WITH EFFECT FROM THE ACADEMIC YEAR 2007-2008

SCHEME OF INSTRUCTION AND EXAMINATION

B.E. IInd YEAR

MECHANICAL / PRODUCTION ENGINEERING

SEMESTER - I

Sl. No.	Syllabus Ref. No.	Subject	Scheme of Instruction		Scheme of Examination		
			Periods per Week		Duration in Hrs	Maximum Marks	
			L	D/P		Univ. Exam	Sessionals
		THEORY					
1.	MT 201	Mathematics – III	4	-	3	75	25
2.	ME 201	Metallurgy and 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.	EE 221	Electrical Circuits and Machines.	4	-	3	75	25
6.	CM 221	Managerial Economics & 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**

WITH EFFECT FROM THE ACADEMIC YEAR 2007-2008

SCHEME OF INSTRUCTION AND 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 Hrs	Maximum Marks	
			L	D/P		Univ. Exam	Sessionals
		THEORY					
1.	ME 221	Elements of Mechanical Engineering. (For ECE & EEE)	4	-	3	75	25
2.	ME 222	Elements of Production Techniques (For IE)	4	-	3	75	25

MT 201

MATHEMATICS-III

(Common to all Branches)

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 & Jacobi'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, half range sine and cosine expansion, odd and even functions of Fourier series, change of interval, complex form of Fourier Series.

UNIT – III

Partial differential Equations : Solution of wave equation, heat equation and Laplace's equation by the method of separation of variables, and their use in problems of vibrating string, one and two dimensional wave and heat flow and examples thereon.

UNIT-IV

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

UNIT-V

Numerical Methods : Solution of linear system of equations. Gauss elimination method Gauss-Seidel iterative method, ill-conditioned equations and refinement of solutions, Interpolation, Lagrange Interpolation, Newton's

divided difference interpolation, Newton's Forward and Backward difference Interpolation Formulas. Numerical differentiation and integration (Trapezoidal and Simpson's formulas) Solution of Differential equations by Runge Kutta Method.

Suggested Reading

1. E. Kreyszig. *Advanced Engineering Mathematics*, Wiley Eastern Ltd., 8th Edition, New Delhi, 2006.
2. R. K. Jain and S.R.K. Iyengar, *Advanced Engineering Mathematics*, Narosa Publications, 2005.
3. B.V. Ramana, *Higher Engineering Mathematics*, Core Engineering Series, Tata McGraw Hill Publishing Company Ltd, New Delhi, 2007.
4. B.S. Grewal, *Higher Engineering Mathematics*, Khanna Publications, 34th Edition, 1998.

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

Imperfections 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: Types of fracture in metals, modes of fracture, Griffith theory of brittle fracture, Crack propagation, ductile fracture, Cottrell's equation, 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 of 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 and Corex.

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-6Al-4V) – their composition and Properties.

Suggested Reading:

1. V.Raghavan, *Material Science and Engineering*, Prentice Hall of India Ltd., 4th Edition,, 1994.
2. S.H.Avner, *Introduction to Physical Metallurgy*, McGraw Hill Publication Co.Ltd., 2nd Edition 1974.
3. S.P.Nayak, *Engineering Metallurgy and Material Science*, Charoter Publishing House, 6th Edition, 1995.
4. E. Dieter, *Mechanical Metallurgy*, Metric Editions, McGraw Hill Book Company.

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 of projection, 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 fastening, joints and couplings.

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

3. **ASSEMBLY DRAWING**
   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, machine vice, screw jack, non-return valve, safety valve, bearings, tail stock, These are only examples and actual exercise may include any part. The test is for the ability of the student to read and interpret drawings, The drawing should include part list in standard format.

Suggested Readings:

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.Venkata Reddy, *Machine Drawing*, New Age International (P) Ltd, 2nd Edition, 1999.

CE 221

MECHANICS OF MATERIALS

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

UNIT – I

Stresses and Strains: Definitions, types of stresses and strains. Elasticity and plasticity. Hooke's law. Stress-strain diagrams for engineering materials. Modulus of elasticity. Poisson's ratio. Relationship between elastic constants. Linear and 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 sections. 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 stresses, 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 stresses; Core of rectangular, circular, I- and T-sections.

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

Suggested Reading

1. D. S. Prakash Rao, *Strength of Materials _A Practical Approach,* Universities 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 Rai & Sons, 1993.
4. S. S. Bhavakatti, *Strength of Materials,* Vikas Publications, 2003
5. B. C. Punmia, *Strength of Materials and Theory of Structures,* Laxmi Publications, 1992.

