

Department of Mechanical Engineering
Programme: Diploma in Mechanical Engineering

Year I : Semester I

			L	T	P	C
HS	3101+	Communication Skill	2	0	2	3
PH	3102+	Physics-III B	2	0	2	3
CY	3101+	Chemistry-III	3	0	2	4
MA	3101	Engineering Mathematics-I	3	1	0	4
ES	3100	Object Oriented Programming with C++	2	0	4	4
ME	3101	Production Engineering-I	3	0	0	3
ME	3102	Thermodynamics	3	1	0	4
ME	3103*	Comprehensive Mechanics	3	1	0	4
ME	3151*	Comprehensive Workshop - I	0	0	6	3
ME	3152*	Comprehensive Mechanical Drawing	0	0	6	3
			18	2	10	25/10+2

(Voc)/NERIST

* Bridge for 10+2 PCM.

14 3 16 25 10+2 PCM

+ Bridge for 10+2 Vocational/NERIST Certificate

Year I : Semester II

ES	3200	Environment and Ecology	3	0	0	3
PH	3202	Physics IV B	2	0	2	3
CY	3202	Engineering Chemistry IA	3	0	2	4
MA	3201	Engineering Mathematics-II	3	1	0	4
ME	3201	Fundamentals of Fluid Mechanics	3	1	0	4
ME	3202	Production Engineering - II	4	0	0	4
ME	3251	Workshop Practice	0	0	6	3
EC	3277*	Electronics Engineering	3*	0	0	3*
			18+3*	2	10	25+3*

(Audit)

*Audit Course

Year II : Semester I

EE	4122	Fundamentals of Electrical Engineering	3	0	2	4
ME	4101	Theory of Machines	4	0	0	4
ME	4102	Energy Conversion Principles	4	0	0	4
ME	4103	Strength of Materials	4	0	0	4
ME	4104	Fluid Machines	3	0	2	4
ME	4151	Machine Drawing	0	0	6	3
ME	4152	Experimental Methods and Measurements	2	0	4	4
			20	0	14	27

Year II		: SemesterII					
HS	4201	Principles of Economics & Costing	4	0	0	4	
CE 4	226	Basics of Civil Engineering	3	0	2	4	
ME	4201	Production Cost and Quality Management	4	0	0	4	
ME	4202	Design of Machine Elements	3	1	0	4	
ME	4203	Engineering Metallurgy	4	0	0	4	
ME	40**	Elective	4	0	0	4	
ME	4299	Project	0	0	6	3	
ED	4288	ExtraCurricularactivities	-	-	-	2	
			22	1	8	27+2(ED)	

List of Electives

ME	4001	Automobile Engineering	ME 4004	Statistical Quality Control
ME	4002	Non Traditional Machining	ME 4005	Control Systems
ME	4003	Total Productivity Management	ME 4006	Solar Energy Engineering

Courses offered to branches other than ME only

ME3153	Comprehensive Workshop - II	0	0	6	3	CE (L)
ES3277*	Comprehensive Workshop - III	0	0	6	3	EC (L)+EE(L)
ME4121	Principles of Mechanical Engineering	3	1	0	4	CE

COURSE CONTENTS

ME 3101: Production Engineering – I : 3 Credits (3-0-0 3)		
Unit I	Introduction to basic manufacturing processes: Metal casting and castability, metal joining and weldability, metal cutting and machinability, metal forming and formability.	6 lectures
Unit II	Pattern making: Types of patterns, pattern allowances, pattern materials; Moulding and core making; Organic and inorganic binders, moulding materials & their properties; Moulding processes and core making, melting furnaces, fettling and heat treatment of castings, inspection, casting defects.	12 lectures
Unit III	Plastic deformation of metals: Deformation by slip and twinning, hot/warm forming, cold forming, rolling, forging, drawing, shearing, punching, coining and extrusion; Punch and dies, presswork operations.	12 lectures
Unit IV	Classification of welding processes and applications: Arc welding, TIG welding, MIG welding, gas welding, soldering and brazing, adhesive bonding, friction welding.	12 lectures

Recommended Books :

1. Manufacturing Technology (Vol. I), P.N.Rao, McGraw Hill Education Pvt. Ltd., 2007.
2. Production Engineering Sciences, P.C.Pandey & C.K.Singh, Standard Book Publishers, 2011.
3. Elements of Workshop Technology (Vol I & II), S. K. Hajra Choudhary, AK Hajra Choudhary and N. Roy, Media Promoters & Publishers Pvt. Ltd., 2007.
4. Manufacturing Science, A. Ghosh & A. K. Mallick, East West Press, 1993.
5. Welding Processes and Technology, R. S. Parmar, Khanna Publishers, 2003.

