

ENGINEERING MATHEMATICS – III

CODE: 10 MAT 31
Hrs/Week: 04
Total Hrs: 52
Marks:100

IA Marks: 25
Exam Hrs: 03
Exam

PART-A

Unit-I: FOURIER SERIES

Convergence and divergence of infinite series of positive terms, definition and illustrative examples*
Periodic functions, Dirichlet's conditions, Fourier series of periodic functions of period 2π and arbitrary period, half range Fourier series. Complex form of Fourier Series.
Practical harmonic analysis. **[7 hours]**

Unit-II: FOURIER TRANSFORMS

Infinite Fourier transform, Fourier Sine and Cosine transforms, properties, Inverse transforms
[6 hours]

Unit-III: APPLICATIONS OF PDE

Various possible solutions of one dimensional wave and heat equations, two dimensional Laplace's equation by the method of separation of variables, Solution of all these equations with specified boundary conditions.
D'Alembert's solution of one dimensional wave equation.
[6 hours]

Unit-IV: CURVE FITTING AND OPTIMIZATION

Curve fitting by the method of least squares- Fitting of
curves of the form

$$y = ax + b, \quad y = ax^2 + bx + c, \quad y = ae^{bx}, \quad y = ax^b$$

Optimization: Linear programming, mathematical formulation of linear programming problem (LPP), Graphical method and simplex method.

[7 hours]

PART-B

Unit-V: NUMERICAL METHODS - 1

Numerical Solution of algebraic and transcendental equations: Regula-falsi method, Newton - Raphson method. Iterative methods of solution of a system of equations: Gauss-seidel and Relaxation methods. Largest eigen value and the corresponding eigen vector by Rayleigh's power method.

[6 hours]

Unit-VI: NUMERICAL METHODS – 2

Finite differences: Forward and backward differences, Newton's forward and backward interpolation formulae. Divided differences - Newton's divided difference formula, Lagrange's interpolation formula and inverse interpolation formula.

Numerical integration: Simpson's one-third, three-eighth and Weddle's rules (All formulae/rules without proof)

[7 hours]

Unit-VII: NUMERICAL METHODS – 3

Numerical solutions of PDE – finite difference approximation to derivatives, Numerical solution of two dimensional Laplace's equation, one dimensional heat and wave equations [7 hours]

Unit-VIII: DIFFERENCE EQUATIONS AND Z-TRANSFORMS

Difference equations: Basic definition; Z-transforms – definition, standard Z-transforms, damping rule, shifting rule, initial value and final value theorems. Inverse Z-transform. Application of Z-transforms to solve difference equations.

[6 hours]

Note: * In the case of illustrative examples, questions are not to be set.

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Latest edition, Khanna Publishers
2. Erwin Kreyszig, Advanced Engineering Mathematics, Latest edition, Wiley Publications.

Reference Book:

1. B.V. Ramana, Higher Engineering Mathematics, Latest edition, Tata Mc. Graw Hill Publications.
2. Peter V. O'Neil, Engineering Mathematics, CENGAGE Learning India Pvt Ltd. Publishers

MATERIAL SCIENCE AND METALLURGY

Subject Code	: 10ME32A /42A	IA Marks	: 25
Hours/Week	: 04	Exam Hours	: 03
Total Hours	: 52	Exam Marks	: 100

PART – A

UNIT - 1

Crystal Structure: BCC, FCC and HCP Structures, coordination number and atomic packing factors, crystal imperfections -point line and surface imperfections. Atomic Diffusion: Phenomenon, Ficks laws of diffusion, factors affecting diffusion.

06 Hours

UNIT - 2

Mechanical Behaviour: Stress-strain diagram showing ductile and brittle behaviour of materials, linear and non linear elastic behaviour and properties, mechanical properties in plastic range, yield strength offset yield strength, ductility, ultimate tensile strength, toughness. Plastic deformation of single crystal by slip and twinning.

06 Hours

UNIT - 3

Fracture: Type I, Type II and Type III.

Creep: Description of the phenomenon with examples. three stages of creep, creep properties, stress relaxation.

Fatigue: Types of fatigue loading with examples, Mechanism of fatigue, fatigue properties, fatigue testing and S-N diagram.

07 Hours

UNIT - 4

Solidification: Mechanism of solidification, Homogenous and Heterogeneous nucleation, crystal growth, cast metal structures.

Phase Diagram I: Solid solutions Hume Rothary rule substitutional, and interstitial solid solutions, intermediate phases, Gibbs phase rule.

07 Hours

PART - B

UNIT - 5

Phase Diagram II: Construction of equilibrium diagrams involving complete and partial solubility, lever rule. Iron carbon equilibrium diagram description of phases, solidification of steels and cast irons, invariant reactions.

06 Hours

UNIT - 6

Heat treating of metals: TTT curves, continuous cooling curves, annealing and its types. normalizing, hardening, tempering, martempering, austempering, hardenability, surface hardening methods like carburizing, cyaniding, nitriding, flame hardening and induction hardening, age hardening of aluminium-copper alloys.

07 Hours

UNIT - 7

Ferrous and non ferrous materials: Properties, Composition and uses of

- Grey cast iron, malleable iron, SG iron and steel
- Copper alloys-brasses and bronzes.
Aluminium alloys-Al-Cu,Al-Si,Al-Zn alloys.

06 Hours

UNIT - 8

Composite Materials: Definition, classification, types of matrix materials & reinforcements, fundamentals of production of FRP's and MMC's advantages and application of composites.

07 Hours

TEXT BOOKS:

1. **Foundations of Materials Science and Engineering**, Smith, 4th Edition McGraw Hill, 2009
2. **Materials Science, Shackelford., & M. K. Muralidhara**, Pearson Publication – 2007.

REFERENCE BOOKS:

1. **An Introduction to Metallurgy; Alan Cottrell**, Universities Press India Oriental Longman Pvt. Ltd., 1974.
2. **Engineering Materials Science**, W.C.Richards, PHI, 1965
3. **Physical Metallurgy**; Lakhtin, Mir Publications
4. **Materials Science and Engineering**, V.Raghavan , PHI, 2002
5. **Elements of Materials Science and Engineering**, H. VanVlack, Addison-Wesley Edn., 1998
6. **Materials Science and Engineering**,William D. Callister Jr., John Wiley & Sons. Inc, 5th Edition, 2001.
7. **The Science and Engineering of Materials**, Donald R. Asklund and Pradeep.P. Phule, Cengage Learning, 4th Ed., 2003.

MECHANICAL MEASUREMENTS AND METROLOGY

Subject Code	: 10ME32B /42B	IA Marks	: 25
Hours/Week	: 04	Exam Hours	: 03
Total Hours	: 52	Exam Marks	: 100

PART- A

UNIT-1

Standards of measurement: Definition and Objectives of metrology, Standards of length-International prototype meter, Imperial standard yard, Wave length standard, subdivision of standards, line and end standard, calibration of end bars (Numerical), Slip gauges, Wringing phenomena, Indian Standards (M-81, M-12), Numerical problems on building of slip gauges.

06 Hours

UNIT-2

System of Limits, Fits, Tolerance and Gauging: Definition of tolerance, Specification in assembly, Principle of interchangeability and selective assembly limits of size, Indian standards, concept of limits of size and tolerances, compound tolerances, accumulation of tolerances, definition of fits, types of fits and their designation (IS 919-1963), geometrical tolerance, positional-tolerances, hole basis system, shaft basis system, classification of gauges, brief concept of design of gauges (Taylor's principles), Wear allowance on gauges, Types of gauges-plain plug gauge, ring gauge, snap gauge, limit gauge and gauge materials.

07 Hours

UNIT-3

Comparators and Angular measurement: Introduction to comparators, characteristics, classification of comparators, mechanical comparators-Johnson Mikrokator, sigma comparators, dial indicator, optical comparators-principles, Zeiss ultra optimeter, electric and electronic comparators-principles, LVDT, pneumatic comparators, back pressure gauges, solex comparators. Angular measurements, bevel protractor, sine principle and use of sine bars, sine centre, use of angle gauges (numericals on building of angles), clinometers.

07 Hours

UNIT-4:

Interferometer and screw thread, gear measurement: Interferometer, interferometry, autocollimator. Optical flats. Terminology of screw threads, measurement of major diameter, minor diameter, pitch, angle and effective diameter of screw threads by 2-wire and 3-wire methods, best size

wire. Tool maker's microscope, gear tooth terminology, use of gear tooth vernier caliper and micrometer.

06 Hours

PART-B

UNIT-5:

Measurements and measurement systems: Definition, significance of measurement, generalized measurement system, definitions and concept of accuracy, precision, calibration, threshold, sensitivity, hysteresis, repeatability, linearity, loading effect, system response-times delay. Errors in measurement, classification of errors. Transducers, transfer efficiency, primary and secondary transducers, electrical, mechanical, electronic transducers, advantages of each type transducers.

07 Hours

UNIT-6

Intermediate modifying and terminating devices: Mechanical systems, inherent problems, electrical intermediate modifying devices, input circuitry, ballast circuit, electronic amplifiers and telemetry. Terminating devices, mechanical, cathode ray oscilloscope, oscillographs, X-Y plotters.

06 Hours

UNIT-7

Measurement of force, torque and pressure: Principle, analytical balance, platform balance, proving ring. Torque measurement, Prony brake, hydraulic dynamometer. Pressure measurements, principle, use of elastic members, Bridgeman gauge, McLeod gauge, Pirani gauge.

06 Hours

UNIT-8

Temperature and strain measurement: Resistance thermometers, thermocouple, law of thermo couple, materials used for construction, pyrometer, optical pyrometer. Strain measurements, strain gauge, preparation and mounting of strain gauges, gauge factor, methods of strain measurement.