EE 221

ELECTRICAL CIRCUITS AND MACHINES

(Common to CSE, ME and PE)

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

Unit I

DC & AC Circuits: Analysis of circuits using loop current method, Thevenin's and Norton's theorems, Sinusoidal sources, Phasor representation of sinusoidal quantities, Average and rms values, 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 voltages and currents, Equivalent circuit of transformer on no load and load, Efficiency and regulation of transformer, OC and SC tests, Auto-transformer.

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 motors, Losses and efficiency.

Unit IV

Induction Motors: Production of rotating magnetic field, Construction and principle of operation of induction motors, Methods of starting and Speed control of 3-phase induction motors, Speed-torque characteristics.

Unit IV

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 Reading:

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.

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 of 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 relation ship –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, sources 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, Trial balance and Preparation of Final Accounts with simple adjustments. (Numerical problems on preparation of final accounts, cash books, petty cash book, bank reconciliation statement)

Suggested Readings:

1. Varshney R.L, K.L .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 LAB

Instruction	3	Periods per week
Duration of University Examination	3	Hours
University Examination	50	Marks
Sessionals	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 Gray.
   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 Characteristics 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

Practicals using 2-D drafting packages for the following :

- Exposure to graphic primitives like line, types of lines, arrays, limits, point, plane, circle, arc, annotation etc., Use of Draw, modify, object snap, dimension tool, properties of tool bars etc.
- Development of 2D-drawings to mechanical engineering using commands/tool bars.
- Introduction to surface and solid modeling menus.
- Usage of windows and layers.
- Usage of symbols.

CE 241

MECHANICS OF MATERIALS LABORATORY

Instruction	3	Periods per week
Duration of University Examination	3	Hours
University Examination	50	Marks
Sessionals	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 and EEE)

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

UNIT-I

Thermodynamics: Concept of system, process and properties, laws of thermodynamics, concept of entropy and Clausius inequality, steady flow energy equation for an open system, conditions of reversible and irreversible process, simple calculations of change in internal energy, enthalpy, entropy and workdone

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:Single and multistage compressors, workdone, 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 --Boltzamn law of radiation and concept of black body one dimensional steady state conduction heat transfer through plane walls without heat generation. Critical radius of insulation for cylinders.

Heat exchangers: Classification and application 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 cycle on T-S and H-S diagrams, Types and properties of refrigerants, eco-friendly refrigerants., Introduction to psychrometry and psychrometry 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 application.

Forming: Basic concepts of forming process-Rolling and wire drawing.

Principles and Applications of basic Machining Processes: Turning, drilling and shaping

UNIT - V

Applications of four bar planar mechanisms-single slider crank mechanisms. **Gears**: Classifications of gears, nomenclature **Gear Trains**: Simple, compound, inverted and epi-cyclc gear trains

Belt and Rope drives: Open and cross belt drives, length of belt, ratio of tensions of flat belt, condition for maximum power transmission for flat belt.

Suggested Reading:

1. P. N. Rao, *Manufacturing Technology*, Vol.1(Foundry, welding and Forming) & 2 (Metal cutting and machine tools), Tata McGraw Hill publishing Co, 2005.
2. Thomas Beva, *Theory of Machines*, CBS Publishers, 1995.
3. R. K. Rajput, *Thermal Engineering*, Laxmi Publications, 2005
4. C. Sachdeva, *Fundamentals of Engineering Heat and Mass Transfer*, Wiley Eastern Ltd., 2004.

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 wielding flux and gas welding, 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, (with schematic diagrams) and working of machine tools viz., Lathe, Shaper, Milling and Drilling machines, Commonly performed operations with Lathe, Shaper, Milling , Drilling, Gear cutting, and Grinding machines

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. Concept of NC, CNC, DNC and FMS.

Unit V

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

Suggested Reading:

1. PN Rao. *Manufacturing Technology*, Vol 1.Tata McGraw Hill Publishing, 2000.
2. Hajra Chowdary, *Elements of Workshop Technology*, Volume- 1 and II, Khanna Publishers, 6th Edition, 2004.
3. P.C.Panday and H.S Shart *Modern Machining Processes,* Tata McGraw Hill Pub, 3rd Edition, 2000.