ME 3102: Thermodynamics: 4 Credits (3-1-0)		
Unit I	Introduction of thermodynamics with its application in real systems, power plant, IC engine, rocket propulsion, refrigerator, macroscopic and microscopic view point, thermodynamic system, thermodynamic properties. thermodynamic equilibrium, processes, continuum, specific volume, pressure, Zeroth law of thermodynamics, point function, path function, work and heat, first law of thermodynamics, first law for flow process.	7 lectures
Unit II	Second law of thermodynamics, limitations of first law, heat engine, heat pump, energy reservoir, Kelvin-Planck statement, Clausius Statement, reversible process, irreversible process, Carnot cycle, Carnot's theorem, corollary of Carnot's theorem, temperature scale, entropy, Clausius' theorem, F-S plot. Clausius inequality, entropy change in an irreversible process, entropy principle.	8 lectures
Unit III	Properties of pure substance, P-V diagram for different phaseser substance, critical temperature, triple point, properties of pure substance, T-S diagram, h-s diagram, dryness fraction, saturated liquid, saturated vapour, independent properties; Introduction to steam table, Mollier chart, law of corresponding states, Dalton's law of partial pressure, equivalent gas constant, entropy of gas mixture.	6 lectures
Unit IV	Availability, classification of high grade energy and low grade energy, availability in a steady flow process, availability in a non-flow process, availability in chemical reaction, Maxwell's Equation, Tds equations, Cp, Cv relations; Joule-kelvin effect, Clausius-Clapeyron equation, evaluation of latent heat by Clausius-Clapeyron equation, Trouton's rule, evaluation of thermodynamic properties from an equation of states, Gibbs phase rule, Gibbs-Duham equation for the mixtures of variable composition.	7 lectures

Unit V	Introduction of air vapour power cycle, air standard cycle, Otto, Diesel, Dual, Stirling, Ericson, Atkinson, and Brayton cycles.	7 lectures
Unit VI	Introduction to heat transfer: Fourier's law of heat conduction, thermal conductivity, resistance concept in heat conduction, transient heat conduction with lump heat capacity method, Newton's law of cooling, concept of free, forced convection and radiation.	7 lectures

Recommended Books

1. Engineering Thermodynamics, P. K. Nag, Tata McGraw Hill, 2005.
2. Engineering Thermodynamics Work and Heat Transfer, G. F. C. Rogers and Y. R. Mayhew, 4th Ed., Pearson, 2001.
3. Fundamentals of Thermodynamics, Borgnakke and Sonntag, Wiley, 2003.
Heat and Thermodynamics, Zemansky, Tata McGraw Hill, 2011

ME 3103: Comprehensive Mechanics: 4 credits (3-1-0)		
Unit I	Mechanics and its relevance to engineering, inertia and moving frame of reference, free body diagrams, internal and external forces, laws of mechanics, concept of moment, equilibrium principle.	6 lectures
Unit II	Simple structure: Type of structures/truss, analysis by the method of joints and method of sections.	6 lectures
Unit III	Static analysis of systems with friction: friction in impending motion, rolling resistance, sliding and rolling of cylinders.	6 lectures
Unit IV	Centroids, centre of mass, centre of gravity, first moment, centroid of length, centroid of an area, theorem of Pappus and Guldinus, centroid of volumes, moment of inertia, parallel axis and perpendicular axis theorems, moment of inertia of composite sections.	8 lectures
Unit V	Kinematics of rigid body: Types of motion, fixed axis rotation, plane motion of a rigid body, instantaneous centre of rotation, relative velocity and acceleration for points on a rigid body.	8 lectures
Unit VI	Dynamics of rigid body: D'Alembert's principle, translation of a rigid body, rotation of a rigid body about a fixed principal axis, plane motion of a rigid body, general motion of a rigid body, projectile and SHM, impact of two bodies: elastic and inelastic collision, co-efficient of restitution.	8 lectures

Recommended Books

1. Engineering Mechanics, J. L. Meriam and L. G. Kraige, John Wiley & sons, 7th Ed., 2012.
2. Engineering Mechanics, S. Timoshenko, McGraw Hill Publishers, 5th Ed., 2013.
3. Engineering Mechanics, I.H. Shames and G.K.M. Rao, Pearson Education India, New Delhi, 4th Ed., 2006.
4. Engineering Mechanics, R. K. Bansal, Laxmi Publication, 4th Ed., 2016.

ME 3151: Comprehensive Workshop - I: 3 Credits (0-0-6)	
Fitting Shop: Introduction to fitting and safety aspects; use of different tools (functions, types and specifications), fitting operations, drilling. Practice simple fitting jobs.	28 hours
Carpentry Shop: Introduction to carpentry and safety aspects; use of different tools (functions, types and specifications) types of woods, hand tools and wood working machines. Practice simple carpentry joints.	28 hours
Welding Shop: Introduction to gas and arc welding and safety aspects; use of different tools (functions, types and specifications), soldering and brazing practice. Practice of welding joints.	28 hours

ME 3152: Comprehensive Mechanical Drawing: 3 credits (0-0-6)	
Manipulating and use of drawing equipment and instruments, lines, dimensioning, geometrical constructions, engineering curves.	18 hours
Projection of points, lines, planes and solids (orthographic).	18 hours
Isometric projections.	12 hours
Introduction to limits, fits and tolerances, assembly elements.	18 hours
Sectional views, conventional symbols used in drawing, free hand sketching reading of drawing.	18 hours

Recommended Books:

1. Engineering Drawing (Geometrical Drawing), P.S. Gill, Katson Books, S.K.Kataria & Sons, 2013.
2. Engineering Drawing, N. D. Bhatt & V.M.Panchal, Charotar Publishing House, 53rd Ed., 2014.
3. Machine Drawing, N. Siddeswar, Tata McGraw Hill, 1990.
4. Machine Drawing, K. L. Narayana, New Age International Publication, 4th Ed., 2010.

