- On Completion of the project work students will be in a position to take up any challenging practical problems and find solution by formulating propermethodology.

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