ENGINEERING MATHEMATICS – III

Contact Hours/ Week	: 3+1 (L+T)	Credits :	3.5
Total Lecture Hours	: 39	CIE Marks :	50
Total Tutorial Hours	: 13	SEE Marks :	50
Sub. Code	: MAT31B		

Module-I

Fourier Series: Periodic functions, Fourier Expansions, Half Range Expansions, Complex form of Fourier series, Practical Harmonic Analysis. **Fourier Transforms**: Infinite Fourier Transforms, Fourier Sine and Cosine Transforms, Properties, Inverse Transforms. **11+ 2 Hrs.**

Module-II

Probability: Additional rule, conditional probability, multiplication rule, Baye's theorem.

6 + 2 Hrs.

Module-III

Partial differential equations (P.D.E.): Formation of Partial Differential Equation, Solution of Langrange's Linear P.D.E. of the type Pp+Qq=R. Method of Separation of Variables. **8 + 3 Hrs.**

Module-IV

Applications of P.D.E.: Classification of PDE, solution of one dimensional heat wave and two dimensional Laplace's equation by the method of separation of variables. **7 + 3 Hrs.**

Module-V

Calculus of Variation: Variation of a function and a functional, Extremal of a functional, Variational problems, Euler's equation, Standard Variational problems including geodesics, Minimal surface of revolution, hanging chain and Brachistrochrone problem.

7 + 3 Hrs.

TEXT BOOK

1	Dr. Grewal B.S.	Higher Engineering Mathematics. Ed 39. New Delhi. Khanna Publishers. 2005.

REFERENCE BOOKS

1	Ramana B.V.	Higher Engineering Mathematics. Tata-McGraw Hill.
2	Erwin Kreyszig	Advanced Engineering Mathematics. Ed 8. New Delhi. John Wiley & Sons.
3	Ray C Wylie	Advanced Engineering Mathematics. Ed 4. New Delhi. McGraw Hill.
4	Pipes and Harvill	Applied Mathematics for Engineers and Physicists. Ed 3. New Delhi. McGraw Hill.

ENVIRONMENTAL SCIENCES

Contact Hours/ Week	: 2 (L)	Credits :	0
Total Lecture Hours	: 26	CIE Marks :	50
Sub. Code	: MC02	SEE Marks :	50

Module-I

Environment and Ecology

Introduction, components of Environment and their Interactions. Ecology-Definition of ecology, Ecosystem-types, structure and functions of ecosystem. Flow of bio Geo chemicals, Pond eco system with sketch and listing of biotic & aboitic substances in pond ecosystem. Food chains and food webs-Grazing & Detritus, Producers, Consumers- primary secondary & tertiary with examples. Ecological pyramids–numbers, bio mass & energy.

5 Hrs.

Module-II

Human activities & their effects on environment

Food–Brief notes on Plant food & animal food. Impact of Agriculture, Industrialization, Urbanization & Mining on environment (in brief). Environmental impact assessment- Introduction, definition & steps in EIA process. Concepts of Sustainable development.

Water resources- world's water reserves hydrological cycle, water requirements for human activities (Listing only). Water quality-definition of potable water, wholesome water, polluted water & contaminated water. Common impurities in water & their effects on human health (in brief). Effects of fluorides & nitrates. **5 Hrs.**

Module-III

Energy and Resources

Definition, importance of energy resources, Renewable & non-renewable resources & their comparison. Brief introduction to renewable energies – solar, wind, geothermal, ocean thermal, tidal power and biomass. Hydro electric energy advantages & disadvantages. Hydrogen as alternate source of energy. Rain water harvesting–importance & necessity

5 Hrs.

Module-IV

Environmental pollution

Air pollution–list of pollutants, & their effects on environment Global warming, acid rains. Water pollution–sources, types (listing) Major water pollutants & indicator of water pollutants. Noise pollution–definition, sources, effects & controlling measures Soil pollution sources & effects

5 Hrs

Module-V

Management of solid waste

Municipal solid waste & their generation & composition, collection & methods of disposal (in brief). Industrial solid waste-hazardous, non hazardous bio degradable (definitions Only) storage, transportation & disposal of industrial waste. Bio medical waste sources collection & disposal. Environmental protection laws in India- The water (prevention & control of pollution) act, Air (prevention & control of pollution) act, Environment(protection) act, Wild life (protection act), Forest (Conservation) act Inter national agreement on environmental issues.