ME 3201: Fundamentals of Fluid Mechanics: 4 Credits (3-1-0)		
Unit I	Introduction to fluid mechanics: Characteristics of fluids, continuum principle, units & dimensions, different fluid properties, classification of fluids, different types of flow (steadiness, uniformity and dimensionality of flow: laminar & turbulent flow), control volume & system approach. Fluid statics: Pressure variation with position in static mass of fluid, pressure measurement – barometer, manometers & pressure gauges, hydrostatic thrust on immersed plane & curved surfaces, centre of pressure, buoyancy, metacentre, stability & equilibrium of immersed and floating bodies.	11 lectures
Unit II	Introduction to kinematics of fluids: Velocity & acceleration, rotational & irrotational flow, circulation & vorticity, flow characteristics – streamline, streakline and pathline, velocity potential & stream function, flow net, basic flows and the corresponding velocity potential & stream functions.	6 lectures
Unit III	Fluid dynamics: Fundamental & subsidiary governing equations, continuity equation, Reynolds equation, Navier-Stoke's equation (statement only), Euler's equation of motion, Bernoulli's equation and its application, pitot tube, venturimeter, nozzle & orifice, momentum and kinetic energy, correction factor, total energy line & hydraulic grade line, momentum equation & its applications.	10 lectures
Unit V	Laminar & turbulent flows: Flow between fixed and moving parallel plates, flow through circular pipes, flow through annulus, shear stress & velocity distribution, turbulent flow in pipes, different losses for flow through pipes, Darcy-Weisbach equation, Moody's diagram, pipes in series & parallel, power transmission through pipes.	7 lectures
Unit VI	Reynolds's transport equation and its application to different kinds of fluid machines, impulse-momentum principle, angular momentum conservation principle, impact of jets on (i) plane (stationary, inclined & moving plate) and (ii) curved plates with jet strikes tangentially, series of vanes, Force exerted, work done, and efficiency. Dimensional analysis: Dimensional homogeneity, Buckingham- π theorem, important dimensionless parameters & their significance, definitions of geometric, kinematic & dynamic similarities, introduction to model testing.	8 lectures

Recommended Books:

1. Fluid Mechanics, J.F. Douglas, J.M. Gasiorek, J. A. Swaffield and L.B. Jack, Pearson Education, 2008.
2. Introduction to Fluid Mechanics and Fluid Machines, S. K. Som, G. Biswas, Tata McGraw Hill, 2nd Ed., 2003.
3. Fluid Mechanics, F. M. White, Tata McGraw Hill, 6th Ed., 2008.
4. Introduction To Fluid Mechanics, R.W. Fox, A.T. McDonald and P.J. Pritchard,, John Wiley, 6th Ed. 2004.
5. Fundamentals Of Fluid Mechanics, B.R. Munson, D.F. Young, and T.H. Okhiishi, Wiley India Edition, 5th Ed., 2002.

ME 3202: Production Engineering-II : 4 Credits (4-0-0)		
Unit I	Fundamentals of metal cuttings: Generactics/directics, surface generations, orthogonal and oblique cutting, characteristics of cutting tool materials, tool geometry, tool signature: ASA and ORS system, process parameters, evaluation of cutting speed, tool life and cutting forces, mechanism of chip formation. parameters that affect chip formation and tool life, cutting fluids.	12 lectures
Unit II	General purpose machine tools: Lathe/milling/shaping/grinding and its constructions/mechanisms and features, various machining operations: lathe operations, milling operations, shaping, planning and grinding, measurement of surface roughness and force analysis, grinding wheel specification.	14 lectures
Unit III	Gear cutting in milling, indexing, spur and helical gear cutting, gear shaping, gear hobbing, thread rolling, introduction to jigs and fixtures, principles of work holding, jigs and fixtures used for common machining operations.	10 lectures
Unit IV	Newer and advanced machining processes: Working principles and their applications, merits and demerits of the processes USM, ECM, EDM, WJM, WEDM, LBM, EBM.	10 lectures
Unit V	Introduction to numerical control, NC and CNC, classifications, PTP and contouring, G and M codes, manual part programming for lathe, drilling and milling operations.	10 lectures

Recommended Books:

1. Manufacturing Scienc, A. Ghosh & A. K. Mallick, East West Press, 1993.
2. Fundamentals of Metal Machining and Machine Tools, G.Boothoyd., CRC Press,1988.
3. Manufacturing Technology: Metal Cutting & Machine Tool, P. N. Rao, McGraw Hill Education Pvt. Ltd., 2004.
4. Non conventional Machining, P.K. Misra, Narosa Publishers, 1997.
5. Introduction to Computer numerical control, Barry Leatham,Pitam Publishers, 1989.

