WITH EFFECT FROM THE ACADEMIC YEAR 2014– 2015

SCHEME OF INSTRUCTION & EXAMINATION

B.E. II YEAR
MECHANICAL /PRODUCTION ENGINEERING

SEMESTER – I

Sl No.	Syllabus Ref .No.	SUBJECT	Scheme of Instruction		Scheme of Examination		
			Periods per Week		Duration in Hours	Maximum Marks	
			L	D/P		Univ. Exam	Sessi–onals
THEORY							
1	MT 201	Mathematics –III	4	–	3	75	25
2	ME 201	Metallurgy & Material Science	4	–	3	75	25
3	ME 202	Machine Drawing	–	6	3	75	25
4	CE 221	Mechanics of Materials	4	–	3	75	25
5	CE 222	Environmental Studies	4	–	3	75	25
6	CM 221	Managerial Economics and Accountancy	4	–	3	75	25
PRACTICALS							
1	ME 231	Metallurgy Lab	–	3	3	50	25
2	ME 232	Computer Drafting Lab	–	2	–	–	25
3	CE 241	Mechanics of Materials Lab	–	3	3	50	25
		TOTAL	**20**	**14**	**–**	**550**	**225**

SCHEME OF INSTRUCTION & EXAMINATION

B.E. IInd YEAR

SERVICE COURSES OFFERED TO OTHER DEPARTMENTS

SEMESTER – I

Sl No.	Syllabus Ref .No.	SUBJECT	Scheme of Instruction		Scheme of Examination		
			Periods per Week		Duration in Hours	Maximum Marks	
			L	D/P		Univ. Exam	Sessi–onals
THEORY							
1	ME 221	Elements of Mechanical Engineering. **(For ECE)**	4	–	3	75	25
2	ME 222	Elements of Production Techniques(For IE)	4	–	3	75	25
3	ME 223	Principles of Mechanical Engineering (for EEE)	4	-	3	75	25

MT 201

MATHEMATICS – III

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT – I

Partial Differential Equations: Formation of partial differential equations of first order. Lagrange's solution. Standard types - Charpit's method of solution - Partial differential equations of higher order, Monge's method.

UNIT – II

Fourier Series: Expansion of a function in Fourier series for a given range, odd and even functions of Fourier series, change of interval – Applications of Fourier series – Square wave forms – saw tooth wave form and modified square saw tooth wave form - half range sine and cosine expansions - complex form of Fourier Series.

UNIT – III

Applications of partial differential equations: Solutions of wave equation, hear equation and Laplace's equation by the method of separation of variables, and their use in problems of vibrating string, one dimensional unsteady heat flow and two dimensional steady state hear flow.

UNIT – IV

Numerical methods: Solutions of Algebraic and Transcendental equations – Bisection method, Regula-Falsi method and Newton-Raphson's method - Solution of linear system of equations. Gauss elimination method, Gauss Seidel iterative method, ill conditional equations and refinement of solutions, Interpolation, Newton's divided difference interpolation-Numerical differentiation, Solution of differential equations by Euler's method, modified Euler's method and Runge-Kutta Method of 4^{th} order.

UNIT –V

Z– Transforms: Introduction, Basic theory of Z– Transforms. Z– transform of some standard sequences. Existence of Z– Transform, Linearity property, Transnational Theorem, Scaling property, Initial and Final Value Theorems, Differentiation of Z– Transform, Convolution Theorem, Solution of Difference equations using Z– Transforms.

Suggested Readings:

1. R.K. Jain & S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 2008.
2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publications, 40^{th} Edition, 2008.
3. N. Bali, M. Goyal, C. Watkins, Advanced Engineering Mathematics, 7^{th} Edition, 2009 Laxmi Publications.
4. M.K. Venkatraman, Engineering Mathematics-III, Technical Publications, Chennai.
5. H.K. Dass, Advanced Engineering Mathematics, S. Chand & Co. Pvt. Ltd., 2010.

ME 201

METALLURGY AND MATERIAL SCIENCE

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT – I

Imperfection in crystals, Dislocation in crystals, Types of dislocations, Critical resolved shear stress, Effect of slip and twinning on plastic deformation, Jogs and its effect on yield phenomenon, Hall– Petch equation, Orange peel effect, cold and hot working, strain Hardening and Bauchinger effect. Recovery, Recrystallisation, Grain growth and its effect on mechanical properties of metals.

Fracture: Type of fracture in metals, modes of fracture, Griffith theory of brittle fracture, Crack propagation, ductile fracture, Fracture under combined stress.

UNIT – II

Fatigue: S– N Curve, Structure of fatigue fracture specimen. Fatigue crack propagation, Effect of metallurgical variables on fatigue of metal, Low cycle fatigue, Cumulative fatigue and fatigue damage, Experimental determination of fatigue strength (RR– Moore Test), Factors to be considered for the improvement for the fatigue life.

Creep: Creep strength, Creep curve, Creep deformation mechanisms, Creep Test, Differences between creep curve and stress rupture curve.

Diffusion: Fick's law of diffusion, Application of diffusion theory in Mechanical Engineering.

UNIT – III

Structure of Alloys: Construction and interpretation of Thermal equilibrium diagram of binary nonferrous alloys, Study of Eutectic, Eutectoid, Peritectic, Peritectoid reactions. Iron– Iron Carbide

Equilibrium diagram, Construction and interpretation.

Types of Plain Carbon Steels, Cast Iron and their properties and Characteristics.

UNIT –IV

Heat Treatment: Annealing, Normalising, Hardening, Tempering, Construction and interpretation of T.T.T curve. Austempering and Martempering. Case Hardening: Carburising, Nitriding, Carbo– nitriding, Flame Hardening, Induction Hardening. Brief introduction of Age Hardening.