5 Hrs.

TEXT BOOKS

1	Anjaneyulu.	Introduction to Environmental Sciences. BP Publications.
2	Garg S.K.	Ecological and Environmental Studies. Khanna publishers.

REFERENCE BOOKS

1	Prakash S.M.	Environmental studies. Mangalore. Elite Publishers.
2	Kormandy E.J.	Concepts of ecology. Prentice-Hall.
3	Sharma J.P.	Environmental studies. Lakshmi Publications.
4	Joseph Benny	Environmental studies. Tata McGraw-Hill. Mangalore. Elite Publishers.

ENGINEERING MATERIALS

Contact Hours/ Week	: 3	Credits :	3
Total Lecture Hours	: 42	CIE Marks :	50
Sub. Code	: ME31	SEE Marks :	50

Module-I

Mechanical Behavior Materials: Stress- strain diagrams to show ductile and brittle behavior of materials, linear and non-linear elastic behavior, Mechanical properties in plastic range, yield strength, offset yield strength, ductility, ultimate tensile strength, toughness. Plastic deformation of single crystal by slip, dislocation and twinning, deformation of polycrystalline metals. **– 08 Hrs.**

Module-II

Fracture: Types of fracture, Griffith theory of Brittle fracture, Theoretical Cohesive strength. Creep: Phenomenon with examples, three stages of creep, creep properties, Creep testing, stress relaxation. Fatigue: Types of fatigue loading with example, Mechanism of fatigue, fatigue properties, fatigue testing and SN diagram. **– 08 Hrs.**

Module-III

Solidification: Mechanism of solidification, Homogenous and Heterogeneous Nucleation, crystal growth. Cast metal structures.
Phase diagram: Solid solutions, Hume Rothary rules, substitution, and interstitial solid solutions, Gibbs phase rule, construction of equilibrium diagrams, equilibrium diagrams involving complete and partial solubility, lever rule. Numericals on phase diagrams.
Iron Carbon system: Iron carbon equilibrium diagram description of phases, Solidification of steels and cast irons and invariant reactions. **– 10 Hrs.**

Module-IV

TTT Diagrams: TTT curves, continuous cooling curves, Effect of cooling rate on TTT diagram, effect of carbon and alloying elements on TTT diagram.
Heat treatment of metals: Annealing and its types, Normalizing, Hardening, Tempering, Martempering, Austempering, Hardebnability, surface hardening methods like Carburizing cyaniding, nitrading flame hardening and induction hardening. **– 08 Hrs.**

Module-V

Advanced Materials: Composite materials, definition, classification, types of matrix materials & reinforcements, fundamentals of production of FRP's and MMC's, advantages and application of composites.
Ferrous and non-ferrous materials: Properties, composition and uses of Grey cast Iron, malleable iron, S.G. iron and steel, Copper alloys- Brasses and Bronzes. Aluminium alloys- Cast Alloys and Wrought alloys, AISI & BIS designation of steels. **– 08 Hrs.**

TEXT BOOK

1	William D. Callister Jr.	Materials Science & Engineering. Ed 5. John Wiley & Sons. 2001.

REFERENCE BOOK

1	Raghavan V.	Materials Science and Engineering. PHI. 2006.
2	VanVlack H.	Elements of materials science & Engg. Addison–Wesley. 1998.
3	Donald R. Askeland	The science and Engineering of Materials. Ed 4. Thomson Asia. Singapore. 2007.

SCHEME OF EXAMINATION: Answer all five questions.
I Mid-Term – Module – 1
II Mid-Term – Module - 2
End Semester – 25% of Module 1, 25% of Module 2 and 50% of Module 3, 4 and 5.

KINEMATICS OF MACHINES

Contact Hours/ Week	: 4	Credits :	3.5
Total Lecture Hours	: 52	CIE Marks :	50
Sub. Code	: ME32	SEE Marks :	50

Module-I

Introduction:

Definitions: Link or element, pairing of elements with degrees of freedom, Grubler's criterion (without derivation), Kinematic chain, Mechanism, Mobility of Mechanism, Inversion, Machine. Kinematic chain with Four bar chain; Single slider crank chain & Double slider crank chain and their inversions.

i) Quick return motion mechanisms - Whitworth mechanism and Crank & slotted lever Mechanism

ii) Straight line motion mechanisms -Peaucellier's mechanism

iii) Intermittent Motion mechanisms–Geneva mechanism and Ratchet & Pawl mechanism. **8 Hrs.**

Module -II

Velocity and Acceleration Analysis of Mechanisms (Graphical Methods):

Velocity and acceleration analysis of Four Bar mechanism and Slider crank mechanism by vector polygons, Relative velocity and acceleration of particles in a common link, relative velocity and accelerations of coincident Particles on separate links. - Coriolis component of acceleration.