ME 3251 : Workshop Practice – I (Machine shop & CIM lab) : 3 Credits (0-0-6)		
Machine Shop: Machine shop practice, practice on preparation of simple jobs involving different operations like turning, threading, boring, shaping, drilling, grinding and milling, demonstration on milling/lathe attachments, copying mechanism, WEDM, single spindle automats.		24 hours
CIM Lab: CNC Lathe Machine, understand operation procedures of the machine, demonstration of operating procedure with the help of a work piece, understand safety operations. CNC Milling Machine, understand operation procedures of the machine, demonstration of operating procedure with the help of a work piece, understand safety operations.		36 hours
Computer lab: CAM practice, demonstration, switch on/off procedure, part program and its simulation/dry run, demonstration of making sample job involving different operations.		24 lectures

Syllabi of courses offered to other departments only

ME 3153: Comprehensive Workshop – II: 2 Credits (0-0-4) [For CE (L) students]		
Carpentry Shop: Introduction to woodworking and safety aspects in the shop, types of tools (functions, and specifications), equipment and operations, type of woods, carpentry joints.		28 hours
Fitting Shop: Introduction to fitting shop and safety aspects in the shop, type of tools (functions and specifications), equipment and operations, fitting jobs.		28 hours

ES 3277: Comprehensive Workshop – III : 3 Credits (0-0-6) [For EC(L) & EE(L) students]	
Fitting Shop: Introduction to fitting and safety aspects and different tools (functions and specifications), filing operations, drilling, simple fitting jobs.	28 hours
Carpentry Shop: Introduction to carpentry and safety aspects and different tools (functions and specifications), type of woods, hand tools and wood working machines, carpentry joints.	28 hours
Welding Shop: Introduction to gas and arc welding, safety aspects, different tools (functions and specifications), soldering and brazing practices, welding joints.	28 hours

ME 4101: Theory of Machines: 4 credits (4-0-0)		
Unit I	Kinematics and kinetics, mechanism and structures and their inversions, elements of kinematics chain, miscellaneous types of mechanism, kinematics fundamental, degree of freedom and its determination, lower pairs and higher pairs, types of motions, links, joints and kinematics chains, inversions, Grasshoff's law.	10 lectures
Unit II	Velocity analysis and rigid body mechanics, graphical analysis, instantaneous centers, velocity analysis of instantaneous centers, centroids.	8 lectures
Unit III	Analytical solution of velocity analysis: Four bar linkages, velocity analysis of bars, slider crank of mechanism, Whitworth quick return mechanism.	8 lectures
Unit IV	Acceleration analysis: Definition of acceleration of mechanism, graphical analysis, analytical solution of acceleration analysis; four bar linkages, slider crank mechanism, Coriolis acceleration, acceleration of n bars.	8 lectures
Unit V	Belt and chain drives, friction and centrifugal clutches, brakes and dynamometers,	12 lectures
Unit VI	Gear Trains: Rolling cylinder, fundamental law of gearing, involute tooth form pressure angle, simple gear train, compound gear train, epicyclic gear train, or planetary gear trains, transmissions.	10 lectures

Recommended Books:

- 1 Theory of Machines, S.S. Rattan, Tata McGraw Hill, 4th Ed., 2014.
2. Theory of Machines, T. Beven, CBS Publications, 3rd Ed., 2005.
3. Design of Machinery, R.L.Norton, Tata McGraw Hill, 4th Ed., 2008.
4. Theory of Machines & Mechanism, J.E. Shigley, McGraw Hill, 3rd Ed., 2009.

ME 4102 : Energy Conversion Principles: 4 Credits (4-0-0)		
Unit I	Principles of thermo-mechanical energy conversion, IC & E.C. engines, gas turbines, steam turbines, combustion process, fuels, combustion reactions, complete and incomplete combustion, calculation of air requirement, theoretical and actual air-fuel ratios, flue gas analysis, combustion in boilers.	10 lectures
Unit II	IC Engines: Classification of IC engines, two stroke, four stroke engines, spark ignition (S.I.) engines, compression ignition (C.I.) engines, carburetion and fuel injection systems, cooling system of IC engines, multi-cylinder engines, indicated and brake power, brake mean effective pressures, engines efficiencies, performance analysis of IC engines, testing of IC engines, testing of IC engines, heat balance.	8 lectures
Unit III	Steam Power Systems: Components of steam power systems, Rankine cycle & modified Rankine cycle, steam generators- introduction and classification, FTB & WTB, mountings and accessories of boiler, boiler performance (Introduction only).	13 lectures
Unit IV	Gas Turbines: Closed and open cycles, basic closed cycles, analysis of Brayton or Joule cycle, machine efficiencies, optimum pressure ratio for maximum cycle output, optimum pressure ratio for maximum thermal efficiency, gas turbine cycle with heat exchanger or generator, gas turbine cycles with inter-cooling and reheating.	8 lectures

Unit V	Introduction to Jet propulsion: Specific thrust-thermal efficiency, propulsive efficiency and ram efficiency of jet plane, multi-shaft system turbines in series, an advanced automotive gas turbine engine concept.	8 lectures
Unit VI	Reciprocating Air Compressors: Introduction and working principles with constructional details, single stage compressor, equation of shaft work isothermal adiabatic, efficiency, clearance and clearance volume equation of work with conventional p-v diagram, volumetric efficiency, influence of polytropic index on mass flow rate and power of compressor, multistage reciprocating air compressor intercooler, mean effective pressure and indicated power, mechanical efficiency, air motor, control of compressor	9 lectures

Recommended Books

1. Principles of Energy Conversion, A.W. Cipl, MGH, New York, 1991.
2. Energy Conversion: (Vol. I, II & III), V. Kadamni and M. Prasad, Tata McGraw Hill, 1976.
3. Internal Combustion Engine Fundamentals, J. B. Heywood, Tata McGraw Hill, 1988.
4. Power Plant Engineering, P.K. Nag, Tata McGraw Hill, 2nd Ed., 2003.
5. Thermal Engineering, R.K. Rajput, Laxmi Publication Pvt. Ltd., 2006.
6. Engineering Thermodynamics (Principles and Practice), D.S. Kumar, S.K. Kataria & Sons, 2015.

