

MECHANICAL ENGINEERING CURRICULUM

SCHEME OF INSTRUCTION & EXAMINATION

B.E II YEAR (REGULAR)

(MECHANICAL ENGINEERING)

SEMESTER - I

Sl. No.	Syllabus Ref.No	SUBJECT	Scheme of Instructions		Duration in Hrs	Scheme of Examination		
			Periods per Week	L/T D/P		Maximum Marks	Sessions	
THEORY								
1.	MAT 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 & 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	

MAT 201

MATHEMATICS – III

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

I. UNIT-I

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

II. UNIT-II

Fourier series: Expansion of a function in Fourier series for a given range-half range sine and cosine expansions –odd and even functions of Fourier series – change of interval.

III. UNIT-III

Partial differential equations: Solutions of wave equations, heat equations 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 heat flow.

UNIT-IV

Laplace Transforms: Laplace transform- Inverse Laplace transform- properties of Laplace transforms – Laplace transforms of unit step function, impulse function and periodic functions-convolution theorem-solution of ordinary differential equation with constant coefficients using Laplace Transform.

IV. UNIT –V

Numerical Methods : Solutions of simultaneous, linear equations. Gauss elimination method and ill conditional equations and refinement of solutions. Gauss Seidel and iterative method . Numerical differentiation and integration. Solution of differential equations, Runge-Kutta Method – Predictor-corrector method.

Suggested Readings:

1. Kreyszig E, Advanced Engineering Mathematics, Wiley Eastern Ltd., New Delhi, 1976.
2. R.K.Jain & S.R.K.Iyengar, Advanced Engineering Mathematics,Narosa Publications,2002
3. A.K.Mukhopadhyay, Mathematical Methods for Engineers and Physicists, Wheeler Publishing, 2002
4. Narayanan Pilay & Ramaniah, Advanced Mathematics for Engineering Students Volume-III S.Chand & Co. New Delhi, 1980

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, Effect of dislocation on strength of metals, cold and hot working, strain Hardening. Recovery Recrystallisation, Grain growth, grain size 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, 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, Experimental determination of fatigue strength. (RR-Moore Test).
Creep: Creep strength, Creep curve, Low temperature and High temperature creep, Creep Test, Diffusion: Fick's law of diffusion, Application of diffusion theory in Engineering.

UNIT-III

Extractive Metallurgy (General and Elementary treatment only); Methods of production of pig iron, Wrought iron, Cast iron, Steel, Copper and Aluminium. Types of Cast Iron, Plain Carbon Steels and their properties. Alloy Steels: Effects of alloying elements like Nickel, Chromium, Manganese, Silicon and Tungsten.

UNIT-IV

Structure of Alloys: Construction and interpretation of Thermal equilibrium diagram of binary non-ferrous alloys, study of Eutectic, Eutectoid, peritectic, Peritectoid reactions. Iron-Iron Carbide Equilibrium diagram, Construction and interpretation.

UNIT-V

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.

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.

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 angle projections, convention for sectional views. Orthographic projections including sectional views of simple machine elements from the given pictorial or orthographic views.

2. 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, machine vice, screw jack, non-return valves, safety valves, bearings, tail stock etc. These are only examples and actual exercise or examination 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.

3. ASSIGNMENTS

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

Suggested Reading

1. N.D.Bhatt, "Machine Drawing", Charotar Publishing House, Anand, New Delhi, 28th Edition, 1994
2. N.Siddeshwar, "Machine Drawing", Tata Mc Graw 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.

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: Kinds of stresses and strains. Elasticity and Plasticity. Hook's law, Stress-Strain diagrams. Moduli of elasticity, Poisson's ratio, Relation between E, N and K, Linear and volumetric strain, Bars of uniform strength, Temperature stresses, Compound bars.

UNIT-II

Shear Force and Bending Moment: Relation between intensity of loading, Shear force and Bending moment and its diagrams. Applications to cantilever, simply supported and over hanging beams. Simple theory of bending-Derivation and application of the flexural formula $M/I = f/y = E/R$, Moment of resistance, Modulus of section, Flitched beams.

UNIT-III

Deflections: Slope and deflections by the method of double integration – Cantilever, Simply supported, over hanging beams- Point loads and Uniformly distributed loads. Theory of Torsion.

Derivation of torsion formula, Torsional stresses, angle of twist, power transmission, effect of combined bending and torsion. Close coiled and laminated springs.

UNIT-IV

Shear Stresses in Beams: Derivation of formulae, Distribution of shear in rectangular, I and T sections, and Hollow Sections Compound stresses –Principal stresses and strains. Mohr's circle and Ellipse of stress.