UNIT – V

Introduction to Extractive Metallurgy: Method of production of pig Iron by blast furnace, Cast Iron by Cupola furnace, Method of production of Copper and Aluminum. Method of production of steel by Bessemer Convertor, L.D. Process, Electric Arc process. Modern steel making process by Electric slag refining.

Alloy Steels: Effects of alloying elements like Nickel, Chromium, Manganese, Silicon and Tungsten. Titanium. Study about Stainless steels, HSS, Maraging steels, Brass, Bronze, Muntz Metal, Invar, Duralumin and Ti Alloy (Ti– 6AI– 4V) – their composition and properties.

Suggested Readings:

1. V. Raghavan, Material Science and Engineering, Prentice Hall of India Ltd., 4th Edition, 1994.
2. S.H. Avner, Introduction to Physical Metallurgy, Tata McGraw Hill, 2nd Edition, 1997.
3. S.P. Nayak, Engineering Metallurgy and Material Science, Charotar Publishing House, 6th Edition, 1995.
4. E. Dieter, Mechanical Metallurgy, Metric Editions, Tata McGraw Hill, 3rd Edn., 1997/

ME 202

MACHINE DRAWING

Instruction	6 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

1. INTRODUCTION:

Format of drawing sheet, title block, conventions of drawing lines and dimensions, First and third angles projections, convention for sectional views. Orthographic projections including sectional views of simple machine elements.

2. DRAWING OF FASTENERS, JOINTS AND COUPLINGS:

Practice of sketching work: Free hand sketches of typical machine elements for simple cases for riveted and screwed fastenings, joints and coupling.

The sketches should be proportionate; Dimensions should be in terms of proportions to the basic size and dia.

3. ASSEMBLY DRAWING:

Preparation of assembly drawings from given details, Ability to supply additional views, the exercises will be drawings of typical machine parts viz., connecting rod, eccentric, cross head, stuffing box, pipe vice, screw jack, Ram's bottom safety valve, Lathe tool post, Tail stock, Revolving centre, Pedestal bearing (Plummer block), Swivel bearing.

Note: The test is for the ability of the student to read and interpret drawing. The drawing should include part list in standard format.

Suggested Reading:

1. N.D. Bhatt, Machine Drawing, Charotar Publishing house, Anand, New Delhi, 28th edition, 1994.
2. N. Siddeshwar, Machine Drawing, Tata McGraw Hill Publishing Co. Ltd., 5th edition, 1994
3. K.L. Narayana, P.Kannaiah, K.Venkat Reddy, Machine Drawing, New Age International (P) Ltd., 2nd edition 1999.
4. K.C. John, Text book of machine Drawing, PHI Learning, 2010.

CE 221

MECHANICS OF MATERIALS

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT – I

Stresses and Strains: Definitions, types of stresses and strains. Elasticity and Plasticity. Hook's law. Stress–Strain diagrams for engineering materials. Modulus of elasticity. Poission's ratio. Relationship between elastic constants. Linear arid volumetric strains. Bars of uniform strength, Temperature stresses, Compound bars.

UNIT – II

Shear Force and Bending Moment: Bending moment and shear force diagrams for cantilever, simply supported beams and beams with overhangs. Relationship between intensity of loading, Shear force and bending moment. Simple theory of bending. Moment of resistance. Modulus of section, Flitched beams.

UNIT – III

Deflections: Slope and deflections by the method of double integration in Cantilever, Simply supported beams and beams with overhangs subjected to point loads and uniformly distributed loads.

Torsion: Derivation of torsion formula for circular section. Torsional stresses, angle of twist, power transmission, effect of combined bending and torsion. Close coiled and Laminated springs.

UNIT –IV

Shear Stresses in Beams: Distribution of shear stresses in rectangular, I- and T- , standard steel and hollow sections. Compound stress, Principal stresses and strains, Mohr's circle of stress.

UNIT – V

Cylinders: Stresses in thin and thick Cylinders with internal and external pressures. Hoop and Longitudinal stresses. Stresses in Compound cylinders.

Direct and bending stress; Core of rectangular, circular, I– , T– sections.

Columns and struts: Euler and Rankine formulae for axial load applications. Secant and Perry formulae for eccentrically loaded columns.

Suggested Readings:

1. D.S. Prakash Rao, Strength of Materials, A Practical Approach, University Press, Hyderabad, 1999.
2. G.H. Ryder, Strength of Materials, Third Edition in SI units, Macmillan India Limited, Delhi, 2002.
3. S.Ramamrutham, Strength of Materials, Dhanpat Raj & Sons, 1993.
4. S.S. Bhavakatti, Strength of Materials, Vikas Publications, 2003.
5. B.C.Punmia, Strength of Materials & Mechanics of structures, Laxmi Publications, 1992.

CE 222

ENVIRONMENTAL STUDIES

(common to all branches)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT – I

Environmental Studies: Definition, Scope and Importance, need for public awareness. Natural resources: Water resources; Use and over utilization of surface and ground water, floods, drought, conflicts over water, dams– benefits and problems. Effects of modern agriculture, fertilizer– pesticide problems, water logging salinity. Energy resource, Growing Energy Needs, Renewal and Non– Renewable energy sources. Land resources, Land as a resource, land degradation, soil erosion and desertification.

UNIT – II

Ecosystems: Concept of an ecosystem, structure and function of an ecosystem, producers, consumers and decomposers, energy flow in ecosystems, food chains, ecological pyramids, aquatic ecosystems (Ponds, streams, lakes, rivers, oceans, estuaries).

UNIT – III

Biodiversity: Genetic species and ecosystems diversity, bio– geographically classification of India. Value of biodiversity, threats to biodiversity, endangered and endemic species of India, conservation of biodiversity.