8 Hrs.

Module-III

Velocity Analysis by Instantaneous Center Method:

Definition, Kennedy's Theorem, Determination of velocity using instantaneous center method

(Complex mechanisms are not included)

3.1 Klein's Construction: Analysis of velocity & acceleration of single slider crank mechanism by using Klein's Construction. **8 Hrs.**

Module-IV

Spur Gears: Law of gearing, Definitions, Path of contact, Arc of contact, Contact ratio, Interference in involute gears, Methods of avoiding: interference, Back lash,

4.1 Gear Trains: Simple gear trains, Compound gear trains for large speed reduction, Epicyclic gear trains, and tabular methods of finding velocity ratio of epicyclic gear trains. **8 Hrs.**

Module-V

Cams: Types of cams, Types of followers, Displacement, Velocity and Acceleration time curves for cam profiles. Disc cam with reciprocating follower having knife-edge, roller and flat faced follower, Disc cam with oscillating roller follower, Follower motions including SHM, Uniform velocity, uniform acceleration & retardation and Cycloidal motion. **8 hrs.**

TEXT BOOK

1	Rattan S.S.	Theory of Machines. Ed 2. Tata McGraw-Hill. New Delhi. 2005.

REFERENCE BOOK

1	Shigley J.V. and Uickers J.J.	Theory of Machines & Mechanisms. Ed 2. McGraw Hill International. 1995.
2	Sadhu Singh.	Theory of Machines. Ed 2. Pearson Education (Singapore), Indian Branch. New Delhi. 2006.

SCHEME OF EXAMINATION: Five questions will be set, each from individual modules, answering all questions are compulsory. II module will contain an optional question (With choice).

BASIC THERMODYNAMICS

Contact Hours/ Week	: 3+1 (L+T)	Credits :	3.5
Total Lecture Hours	: 39	CIE Marks :	50
Total Tutorial Hours	: 13	SEE Marks :	50
Sub. Code	: ME33		

Module-I

Fundamental Concepts & Definitions

Thermodynamics; definition and scope. Microscopic and Macroscopic approaches. Engineering Thermodynamics Definition, some practical applications of engineering them1odynamic. System (closed system) and Control Volume (open system); Characteristics of system boundary and control surface, examples. Thermodynamic properties; definition and units, intensive and extensive properties. Thermodynamic state, state point, state diagram, path and process, quasi-static process, cyclic and non-cyclic processes; Thermodynamic equilibrium; definition, mechanical equilibrium; diathermic wall, thermal equilibrium, chemical equilibrium- Zeroth law of thermodynamics, Temperature; concepts, scales, measurement. Internal fixed points. **7 Hrs.**

Work & Heat

Mechanics, definition of work and its limitations. Thermodynamic definition of work; examples, sign convention. Displacement work; at part of a system boundary, at whole of a system boundary, expressions for displacement work in various processes through p-v diagrams. Shaft work; Electrical work. Other types of work. Heat; definition, units and sign convention, 5 Hrs

Module-II

First Law of Thermodynamics

Joule's experiments, equivalence of heat and work. Statement of the First law of thermodynamics, extension of the First law to non -cyclic processes, energy, energy as a property, modes of energy, pure substance; definition, two-property rule, Specific heat at constant volume, enthalpy, specific heat constant pressure. Extension of the First law to control volume; steady state-steady flow energy equation, important applications, analysis of unsteady processes such as filling and evacuation of vessels with and without heat transfer. **7 Hrs.**

Module-III

Second Law of Thermodynamics

Devices converting heat to work; (a) in a thermodynamic cycle, (b) in a mechanical cycle. Thermal reservoir. Direct heat engine; schematic representation and efficiency. Devices converting work to heat in a thermodynamic cycle; reserved heat engine, schematic representation, coefficients of performance. Kelvin -Planck statement of the Second law of Thermodynamic; PMM II and PMrv1I. Clasius's statement .of Second law of Thermodynamic; Equivalence of the two statements; Reversible and irreversible processes; factors that make a process .irreversible, reversible heat engines, Carnot cycle, Carnot principles. Thermodynamic temperature scale.