07 Hours

TEXT BOOKS:

1. **Mechanical Measurements**, Beckwith Marangoni and Lienhard, Pearson Education, 6th Ed., 2006.
2. **Engineering Metrology**, R.K. Jain, Khanna Publishers, 1994.

REFERENCE BOOKS:

1. **Engineering Metrology**, I.C. Gupta, Dhanpat Rai Publications, Delhi.
2. **Mechanical Measurements**, R.K. Jain Khanna Publishers, 1994
3. **Industrial Instrumentation**, Alstutko, Jerry. D. Faulk, Cengage Asia Pvt. Ltd. 2002.
4. **Measurement Systems Applications and Design**, Ernest O. Doebelin, 5th Ed., McGraw Hill Book Co.
5. **Metrology & Measurement**, Anand K. Bewoor & Vinay A. Kulkarni, Tata McGraw Hill Pvt. Ltd., New-Delhi

BASIC THERMODYNAMICS

(Common to ME/IP/AU/IM/MA)

Subject Code	: 10ME33	IA Marks	: 25
Hours/Week	: 04	Exam Hours	: 03
Total Hours	: 52	Exam Marks	: 100

PART-A**UNIT - 1**

Fndamental Concepts & Definitions: Thermodynamics definition and scope, Microscopic and Macroscopic approaches. Some practical applications of engineering thermodynamic Systems, 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 ;rocesses; Thermodynamic equilibrium; definition, mechanical equilibrium; diathermic wall, thermal equilibrium, chemical equilibrium, Zeroth law of thermodynamics, Temperature; concepts, scales, fixed points and measurements.

06 Hours**UNIT - 2**

Work and Heat: Mechanics, definition of work and its limitations. Thermodynamic definition of work; examples, sign convention. Displacement work; as a part of a system boundary, as a 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.

06 Hours**UNIT - 3**

First Law of Thermodynamics: Joules 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 at constant pressure. Extension of the First law to control volume; steady state-steady flow energy equation, important applications, analysis of unsteady processes such as film and evacuation of vessels with and without heat transfer.

07 Hours

UNIT - 4

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; reversed heat engine, schematic representation, coefficients of performance. Kelvin - Planck statement of the Second law of Thermodynamics; PMM I and PMM II, Clausius statement of Second law of Thermodynamics, Equivalence of the two statements; Reversible and irreversible processes; factors that make a process irreversible, reversible heat engines, Carnot cycle, Carnot principles.

07 Hours

PART-B

UNIT - 5

Entropy: Clausius inequality; Statement, proof, application to a reversible cycle. Entropy; definition, a property, change of entropy, principle of increase in entropy, entropy as a quantitative test for irreversibility, calculation of entropy using Tds relations, entropy as a coordinate. Available and unavailable energy.

06 Hours

UNIT - 6

Pure Substances: P-T and P-V diagrams, triple point and critical points. Sub-cooled liquid, saturated liquid, mixture of saturated liquid and vapour, saturated vapour and superheated vapour states of pure substance with water as example. Enthalpy of change of phase (Latent heat). Dryness fraction (quality), T-S and H-S diagrams, representation of various processes on these diagrams. Steam tables and its use. Throttling calorimeter, separating and throttling calorimeter.

07 Hours

UNIT - 7

Thermodynamic relations: Maxwell relation, Clausius Clayperon's equation. 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.

07 Hours

UNIT - 8

Ideal gas mixture : Ideal gas mixture; Dalton's laws of partial pressures, Amagat's law of additive volumes, evaluation of properties, Analysis of various processes. Real Gases: Introduction. Van-der Waal's Equation of state, Van-der Waal's constants in terms of critical properties, Law of corresponding states, compressibility factor; compressibility chart

06 Hours

Data Handbooks :

1. **Thermodynamic data hand book**, B.T. Nijaguna.
2. **Properties of Refrigerant & Psychometric** (tables & Charts in SI Units), Dr. S.S. Banwait, Dr. S.C. Laroia, Birla Pub. Pvt. Ltd., Delhi, 2008

TEXT BOOKS:

1. **Basic Engineering Thermodynamics**, A.Venkatesh, Universities Press, 2008
2. **Basic and Applied Thermodynamics**, P.K.Nag, 2nd Ed., Tata McGraw Hill Pub. 2002

REFERENCE BOOKS:

1. **Thermodynamics**, An Engineering Approach, Yunus A.Cengel and Michael A.Boles, Tata McGraw Hill publications, 2002
2. **Engineering Thermodynamics**, J.B.Jones and G.A.Hawkins, John Wiley and Sons..
3. **Fundamentals of Classical Thermodynamics**, G.J.Van Wylen and R.E.Sonntag, Wiley Eastern.
4. **An Introduction to Thermodynamics**, Y.V.C.Rao, Wiley Eastern, 1993,
5. **B.K Venkanna, Swati B. Wadavadagi "Basic Thermodynamics**, PHI, New Delhi, 2010

MECHANICS OF MATERIALS

Subject Code	: 10ME34	IA Marks	: 25
Hours/Week	: 04	Exam Hours	: 03
Total Hours	: 52	Exam Marks	: 100

PART-A

UNIT 1:

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, cast iron 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.

07 Hours

UNIT 2:

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

06 Hours

UNIT 3:

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

07 Hours

UNIT 4:

Energy Methods: Work and strain energy, Strain energy in bar/beams, Castigliano's theorem, Energy methods.

Thick and Thin Cylinder Stresses in thin cylinders, changes in dimensions of cylinder (diameter, length and volume). Thick cylinders Lamé's equation (compound cylinders not included).

06 Hours

PART-B

UNIT 5:

Bending Moment and Shear Force in Beams: 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, uniformly distributed load, (UDL) uniformly varying load (UVL) and couple for different types of beams.

07 Hours

UNIT 6:

Bending and Shear Stresses in Beams: Introduction, Theory of simple bending, assumptions in simple bending. Bending stress equation, relationship between bending stress, 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 / notched beams not included).

07 Hours

UNIT 7:

Deflection of Beams: Introduction, Differential equation for deflection. Equations for deflection, slope and bending moment. Double integration method for cantilever and simply supported beams for point load, UDL, UVL and Couple. Macaulay's method

06 Hours

UNIT 8:

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

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.

06 Hours

TEXT BOOKS:

1. "**Mechanics of Materials**", by R.C.Hibbeler, Prentice Hall. Pearson Edu., 2005
2. "**Mechanics of materials**", James.M.Gere, Thomson, Fifth edition 2004.
3. "**Mechanics of materials**", in SI Units, Ferdinand Beer & Russell Johnston, 5th Ed., TATA McGraw Hill- 2003.

REFERENCE BOOKS:

1. "**Strength of Materials**", S.S. Rattan, Tata McGraw Hill, 2009
2. "**Strength of Materials**", S.S.Bhavikatti, Vikas publications House -1 Pvt. Ltd., 2nd Ed., 2006.

3. "**Mechanics of Materials**", K.V. Rao, G.C. Raju, First Edition, 2007
4. "**Engineering Mechanics of Solids**", Egor.P. Popov, Pearson Edu. India, 2nd, Edition, 1998.
5. "**Strength of Materials**", W.A. Nash, 5th Ed., Schaum's Outline Series, Fourth Edition-2007.

**MANUFACTURING PROCESS – I
(FUNDAMENTALS OF FOUNDRY & WELDING)**

Subject Code	: 10ME35	IA Marks	: 25
Hours/Week	: 04	Exam Hours	: 03
Total Hours	: 52	Exam Marks	: 100

PART – A

CASTING PROCESS

UNIT - 1

Introduction: Concept of Manufacturing process, its importance. Classification of Manufacturing processes. Introduction to Casting process & steps involved. Varieties of components produced by casting process. Advantages & Limitations of casting process.

Patterns: Definition, functions, Materials used for pattern, various pattern allowances and their importance. Classification of patterns, BIS color coding of Patterns.

Binder: Definition, Types of binder used in moulding sand.

Additives: Need, Types of additives used and their properties..

06 Hours

UNIT - 2

Sand Moulding : Types of base sand, requirement of base sand. Moulding sand mixture ingredients for different sand mixtures. Method used for sand moulding, such as Green sand, dry sand and skin dried moulds.

Cores: Definition, Need, Types. Method of making cores, Binders used, core sand moulding.

Concept of Gating & Risers. Principle and types.

Fettling and cleaning of castings. Basic steps, Casting defects, Causes, features and remedies.

Moulding Machines : Jolt type, Squeeze type, Jolt & Squeeze type and Sand slinger.

07 Hours

UNIT - 3

Special moulding Process: Study of important moulding processes, No bake moulds, Flaskless moulds, Sweep mould, CO₂ mould, Shell mould, Investment mould.

Metal moulds: Gravity die-casting, Pressure die casting, Centrifugal casting, Squeeze Casting, Slush casting, Thixo-casting and Continuous Casting Processes.

07 Hours

UNIT - 4

Melting Furnaces: Classification of furnaces. Constructional features & working principle of coke fired, oil fired and Gas fired pit furnace, Resistance furnace, Coreless Induction furnace, Electric Arc Furnace, Cupola furnace.

06 Hours

PART – B

WELDING

UNIT - 5

Welding process: Definition, Principles, Classification, Application, Advantages & limitations of welding.