ME 4103: Strength of Materials: 4 credits (4-0-0)		
Unit I	Stresses and strains, elasticity, Hooke's law, Poisson's ratio, volumetric strain, elastic constants, constitutive relations, material properties for isotropic materials and their relations, stresses in composite bars, strain energy impact and suddenly applied loads, thermal stresses.	12 lectures
Unit II	Principal stresses and their planes, plane of maximum shear, Mohr's circle of stresses, theories of failures for isotropic materials.	10 lectures
Unit III	Shear force and bending moment diagrams for beams subjected to different types of loads.	10 lectures
Unit IV	Bending of beams: Theory of simple bending and assumptions, stresses due to pure bending, transverse shear stress distribution, combined stresses due to bending, torsion and axially loading with eccentricity.	7 lectures
Unit V	Deflection of beams: Double integration method, the moment area method, Macaulay's method, superposition (statically determinate beams only), Castigliano's theorem.	7 lectures
Unit VI	Torsion of shafts and buckling of columns.	10 lectures

Recommended Books:

1. Strength of Materials, G. H. Ryder, McMillan, ELBS Edition, 3rd Ed., 1985.
2. Mechanics of Materials, S. Timoshenko, and M. J. Gere, C.B.S, Publishers, 1980.
3. Strength of Materials, B.C. Punmia, Firewall Media, 2002
4. Engineering Mechanics of Solids, E. P. Popov, PHI, New Delhi, 2nd Ed., 2012.

ME 4104 : Fluid Machines: 4 Credits (3-0-2)		
Unit I	Reynolds transport equation and its application to different kinds of fluid machines.	6 lectures
Unit II	Impulse momentum principle, angular momentum conservation principle, impact of jets on plane (stationary, inclined & moving plate) and curved plates with jet strikes tangentially, series of vanes, force exerted, work done, and efficiency.	8 lectures
Unit III	Centrifugal pump and its classification, components & working principle, velocity triangles, head developed, work done, losses, efficiencies and specific speed, pumps in series and parallel, NPSH, priming, cavitation, performance characteristics. Reciprocating pump and its classification, working principle, indicator diagram, discharge, head developed and power, effect of acceleration of piston, friction on pipes and maximum pump speed, air vessels, power saved.	10 lectures
Unit IV	Hydraulic turbines and its classification, impulse turbine, Pelton wheel, analysis of force on the buckets, work done, power generation and efficiencies. Reaction turbines, Francis turbine, work done, runner design, and efficiencies Kaplan turbine and Francis turbines, governing of turbines, draft tubes, cavitation, performance characteristics, comparison of specific speeds of hydraulic turbines.	10 lectures
Unit V	Miscellaneous hydraulic machines, construction and working principles of gear pump & screw pump, fluid coupling and torque converter, hydraulic ram, accumulator, hydraulic jack.	8 lectures

Recommended Books :

1. Fluid Mechanics and Hydraulic Machines, R. K. Bansal, Laxmi Publications, 2005.
2. Fluid mechanics and Hydraulics, J. Lal, Metropolitan New Delhi, 9th Ed., 1991.
3. Fluid Mechanics & Fluid Machines, S.K. Som & G. Biswas, McGraw Hill Education, 3rd Ed., 2012.
4. Fluid Mechanics and Thermodynamics of Turbomachinery, S. L. Dixon, Elsevier, 5th Ed., 1998.

ME 4151: Machine Drawing : 3 Credits (0-0-6)		
Conventional drawing and drafting: Classification of machine drawing, assembly and parts drawing, parts listing, assembly drawing from detailed drawing, power transmission unit, machine tools parts, tool drawing and miscellaneous parts, toleranced dimensional drawing, exercises involving use of ISI conventions in drawing.		42 hours
Computerized drafting techniques: Introduction of Autocad and other drafting and solid modeling packages viz. mechanical desktop, Creo (Pro-e) Catia, basic command, drawing, sectional views, simple figures, dimensioning, sectional views, three dimensional drawing.		42 hours

Recommended Books

1. Engineering Drawing, N. D. Bhatt, Charotar Publishing House, 53rd Ed., 2014.
2. Machine Drawing, K. L. Narayana, New Age International, 4th Ed., 2013.
3. Production Drawing, K. L. Narayana, New Age International, 2009.
4. .AutoCAD/Creo/Catia Manual.

ME 4152 : Experimental Methods : 4 Credits (2-0-4)		
Unit I	Planning of experiments, error analysis.	4 lectures
Unit II	Classification of instruments, their characteristics, instruments used to measure flow, temperature, velocity & pressure.	6 lectures
Unit III	Measurement of threads, angles & surface roughness, limit gauges, comparators	5 lectures
Unit IV	Calibration of instruments: Methods & analysis.	4 lectures
Unit V	Material properties for metals & non metals.	5 lectures
Unit VI	Behavior of linear spring, rotating masses and various mechanisms	4 lectures
Practice	IC Engine Lab (14 hours), Thermal Engineering Lab & Metrology Lab (14 hours), Strength of Material Lab (14 hours) and Dynamics of Machineries Lab (14 hours).	56 hours

Recommended Books:

1. Experimental Methods, J. P. Holman, MGH, 8th Ed., 2011.
2. Engineering Metrology, R. K. Jain, Khanna Publishers, 3rd Ed., 1975.
3. Mechanical Measurements, T.G. Beckwith & L. Back, Addison Wesley Longman, 1982.
4. Industrial Instrumentation, D.P.Eckman, John, Wiley Eastern Ltd. 1951.