UNIT – IV

Environmental Pollution: Causes, effects and control measures of air pollution, water pollution, soil pollutions, noise pollution, thermal pollution and solid waste management.

Environment Protection Act: Air, water, forest and wild life acts, issues involved in enforcement of environmental legislation.

UNIT – V

Social Aspects and the Environment: Water conservation, watershed management and environmental ethics. Climate change, global warming, acid rain, ozone layer depletion. Environmental protection act, population explosion.

Disaster management: Types of disasters, impact of disasters on environment, infrastructure, and development. Basic principles of disaster mitigation, disaster management, and methodology, disaster management cycle, and disaster management in India.

Suggested Reading:

1. A.K. De, Environmental Chemistry, New age publications, 2002
2. E.P. Odum, Fundamentals Ecology, W.B. Sunders Co., USA.
3. G.L Karia and R.A Christian, Waste Water Treatment, Concepts and Design Approach, Prentice Hall of India, 2005.
4. Benny Joseph, Environmental Studies, Tata Mc– Graw Hill 2005.
5. V.K. Sharma, Disaster Management, National Centre for Disaster Management, IIPE, Delhi, 1999.

CM 221

MANAGERIAL ECONOMICS AND ACCOUNTANCY

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT – I

Evolution Economics– Managerial Economics– nature, scope, importance relation to other sciences, usefulness to engineers and basic concepts.

UNIT – II

Demand– Concept, determinants, Law of demand, Elasticity of demand and types, Demand Forecasting, markets, competitive structures, price– output determination under perfect competition and Monopoly. (simple numerical problems can be asked from elasticity of demand).

UNIT – III

Firm and Industry, Production function–input put relations–laws of returns–internal and external economics of scale, Cost Analysis, Cost concepts, Cost output relationship– Break– even analysis, (numerical problems can be asked on calculation of P/V ratio, break even point, margin of safety and their applications, but excluding decision making problems).

UNIT –IV

Capital, significance, types, determinants and estimation of fixed and working capital requirements, capital budgeting, methods, source of capital (numerical problems on evaluation of capital budgeting opportunities with traditional and discounted cash flow methods and on estimating working capital requirements can be asked).

UNIT – V

Accounting, principles, Journal, Subsidiary books, Ledger, Trail balance and preparation of Final Accounts with simple adjustments. (numerical problems on preparation of final accounts, cash book, petty cash book, bank reconciliation statement).

Suggested Reading:

1. Varshney RL, KL Maheswari, Managerial Economics, Sultan Chand.
2. JC Pappas and EF Brigham, Managerial Economics.
3. Grawal T.S., Introduction to Accountancy.
4. Maheswari S.N., Introduction to Accountancy.
5. Pandey I.M., Financial Management.

ME 231

METALLURGY LABORATORY

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessional	25 Marks

1. **Study of :** Metallurgical Microscope
   Allotropes of Iron
   Iron– Iron Carbide diagram
   Procedure of Specimen preparation

2. **Metallographic study and analysis of:** Steels–Low, Medium, Eutectoid and High Carbon, Stainless, Case Carburized and HSS, Cast Irons – White, Gray, Malleable and Spheroidal.
   Non– Ferrous Alloys–α– Brass, α– β– Brass, Bronze, Al– Si and Babbit.

3. **Study of TTT Curve**
   Study of Microstructure and measurement of Hardness before and after the following. Processes: Annealing, Normalizing, Hardening, hardening and Tempering.

4. **Study of Microstructure characteristic by Image Analyzer.**

Note: Experiment
1. To be carried out in two sessions.
2. To be carried out in ten sessions.
3. To be carried out in five sessions.
4. To be carried out in one session.

ME 232

COMPUTER DRAFTING LAB

Instruction	2 Periods per week
Sessional	25 Marks

1. Introduction to Auto CAD, Setting up drawing environment, Command and System variables, Coordinate system.
2. Creating graphic primitives like Point, Line, Planes, Circle, Arc Annotation etc.
3. Creating and editing 2D object, Layers and object Properties, Creating dimensions, blocks and External reference.
4. Working in 3D Space, Creating 3D Objects, Rendering and imaging, User Coordinate System (UCS).
5. Creating a layout to plot, documents, file formats.

Suggested Reading:

1. Shan Tickoo, Auto CAD 2011: A Problem Solving Approach, Autodesk Press USA.
2. Shan Tickoo, Customizing Auto CAD 2011, Delmar Cengage Press USA.

ME 232

COMPUTER DRAFTING LAB

Instruction	2 Periods per week
Sessional	25 Marks

1. Introduction to Auto CAD, Setting up drawing environment, Command and System variables, Coordinate system.
2. Creating graphic primitives like Point, Line, Planes, Circle, Arc Annotation etc.
3. Creating and editing 2D object, Layers and object Properties, Creating dimensions, blocks and External reference.
4. Working in 3D Space, Creating 3D Objects, Rendering and imaging, User Coordinate System (UCS).
5. Creating a layout to plot, documents, file formats.

Suggested Reading:

1. Shan Tickoo, Auto CAD 2011: A Problem Solving Approach, Autodesk Press USA.
2. Shan Tickoo, Customizing Auto CAD 2011, Delmar Cengage Press USA.

CE 241

MECHANICS OF MATERIALS LABORATORY

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessional	25 Marks

List of Experiments

Cycle I :

1. Direct Tension Test on metal rods.
2. Young's modulus of metal specimen by direct tension test.
3. Brinnel's and Rockwell's Hardness Tests.
4. Compression Test.
5. Impact test.