Arc Welding: Principle, Metal Arc welding (**MAW**), Flux Shielded Metal Arc Welding (**FSMAW**), Inert Gas Welding (**TIG & MIG**) Submerged Arc Welding (**SAW**) and Atomic Hydrogen Welding processes. (**AHW**)

Gas Welding: Principle, Oxy – Acetylene welding, Chemical Reaction in Gas welding, Flame characteristics. Gas torch construction & working. Forward and backward welding.

07 Hours

UNIT - 6

Special types of welding: Resistance welding - principles, Seam welding, Butt welding, Spot welding and projection welding.

Friction welding, Explosive welding, Thermit welding, Laser welding and Electron beam welding.

07 Hours

UNIT - 7

Metallurgical aspect, in welding : Structure of welds, Formation of different zones during welding. Heat affected zone (**HAZ**). Parameters affecting **HAZ**. Effect of carbon content on structure and properties of steel. Shrinkage in welds & Residual stresses.

Concept of electrodes, Filler rod and fluxes. Welding defects – Detection causes & remedy.

06 Hours

UNIT - 8

Principles of soldering & brazing: Parameters involved & Mechanism. Different Types of Soldering & Brazing Methods.

Inspection Methods – Methods used for Inspection of casting and welding. Visual, Magnetic particle, Fluorescent particle, Ultrasonic, Radiography, Eddy current, Holography methods of Inspection.

06 Hours

TEXT BOOKS:

1. “**Manufacturing Process-I**”, Dr.K.Radhakrishna, Sapna Book House, 5th Revised Edition 2009.
2. “**Manufacturing & Technology: Foundry Forming and Welding**”, P.N.Rao, 3rd Ed., Tata McGraw Hill, 2003.

REFERENCE BOOKS:

1. “**Process and Materials of Manufacturing**”, Roy A Lindberg, 4th Ed. Pearson Edu. 2006.
2. “**Manufacturing Technology**”, Serope Kalpakjian, Steuen. R. Sechmid, Pearson Education Asia, 5th Ed. 2006.

COMPUTER AIDED MACHINE DRAWING

Subject Code :10ME36A/10ME46A **IA Marks** : 25

Hours/Week	: 04(1 Hrs. Theory & 3 Hrs Practical)	Exam Hours	: 03
Total Hours	: 52	Exam Marks	: 100

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 units, grid and snap.

02 Hours

PART-A

UNIT - 1

Sections of Solids: Sections of Pyramids, Prisms, Cubes, Tetrahedrons, Cones and Cylinders resting only on their bases (No problems on axis inclinations, spheres and hollow solids). True shape of sections.

Orthographic Views: Conversion of pictorial views into orthographic projections. of simple machine parts with or without section. (Bureau of Indian Standards conventions are to be followed for the drawings) Hidden line conventions. Precedence of lines.

08 Hours

UNIT - 2

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 (assembly) simple assembly using stud bolts with nut and lock nut. Flanged nut, slotted nut, taper and split pin for locking, counter sunk head screw, grub screw, Allen screw.

08 Hours

PART-B

UNIT - 3

Keys & Joints :

Parallel key, Taper key, Feather key, Gibhead key and Woodruff key

Riveted 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.

08 Hours

UNIT - 4

Couplings:

Split Muff coupling, Protected type flanged coupling, pin (bush) type flexible coupling, Oldham's coupling and universal coupling (Hooks' Joint)

08 Hours

PART - C

Assembly Drawings

(Part drawings should be given)

1. Plummer block (Pedestal Bearing)
2. Rams Bottom Safety Valve
3. I.C. Engine connecting rod
4. Screw jack (Bottle type)
5. Tailstock of lathe
6. Machine vice
7. Tool Head of a shaper

18 Hours

TEXT BOOKS:

1. 'A Primer on Computer Aided Machine Drawing-2007', Published by VTU, Belgaum.
2. 'Machine Drawing', N.D.Bhat & V.M.Panchal

REFERENCE BOOKS:

1. 'A Text Book of Computer Aided Machine Drawing', S. Trymbaka Murthy, CBS Publishers, New Delhi, 2007
2. 'Machine Drawing', K.R. Gopala Krishna, Subhash Publication.
3. 'Machine Drawing with Auto CAD', Goutam Pohit & Goutham Ghosh, 1st Indian print Pearson Education, 2005
4. 'Auto CAD 2006, for engineers and designers', Sham Tickoo. Dream tech 2005
5. 'Machine Drawing', N. Siddeshwar, P. Kanniah, V.V.S. Sastri, published by Tata McGraw Hill,2006

NOTE:

Internal assessment: 25 Marks

All the sheets should be drawn in the class using software. Sheet sizes should be A3/A4. All sheets must be submitted at the end of the class by taking printouts.

Scheme of Examination:

Two questions to be set from each Part-A, Part-B and Part-C

Student has to answer one question each from Part-A and Part-B for 20 marks each. And one question from Part-C for 60 marks.

i.e.	PART-A 1 x 20 = 20 Marks
	PART-B 1 x 20 = 20 Marks
	PART-C 1 x 60 = 60 Marks
	<hr/>
Total	= 100 Marks

FLUID MECHANICS

Subject Code	: 10ME36B / 46B	IA Marks	: 25
Hours/Week	: 04	Exam Hours	: 03
Total Hours	: 52	Exam Marks	: 100

PART – A

UNIT-1

Properties of Fluids: Introduction, Types of fluid, Properties of fluids, viscosity, thermodynamic properties, surface tension, capillarity, vapour pressure and cavitation

06 Hours

UNIT-2

Fluid Statistics: Fluid pressure at a point, Pascal's law, pressure variation in a static fluid, absolute, gauge, atmospheric and vacuum pressures, simple manometers and differential manometers. Total pressure and center of pressure on submerged plane surfaces; horizontal, vertical and inclined plane surfaces, curved surface submerged in liquid.

07 Hours

UNIT-3

Buoyancy and Fluid Kinematics:

Buoyancy, center of buoyancy, metacentre and metacentric height, conditions of equilibrium of floating and submerged bodies, determination of Metacentric height experimentally and theoretically.

Kinematics: Types of fluid flow, continuity equation in 2D and 3D (Cartesian Co-ordinates only), velocity and acceleration, velocity potential function and stream function.

07 Hours

UNIT-4

Fluid Dynamics: Introduction equation of motion, Euler's equation of motion, Bernoulli's equation from first principles and also from Euler's equation, limitations of Bernoulli's equation.

06 Hours

PART-B

UNIT-5

Fluid Flow Measurements : Venturimeter, orificemeter, pitot-tube, vertical orifice, V-Notch and rectangular notches.

Dimensional Analysis : Introduction, derived quantities, dimensions of physical quantities, dimensional homogeneity, Rayleigh's method, Buckingham π theorem, dimensionless numbers, similitude, types of similitudes.

07 Hours

UNIT-6

Flow through pipes : Minor losses through pipes. Darcy's and Chezy's equation for loss of head due to friction in pipes. HGL and TEL.

06 Hours

UNIT-7

Laminar flow and viscous effects : Reynold's number, critical Reynold's number, laminar flow through circular pipe-Hagen Poiseuille's equation, laminar flow between parallel and stationary plates.

06 Hours

UNIT-8

Flow past immersed bodies : Drag, Lift, expression for lift and drag, boundary layer concept, displacement, momentum and energy thickness.

Introduction to compressible flow : Velocity of sound in a fluid, Mach number, Mach cone, propagation of pressure waves in a compressible fluid.

07 Hours

TEXT BOOKS:

1. **Fluid Mechanics**, Oijush.K.Kundu, IRAM COCHEN, ELSEVIER, 3rd Ed. 2005.
2. **Fluid Mechanics**, Dr. Bansal, R.K.Lakshmi Publications, 2004.

REFERENCE BOOKS:

1. **Fluid Mechanics and hydraulics**, Dr.Jagadishlal: Metropolitan Book Co-Ltd., 1997.
2. **Fluid Mechanics (SI Units)**, Yunus A. Cengel John M.Oimbala, 2nd Ed., Tata McGraw Hill, 2006.

3. **Fluid Mechanics**, John F.Douglas, Janul and M.Gasiosek and john A.Swaffield, Pearson Education Asia, 5th ed., 2006
4. **Fluid Mechanics and Fluid Power Engineering**, Kumar.D.S, Kataria and Sons., 2004
5. **Fluid Mechanics** -. Merle C. Potter, Elaine P.Scott. Cengage learning

METALLOGRAPHY AND MATERIAL TESTING LABORATORY

Subject Code	: 10MEL37A / 47A	IA Marks	: 25
Hours/Week	: 03	Exam Hours	: 03
Total Hours	: 48	Exam Marks	: 50

PART – A

1. Preparation of specimen for Metallographic examination of different engineering materials. Identification of microstructures of plain carbon steel, tool steel, gray C.I, SG iron, Brass, Bronze & composites.
2. Heat treatment: Annealing, normalizing, hardening and tempering of steel. Hardness studies of heat-treated samples.
3. To study the wear characteristics of ferrous, non-ferrous and composite materials for different parameters.
4. Non-destructive test experiments like,
 - (a). Ultrasonic flaw detection
 - (b). Magnetic crack detection
 - (c). Dye penetration testing. To study the defects of Cast and Welded specimens

PART – B

1. Tensile, shear and compression tests of metallic and non metallic specimens using Universal Testing Machine
2. Torsion Test
3. Bending Test on metallic and nonmetallic specimens.
4. Izod and Charpy Tests on M.S, C.I Specimen.
5. Brinell, Rockwell and Vickers's Hardness test.
6. Fatigue Test.