ME 4201: Production Cost and Quality Management : 4 Credits (4-0-0)		
Unit I	Theory of production; manufacturing vs. production, factors of production, types of production, pre-planning, product design and analysis, cost concepts, prime cost, overheads, estimating sales price, cost procedures. Production costs, material and wage calculations, break even analysis.	14 lectures
Unit II	Indirect and direct expenses depreciation and its types, calculating depreciation, materials management and inventory control, material handling, economic order quantity.	10 lectures
Unit III	Project management, network analysis, PERT & CPM, method study, works study, calculation of management, time study, incentives.	10 lectures
Unit IV	Shop floor management, organizational hierarchy, production planning and control, management and operation research.	10 lectures
Unit V	Quality concepts. techniques for product quality analysis, total quality management, quality circles, quality standards, quality planning, characteristics, quality audit & documentation.	12 lectures

Recommended Books

1. Production & Operation Management, J.S. Martinich, Willey Student Edition, 1997.
2. Fundamentals of Quality Control & Improvement, A. Mitra, PHI, 2008
3. Quality Planning & Analysis, J.Juran, Mc Graw Hill Education Pvt. Ltd., 1993.
4. Industrial Engineering and Management, O.P.Khanna, Dhanpat Rai & Sons Publications, 2010.

ME 4202: Design of Machine Elements : 4 Credits (3-1-0)		
Unit I	Introduction to design and its classification, basic design procedure, standards and codes, engineering materials and its classification, stress – strain diagram, selection of failure theories, design of simple machine parts.	6 lectures
Unit II	Design of power screws, knuckle and cotter joints.	8 lectures
Unit III	Design of joints: riveted, bolted and welded joints.	8 lectures
Unit IV	Design of shafts, keys and couplings.	10 lectures
Unit V	Design of helical and leaf springs, belt drives.	10 lectures

Recommended Books

1. Design Data Book of Engineers, PSG College of Technology, Publisher Kalaikathir Achchagam, Coimbatore, 2009.
2. Design of Machine Elements, M.F. Spotts, T.E. Shoup, L.E. Hornberger, S.R. Jayram, and C. V. Venkatesh, Person Education, 8th Ed., 2006
3. Design of Machine Elements, V. B. Bhandari, Tata McGraw Hill, 2nd Ed., 2007.
4. Fundamentals of Machine Component Design, R.C.Juvinall, K.M.Marshek, Wiley, 3rd Ed., 2007.

ME 4203: Engineering Metallurgy: 4 Credits (4-0-0)		
Unit I	Classification of metals and alloys and their engineering applications; properties of metals and alloys, chemical, physical, mechanical and metallurgical.	6 lectures
Unit II	Metal bonds & bond energy, crystallographic structure of materials – unit cells, packing efficiency and coordination number, BCC & FCC, HCP structures, Bragg's law, miller indices, crystallization, recrystallization and grain growth, crystal defects.	7 lectures
Unit III	Iron–carbon equilibrium phase diagram, time-temperature-transformation diagram, heat treatment of steels and cast irons.	11 lectures
Unit IV	Production of iron, steel and their metallurgical properties, smart materials, composite materials, nano materials.	11 lectures
Unit V	Compositions and their applications of cast iron, steels, alloy steels, IS specifications, ceramics manufacturing processes, characteristics and applications.	11 lectures
Unit VI	Non-ferrous metallurgy of aluminium, copper and zinc base alloys, IS specification, powder metallurgy, manufacturing methods and engineering applications.	10 lectures

Recommended Books:

1. Engineering Materials, A.K.Agarwal, McGraw Hill Education Pvt. Ltd., 2003.
2. Principles of Engineering Metallurgy, L.K.Reddy, New Age International Publishers, 2007.
3. Material and Metallurgy, H.S.Bawa, McGraw Hill Education Pvt. Ltd., 1986.
4. Physical Metallurgy, V. Singh, Standard Book Publishers, 2010.

ME 4299: Project: 3 Credits:0-0-6

Students will take up a project work from amongst those floated by the supervisors. The project should preferably be a fabrication type (any mechanical system or small laboratory set up). Students will work on planning / theoretical review / design / material, process and cost estimation / fabrication / testing and analysis of the product with periodical presentation and monitoring under the supervision of guide(s) and project coordinator. A complete detailed report in bound as well as soft forms of requisite numbers are to be submitted to the project coordinator at least seven days prior to final presentation and demonstration duly authenticated by the supervisors / guides.

All the students must be present and interact during presentations.