8 Hrs.

Module-IV

Entropy

Clasius inequality; statement, proof, application to a reversible cycle. $f\partial Q_R/T$ as independent of the path. Entropy; definition, a property, principle of increase of entropy, entropy as a quantitative test for irreversibility, calculation of entropy using Tds relations, entropy as a coordinate. **6 Hrs.**

Availability and Irreversibility

Available and unavailable energy, Maximum Work, maximum useful work for a system and a control volume, availability of a system and a steadily flowing stream, irreversibility. Second law efficiency. **6 Hrs.**

Module-V

Ideal Gases & Mixture of Ideal Gases

Ideal gas; equation of state, internal energy and enthalpy as functions of temperature only, universal and particular gas constants, specific heats, perfect and semi-perfect gases. Evaluation of heat, work, change in internal energy, enthalpy and entropy in various quasi-static processes. Ideal gas mixture; Dalton's law of additive pressures, Amagat's law of additive volumes, evaluation of properties. Analysis of various processes. **6 Hrs.**

Real Gases

Introduction; Vander Waal's Equation Van der Waal's constants in terms of critical properties, law of corresponding states, compressibility factor; compressibility)" chart. **5 Hrs**

TEXT BOOK

1	Rajput R.K.	Thermal Engineering. Lakshmi publications.
2	Nag P.K.	Basic & Applied Thermodynamics. Tata McGraw Hill Pub. Co. 2002.

REFERENCE BOOK

1	Radhakrishnan E.	Fundamentals of Engineering Thermodynamics. Prentice-hall of India Pvt. Ltd.
2	Yunus A. Cenegal and Michael A. Boles	Thermodynamics -An Engineering Approach. Tata McGraw-Hill. 2002

SCHEME OF EXAMINATION:

Five questions will be set, each from individual modules, answering all questions are compulsory. I module will contain an optional question (With choice)

STRENGTH OF MATERIALS

Contact Hours/ Week	: 4 (L+T)	Credits :	3.5
Total Lecture Hours	: 52	CIE Marks :	50
Tutorial Hours	: 13	SEE Marks :	50
Sub. Code	: ME34		

Module-I

Simple stress and strain: Introduction, stress, strain, mechanical properties of materials, Linear elasticity, Hooke's Law and Poisson's ratio, Stress-Strain relation.behaviour in Tension for Mild steel and non ferrous metals. Extension /Shortening of a bar, bars with cross sections varying in steps, bars with continuously varying cross sections (circular and rectangular), Elongation due to self weight, Principle of super position.

Stress in composite section: Volumetric strain, expression for volumetric strain, elastic constants, simple shear stress, shear strain, temperature stresses (including compound bars).

Module-II

Compound stresses: Introduction, plane stress, stresses on inclined sections, principal stresses and maximum shear stresses, Mohr's circle for plane stress.

Thick and thin cylinders: Stresses in thin cylinders, changes in dimensions of cylinder (diameter, length and volume), Thick cylinders subjected to internal and external pressures (Lame's equation), (compound cylinders not included).

Module-III

Shear force and bending moment diagrams

Introduction, Types of beams, loads and reactions, shear forces and bending moments, rate of loading, sign conventions, relationship between shear force and bending moments, shear force and bending moment diagrams for different beams subjected to concentrated loads, uniform distributed load (UDL) and couple for different types of beams.

Module-IV

Bending and shear stresses in beams: Introduction, theory of simple bending, assumptions in simple bending, relationship between bending stresses and radius of curvature, relationship between bending moment and radius of curvature, moment carrying capacity of a section, shearing stresses in beams, shear stress across rectangular, circular, symmetrical I and T sections (composite / fletched beams not included).

Deflection of beams: Introduction, differential equation for deflection, equations for deflections, slope and moments, double integration method for cantilever and simply supported beams for point load, UDL, and Couple, Macaulay's method.

Module-V

Torsion of circular shafts and Elastic stability of columns:

Introduction, pure torsion, assumptions, derivation of torsional equations, polar modulus, torsional rigidity / stiffness of shafts, power transmitted by solid and hollow circular shafts. Introduction to columns, Euler's theory for axially loaded elastic long columns, derivation of Euler's load for various end conditions, limitations of Euler's theory, Rankine's formula.

TEXT BOOK

1	Ferdinand Beer & Russell Johnston	Mechanics of materials- S.I. Units. Tata MaGrawHill. 2003.
2	Jayram M.A.	Strength of Materials. Ed 5. Spana Book House. 2007.