Scheme of Examination:

ONE question from part -A:	20 Marks
ONE question from part -B:	20 Marks
Viva -Voice:	10 Marks

Total : 50 Marks

**MECHANICAL MEASUREMENTS AND METROLOGY
LABORATORY**

Subject Code	: 10MEL37B / 47B	IA Marks	: 25
Hours/Week	: 03	Exam Hours	: 03
Total Hours	: 48	Exam Marks	: 50

PART-A: MECHANICAL MEASUREMENTS

1. Calibration of Pressure Gauge
2. Calibration of Thermocouple
3. Calibration of LVDT
4. Calibration of Load cell
5. Determination of modulus of elasticity of a mild steel specimen using strain gauges.

PART-B: METROLOGY

1. Measurements using Optical Projector / Toolmaker Microscope.
2. Measurement of angle using Sine Center / Sine bar / bevel protractor
3. Measurement of alignment using Autocollimator / Roller set
4. Measurement of cutting tool forces using
 - a) Lathe tool Dynamometer
 - b) Drill tool Dynamometer.
5. Measurement of Screw thread Parameters using Two wire or Three-wire method.
6. Measurements of Surface roughness, Using Tally Surf/Mechanical Comparator
7. Measurement of gear tooth profile using gear tooth vernier /Gear tooth micrometer
8. Calibration of Micrometer using slip gauges
9. Measurement using Optical Flats

Scheme of Examination:

ONE question from part -A:	20 Marks
ONE question from part -B:	20 Marks
Viva -Voice:	10 Marks

Total : 50 Marks

FOUNDRY AND FORGING LABORATORY

Subject Code	: 10MEL38A / 48A	IA Marks	: 25
Hours/Week	: 03	Exam Hours	: 03
Total Hours	: 48	Exam Marks	: 50

PART – A

1. Testing of Moulding sand and Core sand

Preparation of sand specimens and conduction of the following tests:

- 1 Compression, Shear and Tensile tests on Universal Sand Testing Machine.
- 2 Permeability test
- 3 Core hardness & Mould hardness tests.
- 4 Sieve Analysis to find Grain Fineness number of Base Sand
- 5 Clay content determination in Base Sand

PART – B

2. Foundry Practice

Use of foundry tools and other equipments.

Preparation of moulds using two moulding boxes using patterns or without patterns. (Split pattern, Match plate pattern and Core boxes).

Preparation of one casting (Aluminum or cast iron-Demonstration only)

PART – C

3. Forging Operations :

- Calculation of length of the raw material required to do the model.
- Preparing minimum three forged models involving upsetting, drawing and bending operations.
- Out of these three models, at least one model is to be prepared by using Power Hammer.

Scheme of Examination:

One question is to be set from Part-A: 10 marks

One question is to be set from either

Part-B or Part-C: 30 marks

Calculation part in case of forging is made compulsory

Calculation + Foundry = 05 +25 = 30 Marks

(Forging) Model

Calculation + Forging = 05 +25 = 30 Marks

(Forging) Model

Viva-Voce : **10 marks.**

Total : **50 Marks.**

MACHINE SHOP

Subject Code	: 10MEL38B / 48B	IA Marks	: 25
Hours/Week	: 03	Exam Hours	: 03
Total Hours	: 48	Exam Marks	: 50

PART – A

Preparation of three models on lathe involving Plain turning, Taper turning, Step turning, Thread cutting, Facing, Knurling, Drilling, Boring, Internal Thread cutting and Eccentric turning.

PART – B

Cutting of V Groove/ dovetail / Rectangular groove using a shaper.
Cutting of Gear Teeth using Milling Machine.

Scheme of Examination:

ONE question from part -A:	30 Marks
ONE question from part -B:	10 Marks
Viva -Voice:	10 Marks

Total : 50 Marks

ENGINEERING MATHEMATICS – IV

**CODE: 10 MAT 41
Hrs/Week: 04
Total Hrs: 52
Marks:100**

**IA Marks: 25
Exam Hrs: 03
Exam**

PART-A

Unit-I: NUMERICAL METHODS - 1

Numerical solution of ordinary differential equations of first order and first degree; Picard's method, Taylor's series method, modified Euler's method, Runge-kutta method of fourth-order. Milne's and Adams - Bashforth predictor and corrector methods (No derivations of formulae).

[6 hours]

Unit-II: NUMERICAL METHODS – 2

Numerical solution of simultaneous first order ordinary differential equations: Picard's method, Runge-Kutta method of fourth-order.

Numerical solution of second order ordinary differential equations: Picard's method, Runge-Kutta method and Milne's method.

[6 hours]

Unit-III: Complex variables – 1

Function of a complex variable, Analytic functions-Cauchy-Riemann equations in cartesian and polar forms. Properties of analytic functions.

Application to flow problems- complex potential, velocity potential, equipotential lines, stream functions, stream lines.

[7 hours]

Unit-IV: Complex variables – 2

Conformal Transformations: Bilinear Transformations. Discussion of Transformations: $w = z^2$, $w = e^z$, $w = z + (a^2 / z)$. Complex line integrals- Cauchy's theorem and Cauchy's integral formula.

[7 hours]

PART-B

Unit-V: SPECIAL FUNCTIONS

Solution of Laplace equation in cylindrical and spherical systems leading Bessel's and Legendre's differential equations, Series solution of Bessel's differential equation leading to Bessel function of first kind. Orthogonal property of Bessel functions. Series solution of Legendre's differential equation leading to Legendre polynomials, Rodrigue's formula.

[7 hours]

Unit-VI: PROBABILITY THEORY - 1

Probability of an event, empirical and axiomatic definition, probability associated with set theory, addition law, conditional probability, multiplication law, Baye's theorem.

[6 hours]

Unit-VII: PROBABILITY THEORY- 2

Random variables (discrete and continuous), probability density function, cumulative density function. Probability distributions – Binomial and Poisson distributions; Exponential and normal distributions.

[7 hours]

Unit-VIII: SAMPLING THEORY

Sampling, Sampling distributions, standard error, test of hypothesis for means, confidence limits for means, student's t-distribution. Chi -Square distribution as a test of goodness of fit

[6 hours]

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Latest edition, Khanna Publishers
2. Erwin Kreyszig, Advanced Engineering Mathematics, Latest edition, Wiley Publications.

Reference Book:

1. B.V. Ramana, Higher Engineering Mathematics, Latest edition, Tata Mc. Graw Hill Publications.
2. Peter V. O'Neil, Engineering Mathematics, CENGAGE Learning India Pvt Ltd.Publishers

APPLIED THERMODYNAMICS

Subject Code	: 10ME43	IA Marks	: 25
Hours/Week	: 04	Exam Hours	: 03
Total Hours	: 52	Exam Marks	: 100

PART-A

UNIT - 1

Combustion thermodynamics: Theoretical (Stoichiometric) air and excess air for combustion of fuels. Mass balance, actual combustion. Exhaust gas analysis. A./ F ratio, Energy balance for a chemical reaction, enthalpy of formation, enthalpy and internal energy of combustion, Combustion efficiency, adiabatic flow temperature.

07 Hours

UNIT- 2

Gas power cycle: Air Standard cycles: Carnot, Otto, Diesel, Dual and Stirling cycles, P-V and T-S diagrams, description, efficiencies and mean effective pressures, Comparison of Otto, Diesel and dual cycles.

06 Hours

UNIT - 3

I.C. Engine: Testing of two stroke and four stroke SI and CI engines for performance Related numerical problems, heat balance, Motoring Method, Willian's line method, swinging field dynamometer, Morse test.

06 Hours

UNIT - 4

Vapour Power Cycles: Carnot vapour power cycles, drawbacks as a reference cycle, Simple Rankine cycle, description, T- S diagram, analysis

for performance , comparison of Carnot and Rankine cycles. Effects of pressure and temperature on Rankine cycle performance. Actual vapour power cycles. Ideal and practical regenerative Rankine cycle, open and closed feed water heaters, Reheat Rankine cycle.

07 Hours

PART-B

UNIT - 5

Reciprocating Compressors: Operation of a single stage reciprocating compressors, work input through P-V diagram and steady state steady flow analysis. Effect of clearance and volumetric efficiency. Adiabatic, isothermal and mechanical efficiencies. Multistage compressor, saving in work, optimum intermediate pressure, inter- cooling, minimum work for compression.

06 Hours

UNIT - 6

Gas turbine and Jet propulsion: Classification of Gas turbines, Analysis of open cycle gas turbine cycle. Advantages and disadvantages of closed cycle. Methods to improve thermal efficiency, Jet propulsion and Rocket propulsion.

07 Hours

UNIT - 7

Refrigeration: Vapour compression refrigeration system ; description, analysis, refrigerating effect, capacity , power required, units of refrigeration, COP , Refrigerants and their desirable properties. Air cycle refrigeration; reversed Carnot cycle, reversed Brayton cycle, Vapour absorption refrigeration system, steam jet refrigeration.

06 Hours

UNIT - 8

Psychometry: Atmospheric air and psychometric properties; Dry bulb temperature, wet bulb temperature, dew point temperature; partial pressures, specific and relative humidities and the relation between the two enthalpy and adiabatic saturation temperature. Construction and use of psychometric chart . Analysis of various processes; heating, cooling , dehumidifying and humidifying. Adiabatic mixing of moist air. Summer and winter air conditioning.

07 Hours

Data Hand Book :

1. **Thermodynamic data hand book**, B.T. Nijaguna.