Cycle II:

1. Test on a helical spring to determine the rigidity modulus.
2. Torsion test to determine the rigidity modulus of a shaft.
3. Deflection test on a cantilever beam to determine the Young's modulus.
4. Deflection test on a simple beam to determine the Young's modulus.
5. Deflection test on a fixed beam to determine the Young's modulus.
6. Fatigue Test.

ME 221

ELEMENTS OF MECHANICAL ENGINEERING

(Common for ECE)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT– I

Thermodyanamics: Concept of system, process and properties, laws of thermodynamics, concept of entropy and Clausius inequality, steady flow energy equation for an open system.
IC Engines: Working of Four Stroke and Two Stroke Petrol and Diesel Engine with p– V diagrams, Valve timing diagram, Calculation of Indicated power, Brake power, Specific Fuel Consumption, Mechanical and Thermal efficiencies.
Reciprocating Air Compressors: Work done, efficiency of multistage compressors, Effect of clearance volume.

UNIT– II

Heat Transfer: Basic modes of heat transfer, Fourier's law of conduction, Newton's Law of cooling, Stefan– Boltzman Law of radiation and one dimensional steady state conduction heat transfer through plane walls without heat generation.
Heat Exchangers: classification and applications of heat exchangers in industry, derivation of LMTD in parallel and counter– flow heat exchangers and problems.

UNIT– III

Refrigeration: Types of Refrigeration systems–Air Refrigeration system, vapor compression system, ammonia– water absorption refrigeration system, thermoelectric refrigeration system, COP and representation of cycle on T-S and H-S diagrams, Types and properties of refrigerants, eco– friendly refrigerants, Introduction to Psychometry and Psychometry processes.

UNIT– IV

Basic Manufacturing Processes: Welding, Brazing, Soldering, brief description of process and parameters, associated principles of gas welding, arc welding.
Casting: Sand casting, Die casting and principles and applications.
Forming: Basic concepts of forming processes: Extrusion, rod/wire drawing, Forging and Rolling.
Principles and Applications of basic Machine Processes: Turning, Drilling and Shaping.

UNIT– V

Definition of kinematic link and pair, mechanism and machine. **Gears:** Classification of gears, nomenclature, **Gear Trains:** Simple, compound, inverted and epi– cycle gear trains.
Belt and Rope drives: Open and crossed belt drives, Length of belt, Ratio of tensions of flat belt, condition
for maximum power transmission for flat belt.

Suggested Reading:

1. RK Rajput, Thermal Engineering, Laxmi Publications, 2005
2. C. Sachdeva, Fundamentals of Engineering heat and mass transfer, Wiley Eastern Ltd., 2004.
3. PN Rao, Manufacturing Technology, Vol. 1 & 2, Tata McGraw hill Publishing Co., 2010.
4. Thomas Bevan, Theory of Machines, CBS Publishers, 1995.

ME 222

ELEMENTS OF PRODUCTION TECHNIQUES

(For Instrumentation Engineering)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT– I

Classification and comparison, merits and limitations of manufacturing processes, Criteria for selection of process for manufacturing a product, casting – sand casting types, procedures to make sand moulds, cores, concept of die casting.

UNIT– II

Welding: Introduction and classification of welding process, gas welding, arc welding, flux and gas shielding, consumable and non– consumable electrodes, resistant, spot and butt welding. Brazing and soldering. Brief description of process, parameters and associated principles.

Unit– III

Conventional Machining: General Principles, operations (with schematic diagrams) and working of machine tools viz., Lathe, Shaper, Milling and Drilling machines. Concepts of NC, CNC, DNC and FMS.

UNIT– IV

Unconventional machining processes: Need for unconventional machining processes. Classification, Principles (with schematic diagram) and application of abrasive jet machining, ultrasonic machining, electrical discharge machining. Laser Beam machining and Electron Beam Machining.

UNIT– V

Metal Forming: Basic concepts and classification of forming processes, principles, equipment used. Application of the Forging, Extrusion, Wire drawing, Deep drawing, Rolling, Powder metallurgy.

Suggested Reading:

1. PN Rao, Manufacturing Technology, Vol. 1 & 2. Tata McGraw hill Publishing, 2010.
2. Hajra Choudary, Elements of Workshop Technology, Vol– I&II, Khanna Publications Ltd., 6th Ed. 2004.
3. P.C. Panday & H.S. Shart, Modern Machining Process, Tata McGraw Hill Pub, 3rd Edition. 2006.
4. V.K. Jain, Unconventional Machining, Allied Publishers, 2006

ME 223

PRINCIPLES OF MECHANICAL ENGINEERING

(For EEE)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT-I

Laws of Thermodynamics: Study flow energy equation-conditions of reversible and irreversible process – Modes of Heat transfer – conduction and convection, radiation – concept of black body radiation – steady state conduction – Heat transfer through plane walls, cylinders, critical radius of insulation for cylinders.
Heat Exchanger: Classification, Industry applications, LMTD calculations parallel and counter flows.
Refrigeration System: Types, co-efficient of performance and ton, SVC & air refrigeration and properties of refrigerants, eco friendly refrigerants, Psychometric Processes for summer and winter A/c only.

UNIT-II
Principles of IC Engines: Petrol and Diesel, 2 stroke / 4 stroke and load characteristics, compressors – concept of multi stage compression, Types, load characteristics, Calculation of mechanical and thermal efficiencies.
Generation of steam: Boilers – Gas Turbine – types – classification – constant pressure.

UNIT-III
Gears: Classification, Gear trains, types – Single, compound, Inverted & Epi cyclic gear trains, Belt & rope drives, open and cross belt, length of belt, ratio of tension flat belts, condition for maximum power.