UNIT-V

Stresses in Thin and Thick Cylinders with internal or / and external pressure, Hoop and Longitudinal stresses. Derivation and expressions for stresses, Compound cylinders. Direct and bending stresses-Core of section for rectangular, circular, I,T and rhombus sections. Columns and Struts. Euler and Rankine formula for axial load applications. Secant and Perry formulae for eccentrically loaded columns.

Suggested Reading:

1. B.C Punmia, Strength of Materials & Mechanics of Structures, Standard Publ., 9th Edn.,1992
2. S.Ramamrutham, Strength of Materials, Dhanpat Raj & Sons, 10 th Edn.,1993.

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 Circuits: Ohm's Law, network elements, Krichoff's Laws, Analysis of circuits using loop current methods and node voltage method. Power in DC circuits. Serial and Parallel combination of resistance- Thevenin's and Norton's Theorem.

AC Circuits: Sinusoidal Sources. Phasor representation of Sinusoidal quantities, average and RMS value, form factor. Analysis of RLC circuits to sinusoidal inputs. power factor, 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. Transformer on no load and load, efficiency and regulation of transformation. 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 motors. Loses and efficiency.

UNIT-IV

Induction motors: Production of rotating magnetic field, construction and principle of induction motors, methods of starting 3-phase IM, speed control. Rotor current frequency, effect of slip on rotor circuits. Slip torque characteristics.

UNIT-V

Single phase motors: Various types of single-phase motors, split phase, Capacitor start and capacitor run, and shaded pole.
3-Phase AC Generators: Construction, production of emf, armature reaction, synchronous impedance, losses and regulation.

Suggested Reading:

1. V.K.Mehta-Principles of Electrical Engineering & Ele. S. Chand & Co., 1995

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

Introduction to Economics and its evolution-Managerial Economics its scope,importance and relation to other sciences, its usefulness to engineers-Basic concept of Managerial economics

UNIT-II

Demands Analysis –Concept of demand, determinants, Law of demand, its assumptions, Elasticity of demand, price, income and cross elasticity, Demand Forecasting – markets Competitive structures, price-output determination under perfect competition and Monopoly. (Theory questions and small numerical problems can be asked).

UNIT-III

Theory of Production- Firm and Industry- Production function- input – out relations-laws of returns-internal and external economics of scale. Cost Analysis: Cost concepts – fixed and variable costs-explicit and implicit costs – out of pocket costs and imputed costs – Opportunity cost – Cost output relationship – Break-even analysis. (Theory and problems).

UNIT-IV

Capital Management , its significance , determinants and estimation of fixed and working capital requirements, sources of capital – Introduction to capital budgeting , methods of payback and discounted cash flow methods with problems.
(Theory questions are numerical problems on estimating working capital requirements and evaluation of capital budgeting opportunities can be asked).

UNIT-V

Book-keeping, principles and significance of double entry book keeping, Journal, Subsidiary books, Ledger accounts Trial Balance concept and preparation of Final Accounts with simple adjustments—Analysis and interpretation of Financial Statements through Ratios. (Theory questions and numerical problems on preparation of final accounts, cashbook, and petty cash book, bank reconciliation statement, calculation of some ratios).

Suggested Reading:

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

ME 231

METALLURGY LAB

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

1. Study of : Metallurgical Microscope
Iron-Iron Carbide diagram
Procedure of Specimen preparation.
2. Metallographic study and analysis of : Steels-Low, Medium and High Carbon, Stainless, Case Carburised and Cutting tools.
Cast – Iron – White, Gray and Spheroidal Gray.
Non-Ferrous Alloys-Brass, Bronze , Al-Si and Babbit
3. Study of Microstructure and measurement of Hardness before and after the following Processes: Hardening, Hardening and Tempering, Normalising

Note: Experiment

1. To be carried out in two sessions.
2. To be carried out in eight sessions.
3. To be carried out in eight sessions.

ME 232

COMPUTER DRAFTING LAB

Instruction	2 Periods per week
Sessional	25 Marks

Practical using 2-D drafting packages for the following:

- Exposure to graphic primitives like line, point, plane, circle, arc, annotation etc.,
- Development of drawings to mechanical engineering, using commands.
- Usage of windows and layers
- Creation and updation of symbols libraries.