2. **Properties of Refrigerant & Psychometric** (tables & Charts in SI Units), Dr. S.S. Banwait, Dr. S.C. Laroia, Birla Pub. Pvt. Ltd., Delhi, 2008

TEXT BOOKS:

1. **Basic and applied Thermodynamics**, P.K. Nag, 2nd Ed., Tata McGraw Hill Pub.Co,2002
2. **Applied Thermodynamics**, Rajput, Laxmi Publication
3. **Applied Thermodynamics**, B.K. Venkanna, Swati B. Wadavadagi, PHI, New Delhi, 2010

REFERENCE BOOKS:

1. **Thermodynamics , An engineering approach**, Yunus, A. Cengel and Michael A.Boies, 6th Ed., Tata McGraw Hill pub. Co., 2002,
2. **Fundamental of Classical Thermodynamics**, G.J. Van Wylen and R.E. Sontang Wiley eastern.

KINEMATICS OF MACHINES

Subject Code	: 10ME44	IA Marks	: 25
Hours/Week	: 04	Exam Hours	: 03
Total Hours	: 52	Exam Marks	: 100

PART – A

UNIT - 1

Introduction: Definitions Link or element, kinematic pairs, Degrees of freedom, Grubler's criterion (without derivation), Kinematic chain, Mechanism, Structure, Mobility of Mechanism, Inversion, Machine.

Kinematic Chains and Inversions: Inversions of Four bar chain; Single slider crank chain and Double slider crank chain.

07 Hours

UNIT - 2

Mechanisms: Quick return motion mechanisms-Drag link mechanism, Whitworth mechanism and Crank and slotted lever Mechanism.

Straight line motion mechanisms Peaucellier's mechanism and Robert's mechanism. Intermittent Motion mechanisms -Geneva wheel mechanism and Ratchet and Pawl mechanism. Toggle mechanism, Pantograph, Ackerman steering gear mechanism.

06 Hours

UNIT - 3

Velocity and Acceleration Analysis of Mechanisms (Graphical Methods)

Velocity and acceleration analysis of Four Bar mechanism, slider crank mechanism and Simple Mechanisms 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. Angular velocity and angular acceleration of links, velocity of rubbing.

07 Hours

UNIT - 4

Velocity Analysis by Instantaneous Center Method: Definition, Kennedy's Theorem, Determination of linear and angular velocity using instantaneous center method

Klein's Construction: Analysis of velocity and acceleration of single slider crank mechanism.

06 Hours

PART – B

UNIT - 5

Velocity and Acceleration Analysis of Mechanisms (Analytical Methods):

Analysis of four bar chain and slider crank chain using analytical expressions. (Use of complex algebra and vector algebra)

06 Hours

UNIT - 6

Spur Gears: Gear terminology, law of gearing, Characteristics of involute action, Path of contact. Arc of contact, Contact ratio of spur, helical, bevel and worm gears, Interference in involute gears. Methods of avoiding interference, Back lash. Comparison of involute and cycloidal teeth. Profile Modification.

07 Hours

UNIT - 7

Gear Trains: Simple gear trains, Compound gear trains for large speed. reduction, Epicyclic gear trains, Algebraic and tabular methods of finding velocity ratio of epicyclic gear trains. Tooth load and torque calculations in epicyclic gear trains.

07 Hours

UNIT - 8

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-face follower, Disc cam with oscillating roller follower. Follower motions including SHM, Uniform velocity, uniform acceleration and retardation and Cycloidal motion.

06 Hours

TEXT BOOKS:

1. "Theory of Machines", Rattan S.S, Tata McGraw-Hill Publishing Company Ltd., New Delhi, and 3rd edition -2009.
2. "Theory of Machines", Sadhu Singh, Pearson Education (Singapore) Pvt. Ltd, Indian Branch New Delhi, 2nd Edi. 2006

REFERENCE BOOKS:

1. "Theory of Machines & Mechanisms", J.J. Uicker, , G.R. Pennock, J.E. Shigley. OXFORD 3rd Ed. 2009.
2. Mechanism and Machine theory, Ambekar, PHI, 2007

Graphical Solutions may be obtained either on the Graph Sheets or on the Answer Book itself.

**MANUFACTURING PROCESS – II
(Metal Removing Process)**

Subject Code	: 10ME45	IA Marks	: 25
Hours/Week	: 04	Exam Hours	: 03
Total Hours	: 52	Exam Marks	: 100

PART – A

UNIT - 1

Theory of Metal Cutting: Single point cutting tool nomenclature, geometry. Mechanics of Chip Formation, Types of Chips. Merchant's circle diagram and analysis, Ernst Merchant's solution, shear angle relationship, problems of Merchant's analysis. Tool Wear and Tool failure, tool life. Effects of cutting parameters on tool life. Tool Failure Criteria, Taylor's Tool Life equation. Problems on tool life evaluation.

07 Hours

UNIT - 2

Cutting Tool Materials: Desired properties and types of cutting tool materials – HSS, carbides coated carbides, ceramics. Cutting fluids. Desired properties, types and selection. Heat generation in metal cutting, factors affecting heat generation. Heat distribution in tool and work piece and chip. Measurement of tool tip temperature.

07 Hours

UNIT - 3

Turning (Lathe), Shaping and Planing Machines: Classification, constructional features of Turret and Capstan Lathe. Tool Layout, shaping Machine, Planing Machine, Driving mechanisms of lathe, shaping and planing machines, Different operations on lathe, shaping machine and planing machine. Simple problems on machining time calculations

07 Hours

UNIT - 4

Drilling machines: Classification, constructional features, drilling & related operations. Types of drill & drill bit nomenclature, drill materials. Introduction to CNC machines- Principles of operation. Axes of NC machine-Coordinate systems. Basics of Manual part programming methods.

06 Hours

PART – B**UNIT - 5**

Milling machines: Classification, constructional features, milling cutters nomenclature, milling operations, up milling and down milling concepts. Various milling operations.

Indexing: Simple, compound, differential and angular indexing calculations. Simple problems on simple and compound indexing.

06 Hours

UNIT - 6

Grinding machines: Types of abrasives, Grain size, bonding process, grade and structure of grinding wheels, grinding wheel types. Classification, constructional features of grinding machines (Centerless, cylindrical and surface grinding). Selection of grinding wheel. Grinding process parameters. Dressing and truing of grinding wheels.

07 Hours

UNIT - 7:

Broaching process - Principle of broaching. Details of a broach. Types of broaching machines-constructural details. Applications. Advantages and Limitations.

Finishing and other Processes Lapping and Honing operations – Principles, arrangement of set up and application. Super finishing process, polishing, buffing operation and application.

06 Hours

UNIT - 8

Non-traditional machining processes: Need for non traditional machining, Principle, equipment & operation of Laser Beam, Plasma Arc Machining, Electro Chemical Machining, Ultrasonic Machining, Abrasive Jet Machining, Water Jet Machining, Electron Beam Machining, Electron Discharge Machining and Plasma Arc Machining.

06 Hours

TEXT BOOKS:

1. **Workshop Technology**, Hazara Choudhry, Vol-II, Media Promoters & Publishers Pvt. Ltd. 2004
2. **Production Technology**, R.K.Jain, Khanna Publications, 2003.
3. **Production Technology**, HMT, Tata Mc Graw Hill, 2001.

REFERENCE BOOKS:

1. **Manufacturing Science**, Amitabha Ghosh and Mallik, affiliated East West Press, 2003.
2. **Fundamentals of Metal Machining and Machine Tools**, G. Boothroyd, McGraw Hill, 2000.

**V SEMESTER
MANAGEMENT & ENTREPRENEURSHIP**

Subject Code	: 10AL 51	IA Marks	: 25
No. of Lecture Hrs./ Week	: 04	Exam Hours	: 03

PART – A

MANAGEMENT

UNIT - 1

MANAGEMENT: Introduction – Meaning – nature and characteristics of Management, Scope and Functional areas of management – Management as a science, art of profession – Management & Administration – Roles of Management, Levels of Management, Development of Management Thought – early management approaches – Modern management approaches.

7 Hours

UNIT - 2

PLANNING: Nature, importance and purpose of planning process – Objectives – Types of plans (Meaning Only) – Decision making – Importance of planning – steps in planning & planning premises – Hierarchy of plans.

6 Hours

UNIT - 3

ORGANIZING AND STAFFING: Nature and purpose of organization – Principles of organization – Types of organization – Departmentation – Committees- Centralization Vs Decentralization of authority and responsibility – Span of control – MBO and MBE (Meaning Only) Nature and importance of staffing–Process of Selection & Recruitment (in brief).

6 Hours

UNIT - 4

DIRECTING & CONTROLLING: Meaning and nature of directing – Leadership styles, Motivation Theories, Communication – Meaning and importance – coordination, meaning and importance and Techniques of Co – Ordination. Meaning and steps in controlling – Essentials of a sound control system – Methods of establishing control (in brief).

7 Hours

PART – B

ENTREPRENEURSHIP

UNIT - 5

ENTREPRENEUR: Meaning of Entrepreneur; Evolution of the Concept, Functions of an Entrepreneur, Types of Entrepreneur, Entrepreneur - an emerging Class. Concept of Entrepreneurship – Evolution of Entrepreneurship, Development of Entrepreneurship; Stages in entrepreneurial process; Role of entrepreneurs in Economic Development; Entrepreneurship in India; Entrepreneurship – its Barriers.

6 Hours

UNIT - 6

SMALL SCALE INDUSTRIES: Definition; Characteristics; Need and rationale; Objectives; Scope; role of SSI in Economic Development. Advantages of SSI Steps to start and SSI – Government policy towards SSI; Different Policies of SSI; Government Support for SSI during 5 year plans. Impact of Liberalization, Privatization, Globalization on SSI Effect of WTO/GATT Supporting Agencies of Government for SSI, Meaning, Nature of support; Objectives; Functions; Types of Help; Ancillary Industry and Tiny Industry (Definition Only)

7 Hours

UNIT - 7

INSTITUTIONAL SUPPORT: Different Schemes; TECKSOK; KIADB; KSSIDC; KSIMC; DIC Single Window Agency; SISI; NSIC; SIDBI; KSFC.