UNIT-IV
Introduction to Bernoulli's equation, applications – Venturi meter, Orifice meter, Flow through pipes – Hagen's formula, Friction loss in pipes, Darcy's formula, Reynolds number and its significance.
Hydraulic Turbines: Classification – working principle – Francis, Kaplan, Pelton Wheels, work done, power output, efficiency, specific speed, unit quantities, draft tube, performance characteristic curves.

UNIT-V
Pumps: Working principles and construction details of centrifugal and reciprocating pumps, Effect of friction, acceleration head, work done, power required with and without air vessels, problems faced in pumps, precaution, cavitation, primary velocity triangles of centrifugal pumps.

Suggested Reading:

1. R.K. Rajput, Thermal Engineering, Laxmi Publications, 2005
2. Thomas Bevan Theory of Machines, CBS Publishers, 1995
3. Yadav, Steam and Gas Turbines, Central Publishing House Ltd., 2004
4. S. Ramamrutham, Hydraulic machines, Dhanpat Rai and sons, 2004

SCHEME OF INSTRUCTION AND EXAMINATION

B.E. IInd YEAR

MECHANICAL /PRODUCTION ENGINEERING

SEMESTER – II

Sl No.	Syllabus Ref .No.	SUBJECT	Scheme of Instruction		Scheme of Examination		
			Periods per Week		Duration in Hours	Maximum Marks	
			L	D/P		Univ. Exam	Sessi–onals
THEORY							
1	MT 251	Mathematics –IV	4	–	3	75	25
2	ME 251	Kinematics of Machines	3	2	3	75	25
3	EE 221	Electrical Circuits & Machines	4	–	3	75	25
4	ME 253	Thermodynamics	4	–	3	75	25
5	EC 272	Basic Electronics	4	–	3	75	25
6	CE 271	Fluid Dynamics	4	–	3	75	25
PRACTICALS							
1	EE 291	Electrical Circuits & Machines Lab	–	3	3	50	25
2	EC 292	Basic Electronics Lab	–	3	3	50	25
		TOTAL	**23**	**8**	**–**	**550**	**200**

SCHEME OF INSTRUCTION AND EXAMINATION
B.E. IInd YEAR
SERVICE COURSES OFFERED TO OTHER DEPARTMENTS

SEMESTER – II

Sl No.	Syllabus Ref .No.	SUBJECT	Scheme of Instruction		Scheme of Examination		
			Periods per Week		Duration in Hours	Maximum Marks	
			L/T	D/P		Univ. Exam	Sessi–onals
THEORY							
1	ME 271	Part B – Mechanical Technology (For CE)	3	–	1.5	37	13
2	ME 272	Thermodynamics and Fluid Mechanics (For IE)	4	–	3	75	25
PRACTICALS							
1	ME 292	Mechanical Technology Lab (For IE & EEE)	–	3	3	50	25

MT 251

MATHEMATICS – IV

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT-I

Functions of complex Variables : Limit and Continuity of function–Analytic function – Cauchy – Reimann equations – Cartesion and Polar form and Harmonic functions-complex integration, Cauchy's theorem – Derivative of Analytic functions – Cauchy's integral formula and it's applications.

UNIT – II: Taylor's and Laurent's Series Expansions

Zeroes and Singularities – Residues – Residue theorem – Evaluation of real Integrals using Residue theorem – Conformal mapping – Bilinear transformation.

UNIT – III: Statistics

Random variables, distributions, density functions – conditional distributions – Baye's theorem– mathematical expectations – expected values – moments and moment generating functions – Characteristic function.

UNIT –IV: Distributions

Normal, Gamma, Poisson and Chi– square distribution – Tests of significance Chi– square, F and T– tests.

UNIT – V: Curve fitting by method of least squares

Correlations and Regression–lines of regression fitting of cures by the method of least squares (straight line, parabola, exponential curves).

Suggested Readings:

1. R.K. Jain & S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 2008.
2. B.S. Grewal, Higher engineering Mathematics, Khanna Publications, 40th Edition, 2008.
3. N. Bali, M. Goyal, C. Watkins, Advanced Engineering Mathematics, 7th Edition, 2009 Laxmi Publications.
4. M. Venkata Krishna, Probability and Statics, B.S. Publications, 2010.
5. H.K. Dass, Advanced Engineering Mathematics, S. Chand & Co. Pvt. Ltd., 2010

ME 251

KINEMATICS OF MACHINES

Instruction	Lectures: 3 Periods per week
	Drawing/Tutorials: 2 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT– I

Definitions of link, element, pair, kinematic chain, mechanism and machine, Crubler's criterion, single and double slider chains, Inversions of quadric cycle chain, Inversions of single and double slider chains. Fundamentals of coupler curves, Robert's Law, mechanism with lower pairs and straight line motion mechanism, Pantograph, Peaucerlier, Hart, Davis and Ackerman's Steering gear mechanisms.

UNIT– II

Analysis of Mechanisms: Graphical methods to find velocities of mechanisms, Instantaneous centre, body centre and space centre, Kennedy's theorem, Graphical determination of acceleration of different mechanisms including coriolis components of acceleration. Analytical method to find the velocity and acceleration, analysis of four bar mechanism with turning parts, Freudenstein's method for four bar linkage synthesis.

UNIT– III

Laws of friction: Friction in screw threads, pivots, collars and clutches, Friction axis of link and friction circle.
Belt and Ropes: Open and closed belt drives, Length of belt, Ratio of tensions, Effect of Centrifugal tension and initial tension over power transmission, Conditions for maximum power.
Brakes and Dynamometers: Block or shoe, Bank and block, Internal expanding shoe brake, Prony, Rope brake, Belt transmission, Torsion Dynamometers.