ME 4001: Automobile Engineering: 3 Credits (3-0-0)		
Unit I	Introduction: Classification of automobiles, application, capacity and specifications, parts of an automobile engines, its function & layout, frames, axles, frameless construction, steering system, braking system, power train and drives, clutch, gear box, final drive, propeller shaft, vehicle body, wheels, tyres & tubes.	4 lectures
Unit II	Engine and engine power: Fuels and combustion, air fuel mixture and carburetor, fuel feed systems, fuel injection system, ignition systems, firing order and its significance, knock in CI and SI engines, types of combustion chamber, supercharging and turbocharging.	10 lectures
Unit III	Transmission: Different types of gear box, resistance, variation of the tractive efforts and total resistance with speed, propeller shaft and rear axle, universal joints, final drive, differential, force on rear axle, rear axle drives and supporting, suspension system types, shock absorbers, front axle and steering mechanism & assembly, alignment, steering linkages, characteristics, connections, gear, gear ratio.	8 lectures
Unit IV	Brakes: Introduction, drum, disk, hydraulic, air, mechanical and electric brakes, servo assisted braking system. Clutch: Function, principle of operation and main components of clutches, types of clutches, clutch lining material, lubrication and lubricant, cooling systems.	6 lectures

Unit V	Batteries: Charging system, starting and generating system, ignition systems types, construction & working of battery coil and magneto ignition systems, types and construction of spark plugs, electronic ignition systems, lighting system & accessories. Automotive electronics: Current trends in automobiles, vehicle motion control, crank angle position sensors, fuel metering/vehicle speed sensor and detonation sensor, altitude sensor, flow sensor, throttle position sensors, introduction of electronic fuel injection, ignition systems and digital engine control system.	8 lectures
Unit VI	Automotive air pollution & control: Air pollution, SI and CI engine exhaust, air pollution control techniques, test procedures & instrumentation for emission measurement, emission standards.	6 lectures

Recommended Books:

1. Automobile Mechanics, Crouse, Tata McGraw-Hill, 10th Ed., 2006.
2. Automobile Chassis and body, Crouse, Tata McGraw-Hill, 1985.
3. Automobile Engineering (Vol. I&II), K. Singh, Standard Publishers, 2011
4. A Textbook of Automobile Engineering, R.K.Rajput, LP, 2nd Ed., 2015

ME 4002: Non Traditional Machining: 4 Credits (4-0-0)		
Unit I	Introduction of non-conventional machining, classification and comparative analysis of various processes, special machining processes; EDM and ECM.	12 lectures
Unit II	Abrasive Jet Machining (AJM) & Ultrasonic Machining (USM), machine set up, mechanics, parametric analysis, process capabilities and applications.	9 lectures
Unit III	LBM, working principle, types of laser, process characteristics and applications.	9 lectures
Unit IV	EBM, working principle, process characteristics and applications.	8 lectures
Unit V	Water jet machining, low temperature machining, hot machining.	9 lectures
Unit VI	Chemical machining, electro chemical grinding, deburring, plasma arc machining and metal spraying.	9 lectures

Recommended Books:

1. Advance Machining Processes, V. K. Jain, Allied Publication, 2007.
2. Modern Machining Processes, P.C. Pandey and H.S. Shan, Tata Mc Graw Hill, New Delhi, 1981.
3. Non Conventional Machining Processes, P.K. Mishra, Narosa Pubication, 1997.
4. Unconventional Manufacturing Processes, M.K. Singh, New Age International, 2008.

ME 4003 : Total Productivity Management: 4 Credits (4-0-0)		
Unit I	Definition and classification of productivity, international, national and industrial levels, factors affecting productivity.	9 lectures
Unit II	Productivity evaluations in companies and organizations, productivity planning, short, intermediate, long terms.	9 lectures
Unit III	Productivity improvement concepts, technology, material based, employee based techniques.	10 lectures
Unit IV	Productivity improvement concepts, product and task- based, total productivity models, National Productivity Council and its role.	10 lectures
Unit V	Work centers, machine productivity, TIP and WIP role of engineers and supervisors in productivity improvement.	10 lectures
Unit VI	Productivity in automated factories, CAD, CAM, CIM systems, robotics.	8 lectures

Recommended Books:

1. Productivity Management: A Systems Approach, Prem Vrat, McGraw, 1998.
2. Productivity Engineering and Management- David J. Sumanth, McGraw, 1984.
3. Comprehensive Production and Operation Management- K.C. Arora, Laxmi Publications Pvt. Ltd., 2004.
4. Total Quality Management, D.H.Besterfield, Pearson, 2011.

ME 4004: Statistical Quality Control: 4 Credits (4-0-0)		
Unit I	Introduction to quality control, fundamentals of statistical concepts and techniques in quality control and improvement, graphical methods and data representation.	9 lectures
Unit II	Statistical process control using control charts, control charts for variables and attributes, process capability analysis.	9 lectures
Unit III	Acceptance sampling plans for attributes and variables, operating characteristic curves, A & L system for Lot by Lot acceptance sampling, sampling plans, MILSTD411, Dodge -Romig sampling plans, LTPD, AOQL.	10 lectures
Unit IV	Chain sampling, Continuous sampling, skip lot, economic design of sampling plans.	9 lectures
Unit V	Life testing, life cycle curve and probability distributions in modeling reliability, system reliability.	9 lectures
Unit VI	Experimental design and Taguchi Methods, factorial designs, signal to noise ratio, Taguchi definition of quality.	10 lectures

Recommended Books:

1. Statistical Quality Control - D.C. Montgomery, Wiley International, 2012.
2. Statistical Quality Control- G. L.Worth, McGraw Hill Education Pvt. Ltd., 1996.
3. Quality Planning and Analysis - J.Juran, McGraw Hill Education Pvt. Ltd., 1993.
4. Managing Quality, Concepts and Tasks, N.S.Sreenivasan, New Age Publishers, 1st Ed., 2005.