7 Hours

UNIT - 8

PREPARATION OF PROJECT: Meaning of Project; Project Identification; Project Selection; Project Report; Need and Significance of Report; Contents; Formulation; Guidelines by Planning Commission for Project report; Network Analysis; Errors of Project Report; Project Appraisal. Identification of business opportunities: Market Feasibility Study; Technical Feasibility Study; Financial Feasibility Study & Social Feasibility Study.

7 Hours

TEXT BOOKS:

1. **Principles of Management** – P.C.Tripathi, P.N.Reddy – Tata McGraw Hill.
2. **Dynamics of Entrepreneurial Development & Management** – Vasant Desai – Himalaya Publishing House.
3. **Entrepreneurship Development** – Poornima.M.Charantimath – Small Business Enterprises – Pearson Education – 2006 (2 & 4).
4. **Management & Enterpreneruship**-N V R Naidu, IK Internatioal, 2008

REFERENCE BOOKS:

1. **Management Fundamentals** – Concepts, Application, Skill Development – Robers Lusier – Thomson.
2. **Entrepreneurship Development** – S.S.Khanka – S.Chand & Co.
3. **Management** – Stephen Robbins – Pearson Education/PHI – 17th Edition, 2003.

ENGINEERING ECONOMY

Subject Code	: 10IP /IM 52	IA Marks	: 25
No. of Lecture Hrs./ Week	: 04	Exam Hours	: 03

PART - A**UNIT - 1**

INTRODUCTION: Engineering Decision- Makers, Engineering and Economics, Problem solving and Decision making, Intuition and Analysis, Tactics and Strategy

6 Hours**UNIT - 2**

INTEREST AND INTEREST FACTORS: Interest rate, simple interest, Compound interest, Cash- flow diagrams, Exercises and Discussion.

6 Hours**UNIT - 3**

PRESENT WORTH COMPARISON: Conditions for present worth comparisons, Basic Present worth comparisons, Present worth equivalence, Net Present worth, Assets with unequal lives, infinite lives, Future worth comparison, Pay – back comparison, Exercises, Discussions and problems.

7 Hours**UNIT - 4**

EQUIVALENT ANNUAL WORTH COMPARISONS: Equivalent Annual Worth Comparison methods, Situations for Equivalent Annual Worth Comparison, Consideration of asset life, Comparison of assets with equal and unequal lives, Use of sinking fund method, Annuity contract for guaranteed income, Exercises, Problems.

7 Hours**UNIT - 5**

RATE OF RETURN CALCULATIONS: Rate of return, Minimum acceptable rate of return, IRR, IRR misconceptions, Cost of capital concepts, replacement models.

4 Hours

STRUCTURAL ANALYSIS OF ALTERNATIVES: Identifying and Defining alternatives, IRR analysis of mutually exclusive alternatives, Capital Budget view point, Ranking criteria.

3 Hours**UNIT - 6**

DEPRECIATION: Causes of Depreciation, Basic methods of computing depreciation charges

3 Hours

ESTIMATING & COSTING: Components of costs such as Direct Material Cost, Direct Labour Cost, Fixed, Over – Heads, Factory Costs,

Administrative – Over Heads, First Cost, Marginal Cost, Selling price, Estimation for simple components

4 Hours

UNIT - 7

REPLACEMENT ANALYSIS: Introduction, reasons for replacement, Individual Replacement of machinery or equipment with/without value of money, Group Replacement Policies, Problems.

6 Hours

UNIT - 8

EFFECTS OF INFLATION: Causes, consequences and control of inflation. After tax actual cash flow comparisons, Lease/ Buy decisions

2 Hours

BREAK-EVEN ANALYSIS

Basic Concepts Linear & non-linear break even analysis.

4 Hours

TEXT BOOKS:

1. **Engineering economics** - RIGGS J.L. - McGraw Hill - 2002.
2. **Engineering economy** - PAUL DEGARMO - Macmillan Pub. Co. - 2001.
3. **Engineering Economy** - Naidu, Babu and Rajendra – New Age International Pvt. Ltd. - 2006

REFERENCE BOOKS:

1. **Industrial Engineering and Management** - OP KHANNA - Dhanpat Rai & Sons - 2000
2. **Financial Management** - I M PANDAY - Vikas Publishing House - 2002.
3. **Engineering economy** - THUESENH.G. – PHI - 2002

WORK STUDY AND ERGONOMICS

Subject Code : 10IP /IM 53 IA Marks : 25

No. of Lecture Hrs./ Week	: 04	Exam Hours	: 03
Total No. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

PRODUCTIVITY: Definition of productivity, individual enterprises, task of management, Productivity of materials, land, building, machine and power. Measurement of productivity, factors affecting the productivity, productivity improvement programmes, wages and incentives (simple numerical problems)

7 Hours

UNIT - 2

WORK STUDY: Definition, objective and scope of work study. Human factor in work study. Work study and management, work study and supervision, work study and worker.

6 Hours

UNIT - 3

INTRODUCTION TO METHOD STUDY: Definition, objective and scope of method study, activity recording and exam aids. Charts to record movements in shop operation – process charts, flow diagram, flow process charts, travel chart and multiple activity charts.(With simple problems)

7 Hours

UNIT - 4

MICRO AND MEMO MOTION STUDY: Charts to record movements at work place – principles of motion economy, Therbligs and classification of movements, Two Handed process chart, SIMO chart, and micro motion study. Development, definition and installation of the improved method, brief concept about synthetic motion studies.

6 Hours

PART - B

UNIT - 5

INTRODUCTION TO WORK MEASUREMENT: Definition, objective and benefit of work measurement. Work measurement techniques:

WORK SAMPLING, need, confidence levels, sample size determinations, random observation, conducting study with the simple problems.

6 Hours

UNIT - 6

STOP WATCH TIME STUDY: Time Study, Definition, time study equipment, selection of job, steps in time study. Breaking jobs into elements, recording information. Rating & standard Rating, standard performance, scale of rating, factors affecting rate of working, allowances and standard time determination.

PREDETERMINED MOTION TIME STUDY (PMTS)

UNIT - 7

ERGONOMICS: Introduction, Areas of study under Ergonomics, System approach to Ergonomics model, Man-Machine System. Components of Man-Machine System and Their functions – Work capabilities of Industrial Worker, Study and Development of Stress in Human body and their consequences. Computer based ergonomics

6 Hours

UNIT - 8

DESIGN OF MAN-MACHINE SYSTEM: Fatigue in industrial workers. Quantitative, qualitative representation and alphanumeric displays. Controls and their design criteria, control types, relation between controls and displays, layouts of panels and machines. Design of work places, influence of climate on human efficiency. Influence of noise, vibration and light.

7 Hours

TEXT BOOKS:

1. **Introduction to work study, ILO** - III Revised Edition, 1981
2. **Motion and Time study** - Ralph M Barnes - John Wiley - 8th Edition, 1985.
3. **Motion and Time study** - Marvin E. Mundel – PHI -1st edition.
4. **Work Study and Ergonomics** - S Dalela and Sourabh, – Chand Publishers - 3rd edition.

REFERENCES BOOKS:

1. **Human Factors in Engineering Design** - S Sanders and E J McCormick - Mc Graw Hill - 6th Edition.
2. **Industrial Engineering Hand book** - Maynard.
3. **Engineered work Measurement** – Wledon - ELBS - 1991.

CAD/CAM

Subject Code : 10IP /IM 54 IA Marks : 25

No. of Lecture Hrs./ Week	: 04	Exam Hours	: 03
Total No. of Lecture Hrs.	: 52	Exam Marks	: 100

PART - A

UNIT - 1

INTRODUCTION: CAD/CAM, Product cycle & CAD/CAM, Design process, Application of Computers for Design, Traditional Production Planning & Control, Computerized Integrated Production Management System, Advantages & Disadvantages of CAD & CAM.

FUNDAMENTALS OF CAD: Comparison of general design process and CAD process, Concept of manufacturing data base, general consideration of Hardware for a typical CAD system.

7 Hours

UNIT - 2

COMPUTER GRAPHICS SOFTWARE & DATA BASE: Introduction, Software Configuration of a Graphics System, Functions of a Graphics Package, Constructing the Geometry, Transformations, Data Base Structure & Content, Wire-Frame versus Solid Modeling, Introduction to exchange of modeling data-Basic features of IGES, STEP, DXF, DMIS. **7 Hours**

UNIT - 3

INTRODUCTION TO FINITE ELEMENT ANALYSIS: Introduction, Basic Concepts, Discretization, Element types, Nodes & degrees of freedom, Mesh generation, Constraints, Loads, Preprocessing, Application to static analysis.

6 Hours

UNIT - 4

NC, CNC, DNC TECHNOLOGIES: NC, CNC, DNC, Modes, NC Elements, Advantages and Limitations of NC, CNC. Functions of computers in DNC.

CNC MACHINE TOOLS: CNC tooling, Turning tool geometry, Milling tooling system, Tool presetting, ATC, Work holding, Overview of different CNC machining centers, CNC Turning centers, High speed machine tools.