WITH EFFECT FROM THE ACADEMIC YEAR 2007-2008

SCHEME OF INSTRUCTION AND EXAMINATION

B.E. IInd YEAR

MECHANICAL / PRODUCTION ENGINEERING

SEMESTER - II

Sl. No.	Syllabus Ref. No.	Subject	Scheme of Instruction: Periods per Week L	Scheme of Instruction: Periods per Week D/P	Scheme of Examination: Duration in Hrs	Scheme of Examination: Maximum Marks Univ. Exam	Scheme of Examination: Maximum Marks Sessionals
		THEORY					
1.	MT 251	Mathematics - IV	4	-	3	75	25
2.	ME 251	Kinematics of Machines	3	2	3	75	25
3.	CE 222	Environmental Studies	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**

WITH EFFECT FROM THE ACADEMIC YEAR 2007-2008

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: Periods per Week L	Scheme of Instruction: Periods per Week D/P	Scheme of Examination: Duration in Hrs	Scheme of Examination: Maximum Marks Univ. Exam	Scheme of Examination: Maximum Marks Sessionals
		THEORY					
1.	ME 271	Part B - Mechanical Tech., (For CE)	3	-	1.5	37	13
2.	ME 272	Thermodynamics and Fluid Mechanics (For IE)	4	-	3	75	25
3.	ME 273	Prime Movers and Pumps (For EEE)	4	-	3	75	25
		PRACTICALS					
1.	ME 291	Prime Movers and Pumps Lab. (For EEE)	-	3	3	50	25
2.	ME 292	Mechanical Technology Lab. (For IE)	-	3	3	50	25

MT 251

MATHEMATICS-IV
(Common to all Branches)

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 – 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 expectation, expected values-moments and Moment generating functions.

UNIT-IV: Distributions
Poisson, Normal, Gamma and Chi - Square distribution-fitting curves to the data.

UNIT-V: Curve fitting by method of least squares
Correlation and Regression-lines of regression -Tests of Significance, Chi-Square, F and T-Tests

Suggested Reading:

1. R.V. Churchill & J.W. Brown, *Complex Variables and Applications*, Fifth Edition, McGraw –Hill International Edition, 1990.
2. S.C. Gupta and V.K. Kapoor, *Fundamentals of Mathematical Statistics*, S. Chand & Co., New Delhi, 1997
3. R.K. Jain & S.R.K. Iyengar, *Advanced Engineering Mathematics*, Narosa Publications, 2002.
4. B.V. Raman, *Higher Engineering Mathematics, Core Engineering Series* Tata Mc Graw Hill Publishing Company Ltd, New Delhi, 2007.

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
Definition of link, element, pair, kinematic chain, mechanism and machine, Crubler's criterion, single and double slider chains, inversions of quadratic cycle chain, inversions of single and double slider crank 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 component 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

Belts and Ropes: Open and closed belt drives, length of belt, ratio of tensions, effect of centrifugal tension and initial tension over power transmission, condition for maximum power

Brakes and Dynamometers: Block or shoe, band 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 power, Eccentric circle cam with translating roller follower.

Unit-V

Gears: Classification of gears, Spur gears- Nomenclature, law of gear tooth action, involute as gear tooth profile, interference of involute gears, minimum number of teeth to avoid interference , contact ratio, cycloidal tooth profile, 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 Publications, 2005.
2. J.E.Shigley, *Theories of Machines*, McGraw-Hill Publications, 2005.
3. Thomas Bevan, *Theory of Machines*, CBS Publishers, 2005.

CE 222

ENVIRONMENTAL STUDIES

(Common to all Branches)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessionals	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 resources, growing energy needs, renewable and non-renewable energy sources. Land Resources, land as a resource, land degradation, soil erosion and desertification.

UNIT – II

Ecosystems : Concepts of an ecosystem, structure and functions of an ecosystem, producers, consumers and decomposers, energy flow in ecosystem, food chains, ecological pyramids, aquatic ecosystem (ponds, streams, lakes, rivers, oceans, estuaries).

UNIT – III

Biodiversity : Genetic species and ecosystem diversity, bio-geographical 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 pollution, 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 of 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 McGraw-Hill, 2005
5. V. K. Sharma, *Disaster Management*, National Centre for Disaster Management, IIPE, Delhi, 1999.

ME 253

THEROMODYNAMICS

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 scale, ideal and ideal gas thermometer, reversibility and irreversibility, quasi static process, specific heats for ideal gases, thermodynamic equilibrium.