UNIT– IV

Cams: Types of Cams and followers, Displacement diagrams for followers, uniform motion, parabolic motion, simple Harmonic motion, cycloidal motion. Drawing Cam profile with knife– edge follower, translating roller follower and translating flat follower, Cams of Specified Contour: Eccentric circle cam with Translating Flat follower, Eccentric circle cam with translating roller follower.

UNIT– V

Gears: Classification of gears. Spur Gears– Nomenclature, Law of gear tooth action, involute as a gear tooth profile, interference of involute gears, minimum number of teeth to avoid interference, contact ratio, cycloidal tooth profiles, Comparison of involute and cycloidal tooth profile.
Helical Gears: Helical gear tooth relations, contact of helical gear teeth. Gear trains– Simple and Compound, Reverted, and epicyclic Gear Trains.

Suggested Reading:

1. S.S. Ratan, Theory of Machines, Tata McGraw Hill, 3rd Edition, 2009.
2. J.E.Shigley, Theory of Machines, McGraw Hill Publications, 2005.
3. Thomas Bevan, Theory of Machines, CBS Publishers, 2005.

EE 221

ELECTRICAL CIRCUITS AND MACHINES

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT – I

DC & AC Circuits: Analysis of circuits using loop current method, Thevenin's and Norton's theorems, Sinusodial Sources. Phasor representation of sinusoidal quantities, average and rms value, active power, reactive power, energy stored in inductance and capacitance, mutual inductance, dot convention, analysis of simple coupled circuits.

UNIT – II

Production of 3– phase voltages: Analysis of 3– phase balanced circuits, 3– phase power measurement by two wattmeter method. Transformers: Principle of transformation of voltage and currents, Equivalent circuit of transformer on no load and load, efficiency and regulation of transformer, OC and SC tests, Auto– transformers.

UNIT – III

DC Machines: Construction and working principle of a DC machine. Production of emf in a generator, types of excitation, Characteristics of series, shunt and compound motors. Speed control and application of DC motor Losses and efficiency.

UNIT –IV

Induction motors: Production of rotating magnetic field, construction and principle of operation of induction motors, Speed– torque characteristics, methods of starting and speed control of 3– phase Induction motors.

UNIT – V

Single phase & Special motors: Various types of single phase motors, Split phase, capacitor start and capacitor run, Basic features of stepper motor and Brushless DC Motor.

Suggested Readings:

1. V.K. Mehta, Principles of Electrical Engineering, S. Chand & Co., 1995.
2. Kothari and Nagrath, Basic Electrical Engineering, Tata McGraw Hill, 2nd Edition, 2002.

ME 253

THERMODYNAMICS

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT– I

Introduction: What is Thermodynamics? Microscopic and Macroscopic approach of thermodynamics system. surroundings and property, intensive and extensive properties, Measurement of temperature, Zeroth law of thermodynamics, Temperature Scales, ideal gas and ideal gas thermometer, Reversibility and irreversibility quasi–static process, Specific heats for ideal gases, Thermodynamics Equilibrium.

UNIT– II

First law of Thermodynamics: Statement of First Law, Heat and work interactions, Thermodynamics work and Internal energy, Energy as property of system, First Law applicable to Closed system, Thermodynamic processes and calculation of work, Heat transfer, and internal energy, Heat as Path Function, First law analysis of flow processes and limitation, Calculation of work done during flow processes.

UNIT– III

Second Law of Thermodynamics: Physical description of second law, Kelvin– Planck and Clausis statement of Second Law of thermodynamics, Equivalence of Kelvin– Planck and Clausius statement, Reversible and irreversible processes, Carnot Theorems, Clausius Inequality, Calculation of entropy change during various thermodynamic processes principle of Entropy increase, T– S diagrams, Available and Unavailable energies in steady flow, Second Law Analysis of Control Volume, Helmholtz and Gibb's functions, Available function for flow and non– flow processes.

UNIT– IV

Thermodynamic properties of Fluids: Properties of pure substances, Concept of phase change, Graphical representation of pressure, Volume and Temperature, (PVT)– T and H diagrams, Properties of steam, Use of steam Tables and Mollier diagram, Thermodynamic relations involving entropy, Enthalpy, Internal Energy, Maxwell relations and Clapeyron equation.

UNIT– V

Air standard cycles: Air standard cycles– Otto, Diesel, Dual Combustion Cycle, Sterling and Rankine cycle.

Mixture of Gases: Mole fraction and mass fraction, Partial pressure and Dalton's Law, Amagat-leduc Law of partial volumes, Relation between partial pressure, mole fraction and volume fraction; Gas constant, molecular mass and specific heats of the gas mixtures; relation between volumetric and gravimetric analysis.

Suggested Reading:

1. P.K.Nag, Basic & Applied Thermodynamics, Tata McGraw Hil, 2nd Edition, 2008.
2. Y.V.C.Rao, An Introduction to Thermodynamics, university press, 2nd Edition, 2010.
3. PL Ballaney, thermal Engineering, Khanna Publishers 2004.
4. E. Radha Krishnan, Engineering Thermodynamics, 2002.
5. D.S. Kumar, Thermal Science and Engineering, 2006.

EC 272

BASIC ELECTRONICS

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT– I

Seminar Conductor Theory: Energy levels, Intrinsic and Extrinsic Semiconductors, Mobility, Diffusion and Drift current. Hall effect, characteristics of P– N junction diode, Parameters and applications.

Rectifiers: Half wave and Full wave rectifier (Bridge, center tapped) with and without filters, ripple, regulation and efficiency.

UNIT– II

Transistors: Bipolar and Field effect transistors with their h– parameters equivalent circuits. Basic amplifier circuits classification and their circuits (Qualitative treatment only).

Regulators and Inverters: Zener diode regulator, Transistorized IC regulators and Simple Inverter circuits.

UNIT– III

Feedback concepts – Properties of Negative Feedback Amplifiers, Classification, Parameters Applications.