7 Hours

PART - B

UNIT - 5

CNC PROGRAMMING: Part program fundamentals, Steps involved in development t of a part program, Manual part programming, Milling & Turning Center Programming. **7 Hours**

UNIT - 6

APT PROGRAMMING: APT Programming in Drilling, Milling & Turning

6 Hours

UNIT - 7

INTRODUCTION TO ROBOTICS: Introduction, Robot configuration, Robot motions, End effectors, Work cell, Control & Interlock, Robot Sensor, Robot applications. **6 Hours**

UNIT - 8

PROGRAMMING THE ROBOTS : Robot-Programming Languages, Introduction to different languages and writing the programming for palletising operation **6 Hours**

TEXT BOOKS:

1. **CAD/CAM** - Mikell P. Groover and Emory W. Zimmers Jr - Pearson Education Inc - 2003.
2. **CAD/CAM Principles and Applications** - P.N. Rao – TMH, New Delhi - 2002.

REFERENCE BOOKS:

1. **Principles of Interactive Computer Graphics** - Newman and Sproull – Tata McGraw Hill - 1995.
2. **CAD/CAM** - Ibrahim Zeid – Tata McGraw Hill - 1999.
3. **Computer Aided Manufacturing** - P. N. Rao, N. K. Tewari and T. K. Kundra – Tata McGraw Hill - 1999.

DESIGN OF MACHINE ELEMENTS

Subject Code	: 10IP /IM 55	IA Marks	: 25
No. of Lecture Hrs./ Week	: 04	Exam Hours	: 03
Total No. of Lecture Hrs.	: 52	Exam Marks	: 100

PART - A

UNIT - 1

DESIGN FOR STATIC STRENGTH: Design considerations; Codes and Standards, static loads and factor of safety. Theories of failure: Maximum Normal Stress Theory, Maximum Shear Stress Theory, Distortion energy theory. Failure of Brittle and Ductile materials. Stress concentration. Determination of stress concentration factor. **7 Hours**

UNIT - 2

DESIGN FOR FATIGUE STRENGTH: S – N Diagram, low cycle and High cycle fatigue. Endurance limit. Modifying factors: Load, Size and Surface finish effects. Fatigue stress concentration factor. Fluctuating stresses. Goodman and Soderberg Relationship. Stresses due combined loading, Cumulative fatigue damage. **6 Hours**

UNIT - 3

KEYS, COUPLINGS, COTTER AND KNUCKLE JOINTS: Design of Keys, Design of rigid flange coupling, Bush and Pin type Flexible Coupling, Design of Cotter and Knuckle joints. **6 Hours**

UNIT - 4

DESIGN OF SHAFTS: Design of shafts subjected to torsion, bending moment and combined torsion moment and axial loading. ASME and BIS Codes for design of transmission shafting. Design for strength and rigidity. Shafts under fluctuating loads and combined loads. **7 Hours**

PART B

UNIT - 5

DESIGN OF GEARS: Introduction to Spur, Helical and Bevel Gears. Design of Spur gear, Lewis equation, form factor, stresses in gear tooth, Dynamic load and wear load. **6 Hours**

UNIT - 6

RIVETED JOINTS AND WELDED JOINTS: Types of riveted joints, failures of riveted joints, Boiler joint, Efficiency.

Types of welded joints, Strength of butt and fillet welds, Eccentrically loaded welds. **7 Hours**

UNIT - 7

DESIGN OF SPRINGS: Types of springs, Stresses in Coil springs of circular and non-circular cross-sections. Tension and compression springs. Stresses in Leaf springs. **6 Hours**

UNIT - 8

LUBRICATION AND BEARINGS: Mechanism of lubrication, Viscosity, Bearing Modulus, Coefficient of friction, minimum oil film thickness. Heat generated and Heat dissipated.

Examples of journal bearing and thrust bearing design.

BALL AND ROLLER BEARINGS: Bearing life, Equivalent bearing load, Selection of Deep groove ball bearings. **7 Hours**

TEXT BOOKS:

1. **Mechanical Engineering Design** - Joseph Edward Shigley – Tata McGraw Hill, New Delhi - 1986.
2. **Machine Design** - VL. Maleev and Hartman – CBS Publishers and Distributors, Delhi - 1983.
3. **Design of Machine Elements** - V. B. Bahandari – Tata McGraw Hill, New Delhi - 2000.

REFERENCE BOOKS:

1. **Machine Design** - Robert. L. Norton – Pearson Education Asia, New Delhi - 2001.
2. **Theory and Problems of Machine Design** - Hall, Holowinko, Laughlin Schaums - Outline Series - 2002.
3. **Elements of Machine Design** - N. C. Pandey and C. S. Shah – Chorotar Publishing house – 2002.

STATISTICS FOR ENGINEERS

Subject Code	: 10IM 56	IA Marks	: 25
No. of Lecture Hrs./ Week	: 04	Exam Hours	: 03
Total No. of Lecture Hrs.	: 52	Exam Marks	: 100

PART - A

UNIT - 1

THE ROLE OF STATISTICS IN ENGINEERING (DATA SUMMARY AND PRESENTATION): Statistical Thinking, Collecting data, Statistical Modelling Frame work, measure of central tendency and variance, Importance of Data summary and Display, Tabular and Graphical display:

6 Hours

UNIT - 2

DISCRETE RANDOM VARIABLES AND PROBABILITY DISTRIBUTIONS: Discrete Random variables, Probability distributions and Probability mass functions, Cumulative distribution functions, Mean and Variance of a discrete random variable, Discrete uniform distribution, Binominal distribution, Hyper Geometric distribution, Poisson distribution and their Applications.

7 Hours

UNIT - 3

CONTINUOUS RANDOM VARIABLES AND PROBABILITY DISTRIBUTIONS: Continuous random variables, Probability distributions and probability density functions, cumulative distribution functions, Mean and Variance of a continuous random variable, uniform distribution, Normal distribution, Normal approximation to Binominal and Poisson distribution, Exponential distribution and their Applications.

7 Hours

UNIT - 4

ESTIMATION THEORY: Statistical Inference, Random sampling, Properties of Estimators, Sampling distribution, Sampling distribution of mean, variance and proportion. Introduction to confidence intervals.

6 Hours

PART - B

UNIT - 5

STATISTICAL INFERENCE FOR A SINGLE SAMPLE: Hypothesis testing, Inference on the mean of a population (variance known and unknown), Inference on the variance of a normal population, Inference on a population proportion.

7 Hours

UNIT - 6

STATISTICAL INFERENCE FOR A SINGLE SAMPLE AND TWO SAMPLES: Testing for Goodness of Fit, Inference for a difference in Means, Variances known, Inference for a difference in means of two normal distributions, Variances unknown, Inference on the Variances of two normal populations, Inference on two population proportions.

7 Hours

UNIT - 7

SIMPLE LINEAR REGRESSIONS AND CORRELATION: Simple Linear Regression, Properties of Least square Estimators and Estimation of variances, Common abuses of regression, Prediction of new observations, Assessing the adequacy of regression model, Transformations to a straight line, Introduction to multiple regression (no problems), Correlation.

6 Hours

UNIT - 8

DESIGN OF EXPERIMENTS: Strategy of experimentation, completely randomized single - factor experiment, Tests on individual treatment means, the random effects model, the randomized complete block design, one way analysis of variance and two way analysis of variance.

6 Hours

TEXT BOOKS:

1. **Applied statistics and Probability for Engineers** – Douglas C Montgomery, George C Runger - John Wiley and Sons - 2nd Edn, ISBN-0-471-17027-5.
2. **Statistics for Management** - Richard I Levin, David S Rubin - Prentice Hall India - 6th Edn, ISBN-81-203-0893-X.

REFERENCE BOOKS:

1. **Probability and Statistics in Engineering** - William W Hines, Douglas C Montgomery - John Wiley and Sons - 2nd Edn.
2. **Business Statistics for Management and Economics** - Daniel, Terrell - Houghton Mifflin Company - 6th Edn, ISBN-0-395-62835-0
3. **Probability and Statistics** - Walpole & Mayer, MacMillan Publishing Company -1989.

MECHANICAL LAB

Subject Code	: 10IML 57	IA Marks	: 25
No. of Lab Hrs./ Week	: 03	Exam Hours	: 03
Total No. of Lab Hrs.	: 42	Exam Marks	: 50

PART - A

(Individual experiments)

Determination of Flash point and Fire point of lubricating oil using Abel Pensky Martins Apparatus
Determination of Calorific value of solid and gaseous fuels.
Determination of Viscosity of a lubricating oil using Redwoods and Say bolts – Viscometers.

PART - B

Group experiments

Performance Tests on Four stroke Petrol and Diesel Engines, Calculations of IP, BP, Thermal efficiencies, SFC, FP and heat balance sheet
Performance Test on Four stroke Petrol - Calculations of IP, BP, Thermal efficiencies, SFC. Multi cylinder petrol / diesel engine (Morse Test)
Calibration of Venturi meter, Flow through pipes
Performance test on centrifugal and reciprocating pumps

Note: A minimum of 12 exercises are to be conducted.

WORK STUDY AND ERGONOMICS LAB

Subject Code	: 10IPL/IML 58	IA Marks	: 25
No. of Lab Hrs./ Week	: 03	Exam Hours	: 03
Total No. of Lab Hrs.	: 42	Exam Marks	: 50

PART - A
METHOD STUDY

Recording Techniques: Preparing the following charts and diagrams
(Minimum 3 Charts)

1. Outline process chart, Multiple Activity Chart
2. Flow process chart and Flow diagram, String diagram
3. Experiments on the Application of principle of motion economy
Two handed process chart
4. SIMO chart
5. Exercises on conducting method study for assembling simple components and office work.
6. Development of Layout plans using SLP technique
7. Experiments on Line balancing. (demo only)

PART - B
WORK MEASUREMENT

1. Rating practice using: walking simulator, pin board assembly, dealing a deck of cards
2. and marble collection activity
3. Determining the standard time for simple operations using stopwatch time study
4. Exercises on estimating standard time using PMTS.
5. Measurement of parameters (heart beat rate, calorie consumption) using walking simulator
6. Measurement of parameters (heart beat rate, calorie consumption, revolutions per minute) using ergometer
7. Effect of Noise, Light, Heat on human efficiency in work environments.