Unit-II

First law of thermodynamics: Statement of First law, heat and work interactions, thermodynamic work and internal energy, energy as property of system, first law applicable to closed system, thermodynamic processes and calculation of work, heat transfer, internal energy, heat as path function, first law analysis of flow processes and limitation, calculation of work done during flow process

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 – Clausis statement, Reversible and irreversible processes, Carnot theorem, Classius inequality, calculation of entropy changes during various thermodynamic processes principle of Entropy increase , T-S diagram, Available and Unavailable energies in steady flow, second law of control volume, Helmholtz and Gibb's function , Available function for flow and non-flow process

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 diagram, 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 & Combustion of fuels : Air standard cycles-Otto, Diesel, dual combustion cycle, Sterling and Rankine cycle. Classification of fuels, high calorific value, low calorific value, advantages and disadvantages of liquid fuels over solid fuels and gaseous fuels over other fuels, calorific value of fuels – higher calorific value (HCV) and lower calorific value (LCV) – determination of HCV and LCV of fuels by Bomb calorimeter and Junker's gas calorimeter, Theoretical (stoichiometric) mass and volume of air required for complete combustion of fuels, excess air supplied, actual amount of air, gravimetric and volumetric analysis of fuels, conversion of gravimetric to volumetric analysis and vice-versa, mass of carbon in flue gases and analysis of flue gases by Orsat apparatus.

Suggested Reading:

1. P.K. Nag, *Basic & Applied Thermodynamics*, Tata McGraw Hill Publications, 2003.
2. Y.V.C.Rao, *An introduction to Thermodynamics*, (Orient-Longman, revised edition, 2004)
3. P.L.Ballaney, *Thermal Engineering*, Khanna Publishers 2004.
4. E.Radha Krishnan, *Engineering Thermodynamics*, 2002.

EC 272

BASIC ELECTRONICS

(For Mech., Prod. and CSE)

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

UNIT - I

Semi 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 Rectifiers (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 amplifiers 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.

Oscillators – LC Type and RC Type Oscillators and Crystal Oscillators (Qualitative treatment only)

UNIT - IV

Operational Amplifiers - Basic Principle – Characteristics and Applications (Summer, Adder, Integrator, Differentiator, Instrumentation Amplifier).

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

UNIT - V

Data Acquisition systems: Study of transducer (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: Constructional details of C.R.O and Applications.

Suggested Reading:

1. Jacob Milman & C., Halkias, *Electronic Devices* (Eight Edition, 1991) Reprint 1995)
2. *Op-AMPS and Linear Integrated Circuits* – Rama Kanth A. Gaykward, EEE Third Edition.
3. *Digital Design* by-Moris Mano (2nd Edition).
4. *Electronic Measurements and Instrumentations* – Cooper (3rd Edition)
5. *Electronic Devices and Circuits:* G.K. Mittal (11th Edition).

CE 271

FLUID DYNAMICS

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

UNIT – I

Properties of fluids: Definition of fluid and concept of continuum. Fluid properties; pressure, density, specific weight, specific volume, dynamic and kinematic 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, 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 Bernoullis' 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 and 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 weirs 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 numbers 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 phenomenon 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 Reading

1. K. L. Kumar, *Engineering Fluid Mechanics,* Eurasia Publishing House, 1997.
2. R. K. Rajput, *Fluid Mechanics and Hydraulic Machines,* S. Chand & Co., 2003.
3. P. N. Modi and S. M. Seth, *Hydraulic and Fluid Mechanics*, Standard Book House, Delhi, 1995.
4. V. L. Streeter, *Fluid Mechanics*, McGraw-Hill Co. Ltd., 2002.

EE 291

ELECTRICAL CIRCUITS & MACHINES LAB

Instruction	3	Periods per week
Duration of University Examination	3	Hours
University Examination	50	Marks
Sessionals	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's Theorems
2. Measurement of 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 a Separately Excited DC Generator
6. To Determine the Load Characteristics of a Shunt Generator
7. To Determine the Performance Characteristics of a 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. O.C. and S.C. Tests on Single-Phase Transformer.
12. Performance Characteristics of 3-Phase Induction Motor.
13. Speed Control Methods of Induction Motors.

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 diodes
2. CRO Applications
3. Fullwave rectifier with and without filter
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 & Colpitts Oscillator.
11. Operational Amplifier 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. Malvino, 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.

ME 271

PART - B
MECHANICAL TECHNOLOGY
(For Civil Engineering)

Instruction	3	Periods per week
Duration of University Examination	1 & 1/2	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 Conveyer, 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, concreter 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 Applications*, Metropolitan Books Co, Delhi, 2004
3. Goodes Spence, *Building and Civil Engineering Plant*, Crossby Lock Wood, 1995.

ME 272

THERMO DYNAMICS AND FLUID MECHANICS

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessionals	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 process

IC Engines: Concept of Air standard cycles, Otto, Diesel and Dual combustion cycles, 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.

Unit-II

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

Steam turbines: Classification of steam turbines, velocity diagrams for simple impulse and reaction turbines, problems on workdone, blade angles, power and thermal efficiency of the turbine.

Gas turbine: Classification of gas turbine-constant pressure combustion cycle, open cycle, closed cycle and constant volume combustion gas turbine plants, use of gas turbines and Fuels used, calculation of efficiencies.