REFERENCE BOOK

1	Bhavikatti S.S.	Strength of Materials. Ed 2. Vikas publications House. 2006.
2	Nash W.A.	Strength of Materials. Ed 4. Sahaum's Outline Series. 2007.
3	K.V. Rao, G.C. Raju	Mechanics of materials. Ed1.2007.

MANUFACTURING PROCESS –1

Contact Hours/ Week	: 3 (L)	Credits :	3
Total Lecture Hours	: 39	CIE Marks :	50
Sub. Code	: ME35	SEE Marks :	50

Module-I

1. Introduction to manufacturing process, classification of manufacturing process, steps involved in typical sand casting operations, and flow chart.
2. Types of sand, desirable properties of the molding sand and additives.
3. Functions of the patterns, pattern materials, pattern allowances, Selection of the pattern.
4. Sand molding methods– Green sand, dry sand, skin dried, CO_2 process.
5. Special casting techniques – shell moulding, investment casting.
6. Permanent mold casting, Pressure die casting.
7. Brief description of fettling and finishing of castings and defects in castings-Blow holes, hot tears and core shift. **7 Hrs.**

Module-II

1. Single point cutting tool nomenclature, difference between orthogonal and oblique cutting.
2. Mechanism of chip formation and types of chips.
3. Merchant circle analysis.
4. Shear angle relationship and problems.
5. Tool wear and tool failure, tool life equation and problems.
6. Factors affecting heat generation, measurement of tool tip-temperature.
7. Machinability and factors affecting it, Cutting fluids, types of Cutting fluids, Its beneficial effects.
8. Cutting tool materials, properties. **8 Hrs.**

Module-III

1. Principle of arc and gas welding.
2. Resistance welding-Spot welding, projection and seem.
3. Solid state welding-Friction, Explosive, Forge welding.
4. Thermo chemical welding- thermit welding.
5. Radiant energy welding- EBW and LBW.
6. Tig welding, Mig welding, advantages and applications.
7. Welding defects. **7 Hrs.**

Module-IV

1. Classification of drilling machines, constructional features of radial drilling machine.
2. Drilling and related operations, types of drills.
3. Drill bit- nomenclature.
4. Classification of shaping machines, shaper mechanisms–crank & slotted and Hydraulic shaper mechanism.
5. Tool and work holding devices.
6. Calculation of machining time on shaping machine, problems.
7. Classification of planning machines, constructional features of double housing planer. **8 Hrs.**

Module-V

1. Classification and constructional features of Vertical & horizontal milling machines.
2. Types of milling cutters.
3. Milling machine operations.
4. Nomenclature of plain milling cutter (pmc).
5. Fundamentals of milling - peripheral milling (up and down milling), face milling, & end milling.
6. Indexing methods simple indexing, compound indexing & differential indexing.
7. Problems on simple indexing, compound indexing & differential indexing.

9 Hrs.

TEXT BOOK

1	Jain R.K.	Production Technology. Khanna publishers. 2004.
2	Hajra Choudhary.	Elements Of Workshop Technology. Vol. 2. Dhanpat Rai and Sons. 1992.

REFERENCE BOOK

1	P.N. Rao	Manufacturing Technology
2	Serope Kalpakjian, Steven R. Scmidt	Manufacturing Technology. Ed 4. Pearson Education Asia. 2000.

Scheme of Examination: Student has to answer all five questions.

COMPUTER AIDED MACHINE DRAWING

Contact Hours/ Week	: 2+2	Credits :	2.0
Total Lecture Hours	: 52	CIE Marks :	50
Sub. Code	: MEL31	SEE Marks :	50

Note: * Drawings should be taught using Solid Edge package (Drafting only).
* 10% of the marks are for annotations and dimensioning.
* No viva voce to be conducted.
* Indicated marks for evaluation.

PART A

Module-I

Introduction:
Review of graphic interface of the software. Review of basic sketching commands and navigational commands. Starting a new drawing sheet. Sheet sizes. Naming a drawing. Drawing Modules, grid and snap. **2 Hrs.**

Sectional views: Conversion of pictorial views into orthographic projections of simple machine parts with and without section. (Bureau of Indian Standards conventions are to be followed for the drawings) Hidden line conventions. **10 Hrs.**

Module-II

Thread forms: Thread terminology, sectional views of threads. ISO Metric (Internal & External) BSW (Internal & External) square and ACME. Sellers thread, American Standard thread.