ME 4005 Control Systems: 4 Credits (4-0-0)		
Unit I	Feedback system, mathematical modelling of physical systems, laplace transformation, block diagrams, signal flow graphs, state-space models.	10 lectures
Unit II	Time domain analysis: Performance specifications, steady state error, transient response of first and second systems, stability analysis, Routh-Hurwitz stability criterion, relative stability.	12 lectures
Unit III	Control action: On/Off, Proportional(P), Integral(I), Differential(D) control actions, PI, PD and PID controllers, Lead, Lag and Lag-lead compensators, root-locus method: Analysis, design.	11 lectures
Unit IV	Frequency response method: Bode diagrams, Nyquist stability criterion, Performance specifications, design, state-space methods, analysis, design	12 lectures
Unit V	Physical realizations of controllers: Hydraulic, pneumatic and electronic controllers.	11 lectures

Recommended Books:

1. Modern Control Engineering, K. Ogata, Pearson Education Asia, 4th Ed., 2002.
2. Automatic Control Systems, B. C.Kuo and F. Golnaraghi, John Wiley, 8th Ed., 2002.
3. Control Systems: Principle and Design, M. Gopal, Tata McGraw Hill, 2nd Ed., 2002.
4. Modern Control System Theory, M. Gopal, New Age International, 2nd Ed., 1993.
5. Modern Control Systems, R. C. Dorf and R. H. Bishop, Addison Wesley, 8th Ed., 1998.

ME 4006 : Solar Energy Engineering: 3 Credits (3-0-0)		
Unit I	Introduction to solar energy, solar radiation analysis, characteristics of sun, earth and solar constant, potential evaluation, solar radiation measurement and estimation.	6 lectures
Unit II	Flat plate collectors, principles of energy conversion, general energy balance equation and collector efficiency, construction, design, selective surfaces, concentrating collectors, types, modes of tracking, performance of CPC collector, solar air heaters, applications.	10 lectures
Unit III	Thermal energy storage, mediums, non-convective solar pond, solar cells	6 lectures

Unit IV	Solar heating, passive systems, solar air conditioning, power generation, introduction of solar photovoltaic systems.	6 lectures
Unit V	Agricultural and industrial processes; Heating, distillation, pumping, furnace, cooling, green houses, production of hydrogen.	6 lectures
Unit VI	Indirect sources of solar energy conversions, wind energy, biomass, OTEC.	8 lectures

Recommended Books :

1. Solar Energy, S.P. Sukhatme, Tata McGraw-Hill, 1996.
2. Solar Energy: Fundamentals and Applications, H.P. Garg and J. Prakash, Tata McGraw-Hill, 1997.
3. Solar Power Engineering, B.S. Magal, Tata McGraw-Hill, 1993.
4. Solar Engineering of Thermal Processes, I.A. Duffie and W.A. Beckman, Wiley International, 1991.
5. Non-Conventional Energy Resources, B.H. Khan, Tata McGraw-Hill, 2nd Ed., 2009.

Syllabi of courses offered to other departments only

ME 4121 Principles of Mechanical Engineering: 4 Credits (3-1-0) [For CE students]		
Unit I	Introduction to engineering thermodynamics: Thermodynamic systems & surroundings, thermodynamic properties, states, processes and cycles, heat and work transfer, path function and point function, thermodynamic equilibrium, quasi-static processes, flow & non flow processes, thermodynamic laws & their applications.	6 Lectures
Unit II	Introductory heat transfer: Conduction, convection & radiation, heat flow through building materials, simple power generating equipments like boiler, turbines and IC engines.	7 Lectures
Unit III	Power transmission devices. Belt drives, chain & rope drives, gear drives, conveyors and hoists.	7 Lectures
Unit IV	Engineering materials (cast iron, steel and their alloys) properties, various heat treatment and manufacturing processes, fibres and composites, applications of composite materials.	8 Lectures
Unit V	Introduction to the machine tools: Introduction to working principles of working, construction of lathe, drilling, shaping and milling machines, types of cutting tools, selection of cutting speeds, feeds.	7 Lectures
Unit VI	Introduction to theory of machines : Kinematics and kinetics, mechanism and structures, various mechanisms of practical use, fundamentals of kinematics, degree of freedom and its determination, lower pairs and higher pairs, types of motions, links, joints and kinematic chains, inversions, graphical velocity & acceleration analysis.	7 Lectures

Recommended Books:

1. Engineering Thermodynamics, P.K.Nag, TMGH, 2005.
2. Thermal Engineering, P.L. Ballaney, Khanna Publishers, 3rd Ed., 2009.
3. Elements of Workshop Technology (Vol I & II), S.K.H. Choudhary, A.K.H.Choudhary and N. Roy, Media Promoters & Publishers Pvt. Ltd., 2007.
4. Theory of machines, S.S. Rattan., Tata Mc Graw Hill, New Delhi, 1991
5. Material and Metallurgy, H.S.Bawa, TMGH, 1986.