Unit-III

Properties of Fluids: Definition of the fluid and concept of continuum, fluid properties- density, pressure, specific weight, specific volume, dynamic and kinematic viscosities.

Fluid Kinematics: General concepts of path lines, streak lines, stream lines, stream tubes, 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

Measurement of Fluid Flows: Devices used for measurement of pressure, velocity and discharge and derivation of relevant formulae.

Fluid Dynamics: Derivation of Euler's and Bernoulli's equations, and their applications, impulse moment equation and its applications

Unit-V

Laminar and Turbulent flows through pipes: Distinction between laminar and turbulent flows, Reynolds number and its significance , Critical Reynold's number, laminar and turbulent flow in circular pipes, Hagen Poiseulle equation, frictional losses in pipes, Darcy' s equation, estimation of Darcy's friction factor , empirical formulae and Moody chart, Development of laminar and turbulent boundary layer on a flat plate, Dimensional analysis and dynamic similarity.

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.Benjamin 7th Edition.

ME 273

PRIME MOVERS AND PUMPS

(For EEE)

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

Unit-1

Fluid Mechanics: Newtonian and Non-Newtonian Fluids, viscosity, types of fluid flows, continuity, momentum and energy equations, Bernoulli's equation and its applications, laminar and turbulent flows, flow through pipes, friction losses in pipes, Darcy equation, Reynolds number and its significance

Unit-II

Hydraulic Turbines: Classification and working principles of turbines-Pelton, Francis, and Kaplan turbine, velocity diagrams for impulse and reaction turbine, calculation of blade angles, work-done, power output and efficiencies, specific speed of turbines, function of draft tube and type of draft tubes, unit quantities, performance and characteristic curves.

Unit-III

Generation of steam: Dryness fraction and properties of steam, function of boilers, working principle of Lancashire boiler, Cornish boiler, Cochran boiler, Locomotive boiler, Babcock and Wilcox boiler, boiler mounting and accessories

Steam engines: Rankine and Modified Rankine cycle for steam engines, evaluation of mean effective pressure, power and cylinder dimension for single acting and double acting steam engines

Unit-IV

Steam turbines: Classification of steam turbines, velocity diagrams for simple impulse and reaction turbines, compounding of steam turbines, pressure compounding, velocity compounding, and pressure-velocity compounding, problems on workdone, blade angles, power and thermal efficiency of the turbine.

Gas turbine: Classification of gas turbine-constant pressure combustion cycle, closed cycle and constant volume combustion gas turbine plants, calculation of various efficiencies and parameters

Unit-V

Pumps: Reciprocating pumps, working of single and double acting types, effect of acceleration head and friction, use of air vessels, work done and power required without and with air vessels

Centrifugal pumps: Classification and working of centrifugal pumps, need for priming, workdone and efficiencies, specific speed of pumps, cavitation and its effect on performance

Suggested Reading

1. R.K.Rajput, *Thermal Engineering*, Laxmi Publications, 2004
2. R.Yadav, *Steam and Gas turbines*, Central Publishing House Ltd, 2004
3. S.Ramamrutham, *Hydraulic Machines*, Dhanpat Rai and Sons, 2004.

ME 291

PRIME MOVERS AND PUMPS LAB

(For EEE)

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

1. Performance of reciprocating pump
2. Performance and characteristic curves of centrifugal pumps
3. Performance and characteristic curves of Pelton wheel
4. Performance and characteristic curves of Francis turbine
5. Performance and characteristic curves of Kaplan turbine
6. Performance test on multi- cylinder petrol engine
7. Performance test on Diesel engine
8. Determination of volumetric efficiency of reciprocating air compressor
9. Study of constructional details of and operation of steam turbine
10. Thermal conductivity of composite wall.
11. Determination of Stefan-Boltzman Constant.
12. Determination of heat transfer coefficient under natural convection phenomenon.

ME 292

MECHANICAL TECHNOLOGY LAB

(For Instrumentation Engineering)

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

1. Determination of absolute and kinematic viscosity of lubricants
2. Determination of Flash and Fire points of lubricants
3. Valve timing diagram of IC engine
4. Performance test on multi-cylinder petrol/diesel engine
5. Heat Balance Sheet on IC-engine
6. Performance test on reciprocating air compressor
7. Study and Calibration of pressure gauges
8. Measurement of velocity by pitot tube
9. Measurement of velocity by hot-wire anemometer
10. Measurement of discharge by venturimeter
11. Measurement of discharge by orfice meter/rotameter
12. Determination of Reynold's Number.