CE 241

MECHANICS OF MATERIALS LAB

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

Cycle I:

1. Direct Tension Test on metal rods
2. Young's modulus of metal specimen
3. Brinnel's Hardness Test
4. Compression Test on Bricks
5. Impact Test

Cycle II:

1. Spring Test
2. Torsion Test
3. Bending Test
4. Continuous Beam Test
5. Fatigue Test

ME 221

ELEMENTS OF MECHANICAL ENGINEERING

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

UNIT-I

Thermodynamics: Concepts 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. Calculation of change in Internal Energy, Enthalpy, Entropy and Workdone.

IC Engines: Concept of Air Standard cycles, Otto, Diesel and Dual Combustion cycle. Working of Four Stroke and Two Stroke, Petrol and Diesel Engines. Valve timing diagram, Calculation of Indicated power, Brake power, and Specific Fuel Consumption, Mechanical and Thermal efficiencies.

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

UNIT –II

Heat Transfer: Basic modes of heat transfer, Fourier law of conduction, Newton's Law of cooling and Stefan-Boltzman's Law of Thermal radiation. One dimensional steady conduction heat transfer through plane walls and hollow cylinders with and without heat generation. Critical radius and insulation.

Radiation: Absorptivity, Reflectivity and Transmittivity. Concept of a black body and emissivity. Kirchoff's Law, Lambert cosine law, Plank and Wein's laws. Monochromatic and Total emissive power.

Heat Exchangers: Classification and applications of heat exchangers in industry. Derivation of LMTD in parallel flow and counter flow heat exchangers and problems.

UNIT –III

Refrigeration: Types of Refrigeration systems – Air Refrigeration system, Vapour compression system, Vapour Absorption system, steam jet refrigerator system, thermoelectric refrigeration system. Working of Bell Coleman air refrigerator system and simple vapour compression cycle for vapour compression system. COP and representation of cycle on T-S, P-H and H-S diagrams. Types and properties of Refrigerants.

Air conditioning: Human comfort, components of air conditioning equipment Psychometric chart and Psychometric process and load calculations.

UNIT – IV

Basic Manufacturing Process: Welding, Brazing and Soldering, brief description processes, parameters and associated principles, applications of Gas welding welding and importance of fluxes.

Casting: Sand Casting, die-casting and principles and applications.

Forming: Basic concepts of forming process – Rolling, wire drawing.

Machine Processes: Turning, Drilling and Shaping.

Unit – V

Definitions of link, pair, kinematics chain, mechanism and machine. Inversions of slider crank, double slider crank chains. Gears: Classifications of gears Spur Gears : Types of motion,

Nomenclature, Law of gear tooth action, involutes as a gear tooth profile interference of involute gears, minimum number of teeth to avoid interference . Helical and Bevel Gears: Gear tooth actions and contact conditions. Worm Gears: Calculation of speed ratio, Gear Trains : Simple, Compound, reverted and epicyclic gears trains Belt and Rope drives : Open and Crossed belt drives. Length of belt. Ratio of tensions.

Suggested Reading:

1. Hajra Choudary , “ Elements of workshop technology “ Vol. I&II, Asian publishers 1993.
2. Thomas Bevan, “ thermodynamics “, CBS Publishers 1995.
3. P.L.Ballaney, “Thermodynamics “,Khanna publishers.
4. S.S Ratan, “Theory of Machines “, Tata-McGraw-Hill publications,1995.

ME 222

ELEMENTS OF PRODUCTION TECHNIQUES

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, and 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 (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. Concept of NC machine.

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.

Unit – V

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. Hajra Choudary , “Elements of Workshop Technology , Vol-I&II, Khanna pub.Ltd., 6th Edn. 1993.
2. P.C.Panday & H.S.Shart, Modern Machining Processes, Tata McGraw Hill Pub. Co.Ltd., 3rd Edn, 1980.

MAT 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, 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 expansion-Expected values-moments and moment generating functions.

UNIT-IV

Distributions

Poisson, Normal, Gamma, and Chi –square distribution-fitting these curves to the data.

UNIT-V

Curve fitting by method of least squares

Correlations and regression lines of regression-tests of significance, chi-square, F & T-tests .

Suggested Reading:

1. R.V. Churchill, Complex variables its applications, Kogakusha Co. Ltd., Tokyo,1960.
2. I.Miller and J.E.Fireund, Probabilities and Statistics for Engineers.
3. S.C.Gupta and V.K.Kapoor,Fundamentals of Mathematical Statistics, S.Chand & Co.,New Delhi, 1989
4. R.K.Jain and S.R.K.Iyengar, Advanced Engineering Mathematics, Narosa Publication, 2002.
5. Narayanan Pillay and Ramaniah, Advanced Mathematics for Engineering Students , vol 3 , S.Chand & Co. , New Delhi, 1980