Fasteners: Hexagonal headed bolt and nut with washer (assembly), square headed bolt and nut with washer. Studs, lock nuts, taper and split pin for locking, Parallel key, taper key, Feather key, Gibhead key and Woodruff key. **8 Hrs.**

PART B

Module-III

Riveted and pin Joints:
Single and double riveted lap joints, butt joints with single/double cover straps (Chain and Zigzag, using snap head rivets). Cotter joint (socket and spigot), knuckle joint (pin joint) for two rods. **8 Hrs.**

Module-IV

Couplings:
Solid Muff coupling, Protected and unprotected type flanged coupling. **6 Hrs.**

PART C

Module-5: Assembly Drawings

1. Screw jack (Bottle type)
2. Plummer block (Pedestal Bearing)
3. Machine vice
4. Tool Head of shaper
5. Tailstock of lathe
6. Crane hook
7. I.C. Engine connecting rod **18 Hrs.**

TEXT BOOKS

1	K.R. Gopala Krishna	Machine Drawing, Subhash Publication. Bangalore.
2	N.D. Bhat & V.M. Panchal	Machine Drawing. Charotar Publishing House. ANAND

REFERENCE BOOKS

1	VTU	A Primer on Computer Aided Machine Drawing. VTU, Belgaum.
2	Junnarker N.D.	Machine Drawing. Pearson Education. Delhi. 2005.

Internal assessment: 50 Marks

All the drawings should be drawn in the class using software. Sheet size should be A4. All sheets must be submitted at the end of the class.

Scheme of Examination

One question to be set from Part-A, 2 questions to be set from Part -B and one from Part-C. Student has to answer three questions selecting one from each part.

i.e. PART-A 1x10 = 10 Marks
PART-B 1x10 = 10 Marks
PART-C 1x30 = 30 Marks
Total = 50 Marks

MATERIALS TESTING LABORATORY

Lab Hours/ Week	: 2	Credits :	1.5
Sub. Code	: MEL32	CIE Marks :	50
		SEE Marks :	50

Part A

Preparation of Specimen for Metallographic Examination
(Aluminium and Medium Carbon Steel Metal)
Observation of Microstructure of following Prepared Specimen.

i. Plain carbon steels.
ii. Tool steel.
iii. Gray cast Iron.
iv. Spheroidal graphite iron.
v. Cast iron.
vi. Copper
vii. Aluminium
viii. Brass.
ix. Bronze.
x. Aluminium-Silicon alloys.

Annealing heat treatment and checking the hardness for medium carbon steels- (For demonstration only).

Hardening heat treatment and checking the hardness for medium carbon steels.- (For demonstration only).

Die penetration test
Ultrasonic test
Magnetic particle test

Part - B

Tensile test for low carbon steel.
Compression test for low carbon steel.
Shear test for low carbon steel.
Rockwell hardness test for three different metals.
Brinell hardness test for three different metals.
Impact tests low carbon steel.
Wear test for two different metals.

REFERENCE BOOK

1	William D. Callister Jr.	Materials Science & Engineering. Ed 5. John Wiley & Sons Inc. 2001.
2	Raghavan V.	Materials Science and Engineering. PHI. 2006.
3	VanVlack H.	Elements of materials science & Engg. Addison–Wesley Edition. 1998.
4	Donald R. Askeland	The science and Engineering of Materials. Ed 4. Thomson Asia. Singapore. 2007.

Continuing Internal Evaluation:

Conduction of Experiment and calculation in the class =20 marks
Laboratory record submission = 20 marks
Viva related experiment = 10 marks

Final Semester Examination:

Answer all questions.
1. One question from part A for 20 marks.
2. One question from part B for 20 marks.
3. Viva for 10 marks.

FORGING LABORATORY

Lab Hours/ Week	: 2	Credits :	1.5
Sub. Code	: MEL33	CIE Marks :	50
		SEE Marks :	50

PART-A

1. Smithy & Forging models

Preparing minimum three models in each technique involving upsetting, drawing and bending operations.

PART-B

2. **Wood Turning**

Preparing minimum three models using wood turning machines involving operations like turning, step turning, concave and convex surfaces etc.

SCHEME OF EXAMINATION

One question is to be set from Part-A	: 30 marks
One question is to be set from either Part-B	: 10 marks
Viva	: 10 marks