Oscilators – LC types and RC types Oscillators and Crystal oscillators (Qualitative Treatment only).

UNIT– IV

Operational Amplifiers – Basic Principle– Characteristics and applications (Summer, added, Integrator, Differentiator, instrumentation amplifier)

Digital Systems: Basic Logic Gates, Half, Full Adder and Subtractors.

UNIT– V

Data Acquisition systems: Study of transducers (LVDT, Straingauge, temperature, Force). Photo Electric Devices and Industrial Devices: Photo diode, Photo Transistor, LED, LCD, SCR, TRIAC, DIAC, UJT construction and characteristics only.

Display Systems: Construcitonal details of CRO and Applications.

Suggested Reading:

1. Jacob Millman & Christos C. Halkias and Satyiabrata Jit, Electronic Devices and Circuits, Mc Graw Hills, 3rd Edition 2010.
2. Rama Kanth A. Gaykward, Op-AMPS and Linear Integrated Circuits, EEE, 3/e, 1998. (Ch 2, 3 & 7)
3. Moris mano, Digital Design, PHI, 3/e, 20098 (2, 4 chapters)
4. Cooper, Electronic Measurements and Instrumentaions, 3/e., 1998. (Ch 7)
5. S. Shalivhnan, N. Suresh Kumar, A Vallavea Raj, Electronic Devices and Circuits, TMH, 2003.

CE 271

FLUID DYNAMICS

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT – I

Properties of fluids: Definition of the fluid and concept of continuum – Fluid properties – pressure, density, specific weight, specific volume, dynamic and kinematics viscosity, classification of fluids – ideal and real fluids.

Fluid Kinematics: General concepts of path lines, stream lines, streak lines and stream tubes. Classification of fluid flow; steady and unsteady, uniform and non– uniform flow, laminar and turbulent, rotational and irrotational, one– two– and three– dimensional flows. Definition and properties of stream function and velocity potential function and use of flow nets.

UNIT – II

Fluid Dynamics: Energy of a fluid body, potential energy and potential head, pressure energy and pressure head, kinetic energy and kinetic head, energy equation. Derivation of Euler's and Bernoulli's equations and their applications. Impulse momentum equation and its applications.

UNIT – III

Measurement of Fluid flows: Measurement of pressure and use of pressure measuring devices such as manometers, Bourdon's Pressure gauge and transducers. Measurement of velocity and use of velocity measuring devices such as pitot tube, hot wire anemometer. Measurement of discharge, and use of discharge measuring devices such as Venturimeter, Orifice meter and Rotameter; Derivation of relevant formulae. Discharge formulae for weir and notches.

UNIT – IV

Laminar and turbulent flow through Pipes: Distinction between laminar and turbulent flows. Reynold's number and its significance. Upper and lower critical values of Reynold's number for flow in pipes. Development of laminar and turbulent flow in circular pipes. Hagen– poiseuille equation, frictional losses in pipes. Darcy's equation. Estimation of Darcy's friction Factor. Empirical formulae and Moody's chart.

Boundary layer theory: Development of laminar and turbulent boundary layers on a flat plate, pressure gradient, and phenomena of separation. Fluid flow over an aerofoil, flow around a cylinder at rest, rotational flow around a cylinder at rest, lift and drag forces, and coefficients; circulation and magnus effect.

UNIT – V

Compressible fluid flow: concepts of compressible flow, continuity, momentum and energy equation of compressible flow, velocity of sound in Compressible and incompressible fluids, Mach Number. Classification of compressible flow; adiabatic flow in perfect gas, stagnation pressure and temperature. Temperature, pressure, density ratios as functions of Mach. Number.

Suggested Readings:

1. K.L. Kumar, Engineering Fluid Mechanics, Eurasia Publishing House, 1997.
2. RK Rajput, Fluid Mechanics and Hydraulic Machines, S Chand & Co., 2003.
3. PN Modi and SM Seth, Hydraulic and Fluid Mechanics, Standard Book House, Delhi, 1995.
4. VL Streeter, Fluid Mechanics, Mc Graw Hill Co Ltd., 2002.

EE 291

ELECTRICAL CIRCUITS AND MACHINES LAB

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessional	25 Marks

List of Experiments:

In the normal course not less than 10 of the following experiments should be done during the semester.

1. Verification of Thevenin's and Norton theorems.
2. Measurement power by two wattmeter method.
3. Study of single– phase, R, L & C Series & Parallel circuits.
4. Study of self and mutual inductance of coils and their interconnections
5. To determine the magnetization curve of separately excited DC generator.
6. To determine the load characteristics of a shunt generator.
7. To determine the performance characteristics of shunt motor.
8. To determine the performance characteristics of a compound motor.
9. To determine the performance characteristics of a series motor.
10. Speed control of DC shunt motor.
11. OC and SC tests on single phase transformer.
12. Performance Characteristics of 3– phase induction motor.
13. Speed control methods of Induction motors.

Note: Atleast 10 Experiments should be conduced in the semester

EC 292

BASIC ELECTRONICS LAB

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessional	25 Marks

List of Experiments:

1. Characteristics of semiconductor and Zener diode
2. CRO Applications
3. Fullwave rectifier with and without filters
4. Zener voltage regulator
5. Characteristics of BJT transistor (CB, CE, CC)
6. Characteristics of field effect transistor.
7. Feedback amplifier with and without feedback
8. h– parameters of transistors
9. Phase shift oscillator
10. Hartley Oscillator & Calpits Oscillator
11. Operational Amplifiers and its applications
12. Logic gates and flip flops– verifications
13. Realization of Half and Full adder
14. Comparators

Suggested Reading:

1. Paul B. Zbar, Albert P.Michael A. Miller, Basic Electronics, A Text– Lab Manual, 7th Edition, TMH, 1994.
2. Paul B. Zbar, Industrial Electronics, A Text– Lab Manual, 3rd Edition, TMH, 1983.

General Note:

1. There should not be more than 2 students per batch while performing any of the lab experiment
2. Mini project cum design exercise:
   a) The students must design, rig-up, and test the circuits wherever possible and should carry out the experiments individually.
   b) This exercise carries sessional marks of 10 out of 25, while the remaining 15 marks are for the remaining lab exercises.

ME 271

PART– B
MECHANICAL TECHNOLOGY
(For Civil Engineering)

Instruction	3 Periods per week
Duration of University Examination	1 &½ Hours
University Examination	37 Marks
Sessional	13 Marks

UNIT– I
General description, operation, maintenance and selection of the following: Earth moving and Excavating Equipment: Shovels, Dragline, Clamshell, Cable excavator, Bucket wheel excavator, Tractor, Bulldozer, Scraper, Trenchers, Grader, Earth Compactors.

UNIT– II
Conveying Equipment: Belt conveyor, Screw Conveyor, Bucket Conveyor, Apron Conveyor, Aerial Ropeway.
Hoisting Equipment: Hoist winch. Differential and Worm geared chain hoists. Fork lift trucks, Guyed and stiffly derricks, swing and non– swing mobile crane, whirler crane, Construction elevator, passenger lift, Bucket elevators.

UNIT– III
Aggregate and Concrete Producing Equipment: Crusher's – Jaw, Gyratory, Hammer and Roll Crusher, Screens – Stationary, Shaking and Vibrating screens. Concrete mixers, Concrete pumps.
Pneumatic Equipment: Reciprocating air– compressor. Construction pneumatic jack hammer, paving breaker, Rock drill, concrete vibrator.

Suggested Reading:
1. R.L. Peurifoy, Construction Planning Equipment and Methods, McGraw Hill Publishers, 1956
2. Mahesh Varma, Construction Equipment and its planning and application, Metropolitian books Co, Delhi,2004
3. Goodes Spence, Building and Civil Engineering Plant, Crosby Lock Wood, 1995

ME 272

THERMODYNAMICS AND FLUID MECHANICS

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT– I

Thermodynamics: Zeroth law, First Law of Thermodynamics, Concept of Internal Energy and Enthalpy. Application to closed and open loop systems. Second Law of Thermodynamics, Concept of Entropy, Clausius inequality and principles of increase in entropy in irreversible.

I.C. Engines: Concept of Airstandard cycles, Otto, Diesel and Dual combustion cycles. Working of Four Stroke and Two Stroke, Petrol and Diesel Engines. Valve timing diagram, Calculation of Indicated Power, Brake Power, Specific Fuel Consumption, Mechanical and Thermal efficiencies.

UNIT– II

Reciprocating Air Compressors: Single and Multi stage compressors, workdone, efficiency of multistage compressors, effect of clearance volume.

Steam Turbines: classification of steam. Velocity diagrams for single stage impulse and reaction turbine. Problems on workdone, blade angles, power output and thermal efficiency of turbines.

Gas Turbine: classification of gas turbines, constant pressure combustion, open cycle, closed cycle and constant volume combustion gas turbine plants. Uses of Gas turbine and fuels used. Calculation of efficiencies.

UNIT– III

Properties of Fluid: Definition of fluid and concept of continuum. Fluid properties pressure, density, specific weight, specific volume, dynamic and kinematic viscosity.

Fluid Kinematics: General concepts of path line, streak lines, stream tube, classification of fluid flow – steady and unsteady flow, uniform and non– uniform flow, one, two and three dimensional flows.

Definition and properties of stream function and velocity potential function. Concept of continuity.

UNIT– IV

Fluid Dynamics: Introduction to Bernoulli's equations and their applications – venturimeter orifice meter, flow through pipes – Hagens formula, friction loss in pipes, Tarcy's formula, Reynolds number and its significance.

Hydraulic Turbines: Classification – working principal – Francis, Kaplan, Pelton wheel, workdone , power of put, efficiency, specific speed, unit quantities, draft tube, performance characteristic curves.

UNIT– V

Pumps: Working principals and construction details of centrifugal and reciprocating pumps, effect of friction, acceleration head, workdone, power required with and without air vessels, problems faced in pumps, precaution, caviation, primary velocity triangles of centrifugal pumps.

Suggested Reading:

1. R.K. Rajput, Thermal Engineering, Laxmi Publications, 2005.
2. Modi, P.N. and Seth, S.M., Fluid Mechanics, Standard Book House New Delhi– 2004.
3. Streeter, Fluid Mechanics Victor L & Wylie, E. Benkamin 7th Edition.
4. Yadav S.S Steam and Gas Turbines, Central Publishing House Limited 2006

ME 291

MECHANICAL TECHNOLOGY LAB

(For EEE and Instrumentation Engineering)

Instruction	3	Periods per week
Duration of University Examination	3	Hours
University Examination	50	Marks
Sessional	25	Marks

1. Performance test on multi cylinder petrol / diesel engine.
2. Measurement of discharge by venturimeter.
3. Measurement of velocity by pitot tube.
4. Measure of discharge by Orifice meter / Rotameter.
5. Determination of flash and Fire point of fuels and lubricants.
6. Determination of Thermal conductivity of a composite wall
7. Determination of Heat transfer coefficient under Natural Convection
8. Determination of volumetric efficiency of multi stage reciprocating air compressor
9. Study of construction details of a gear box (EEE only)
10. Performance of a) Francis b) Kaplan and c) Pelton wheel turbines
11. Performance and characteristics of a) reciprocating and b) centrifugal pumps