Note: A minimum of 12 exercisers are to be conducted

REFERENCE BOOKS:

1. **ILO Introduction to work study** - III Revised Edition, 1981.
2. **Motion and Time study** - Ralph M Barnes , John Wiley - 8th Edition, 1985.
3. **Engineered work Measurement** – Wledon - ELBS - 1991.
4. **Motion and Time study** - Marvin E. Mundel – PHI - 1st edition.

VI SEMESTER
MATERIALS MANAGEMENT

Subject Code	: 10IP /IM 61	IA Marks	: 25
No. of Lecture Hrs./ Week	: 04	Exam Hours	: 03
Total No. of Lecture Hrs.	: 52	Exam Marks	: 100

PART - A

UNIT - 1

INTRODUCTION: Dynamics of Materials Management - Materials Management at Micro-level, Materials Management at Macro-level, Inventories of Materials, Total Concept-Definition - A Brief History of Development: An Overview.

SYSTEMS APPROACH TO MATERIALS MANAGEMENT: Systems Approach - The Process of Management and the Materials Function, Interfaces, An Overview of the Systems Concept, Benefits of the Integrated Systems Approach.

6 Hours

UNIT - 2

FORECASTING Objectives and the Materials Organization: Systems Design, Integral Control of the Flow of Materials, Forecasting and Planning, Forecasting Methods, Objectives of Materials Management - Organization of Materials Management, Environmental Change, Functional Organization Model for Materials Management.

MATERIALS PLANNING: Making the Materials Plan Work, The Materials Cycle and Flow Control System, Materials Budget.

6 Hours

UNIT - 3

PURCHASING: Purchasing Principles, Procedures and Practices, Fundamental Objectives of Purchasing - Scope, Responsibility and Limitations, Sources of Supply and Supplier Selection, Purchasing Policy and Procedures - Purchase Budgets and Statistics.

PURCHASING IN MATERIALS MANAGEMENT SYSTEM

CONCEPT: Price Determination, Price Forecasting, Price-Cost Analysis, The Learning Curve, Negotiation, Reciprocity, Cost-Plus Contracts, Hedging, Forward Buying, Buying Ethics, Principles and Standards of Purchasing, Make-or-Buy, Information, Documentation and Purchasing Library, Legal Aspects of Purchasing, Law of Agency, Law of Contract, Legal Status of the Buyer, Warranties and Conditions, Right of Inspection, Right of Rejection, Vendor-Vendee Relations, Vendor Development, Vendor Rating.

8 Hours

UNIT- 4

PURCHASING AND PROCUREMENT Activities under Materials Management: Supplier Quality Assurance Programme, Buyer-Supplier Relationship.

INCOMING MATERIAL QUALITY CONTROL: Significance of Inspection, Purchase Inspection, Sampling Inspection, Sampling Technique, Different Types of Population, Different Types of Sampling, Risks of Sampling. SQC in Operation: A Work-site Problem Study.

6 Hours

PART - B**UNIT - 5**

PURCHASING CAPITAL Equipment, Plant and Machinery: Responsibility and Decision, Purchasing v/s Leasing,

International Buying, Import Purchasing, and Governmental Purchasing: Industrial Needs, Import Procedure and Documents, Classification of Stores- Categories of Importers-Import Application, Basis of Licensing, Import Purchasing Procedures, Letter of Credit, Income-Tax Clearance, Customs Tariff-Registration of Licenses at Port. Governmental Purchasing: Policy and Procedures, Tenders, Inspection of Articles.

6 Hours

UNIT-6

REGISTRATION of Firms, Procedure for Registration, Terms of Registration, Removal of the Firms from the List, Blacklisting of Firms, Banning of Firms, Suspension of Firms, Purchases of the Stores by the DGS&D - Surplus Disposals by the DGS&D, Pre-disposal Inspection of Surpluses.

Inventory Management and Control Systems: Definition of Inventories, The Need for Inventory Audits Control, Types of Inventories, Inventory Control, Max-Min System, Inventories and Demand Uncertainty, Determining Safety Stock.

7 Hours

UNIT – 7

INVENTORY MODELS: Deterministic Inventory Models with numerical examples, Q-system or Quantity Control System or Re-order Point System- Effect of Quantity Discounts, P-system or Periodic Review or Periodic Count System or Replenishment System, Optional Replenishment System or "S, s" Policy, ABC Inventory Classification (Selective Inventory Control - SIC). The Need for a Systems Approach, Materials Planning System (MPS)/Materials Requirement Planning (MRP), Basic Tool.

7 Hours

UNIT - 8

STORES MANAGEMENT AND OPERATION: Storage System, Stores Location and Layout, Development of Storing, Centralization and Decentralization of Stores, Standardization and Variety Reduction, The Systems, Merits and Demerits of Codification.

MATERIALS MANAGEMENT INFORMATION SYSTEM AND COMPUTER: MIS - Management and MM, Computer System for MIS and MM, In-process Materials and Management Control.

6 Hours

Text Book:

1. **Materials Management** - A.K. Datta - PHI Pvt. Ltd, New Delhi - 2001.
2. **Operations Research** - S.D. Sharma – Kedarnath, Ramnath &Co – 1996.

Reference Book:

1. **Handbook of Materials Management** - P. Gopalakrishnan - PHI Pvt. Ltd, New Delhi - 2002.
2. **Principles of Operations Research Theory and Practice** - Philips, Ravindran and Soleberg – Wiley India Pvt Ltd.

QUALITY ASSURANCE AND RELIABILITY

Subject Code	: 10IP/IM 62	IA Marks	: 25
No. of Lecture Hrs./ Week	: 04	Exam Hours	: 03
Total No. of Lecture Hrs.	: 52	Exam Marks	: 100

PART - A

UNIT - 1

INTRODUCTION: Definition of Quality, Quality function, Dimensions of Quality, Quality Engineering terminology, Brief history of quality methodology, Statistical methods for quality improvement, Quality costs – four categories of costs and hidden costs. Brief discussion on sporadic and chronic quality problems. Introduction to Seven QC tools.

6 Hours

UNIT - 2

STATISTICAL PROCESS CONTROL: Introduction to statistical process control – chance and assignable causes for variation. Basic principles of control charts, choice of control limits, sample size and sampling frequency, rational subgroups. Analysis of patterns of control charts. Case Studies on application of SPC. Process capability – Basic definition, standardized formula, relation to product tolerance and six sigma concept of process capability,

6 Hours

UNIT – 3

PROBABILTY DISTRIBUTION – Hyper Geometric, Binomial, Poisson and Normal distribution.

CONTROL CHARTS FOR VARIABLES: Controls Charts for X Bar and Range (R) , Statistical basis of the charts, Development and use of X bar and R charts, Interpretation of charts. Control charts for X bar and Standard Deviation (S), Development and use of X bar and S chart. Brief discussion on – Pre control X Bar and S control charts with Variable sample size, Control charts for individual measurements, cusum chart, Moving-range charts.

8 Hours

UNIT - 4

CONTROL CHARTS FOR ATTRIBUTES: Control chart for fraction non- conforming (defectives), development and operation of control chart, brief discussion on variable sample size.

Control chart for non-conformities (defects) – development and operation of control chart for constant sample size and variable sample size. Choice between variables and attributes control charts. Guidelines for implementing control charts.

7 Hours

PART - B

UNIT - 5

SAMPLING INSPECTION: Concept of accepting sampling, economics of inspection, Acceptance plans – single, double and multiple sampling. Operating characteristic curves – construction and use. Determination of average outgoing quality, average outgoing quality level, average total inspection, producer risk and consumer risk.

7 Hours

UNIT - 6

USE OF PUBLISHED SAMPLING PLANS: Gauge Repeatability & Reproducibility & Measurement system analysis.

STATISTICAL THEORY OF TOLERANCES: Application of statistical theory of tolerances to design tolerances in random assemblies and application in other areas.

6 Hours

UNIT - 7

RELIABILITY AND LIFE TESTING: Failure models of components, definition of reliability, MTBF, Failure rate, common failure rate curve, types of failure, reliability evaluation in simple cases of exponential failures in series, parallel and series-parallel device configurations, Redundancy and improvement factors evaluation.

6 Hours

UNIT - 8

QUALITY ASSURANCE: Definition and concept of quality assurance, departmental assurance activities. Quality audit concept, audit approach etc. structuring the audit program, planning and performing audit activities, audit reporting, ingredients of a quality program.

6 Hours

TEXT BOOKS:

1. **Introduction to statistical Quality Control** - D C Montgomery - John Wiley and Sons – 3rd Edition.
2. **Quality Planning & Analysis** - J M Juran, Frank M Gryna - Tata McGraw Hill - 3rd edition,
3. **Statistical Quality Control** - Grant and Leavenworth - McGraw Hill-6th Edition

REFERENCE BOOKS:

1. **The QS9000 Documentation Toolkit** -Janet L Novak and Kathleen C Bosheers - Prentice Hall PTR - 2nd Edition
2. **ISO 9000 a Manual for Total Quality Management** - Suresh Dalela and Saurabh - S Chand and Co. -1st Edition
3. **Total Quality Management** – NVR Naidu, KM Babu and G. Rajendra – New Age International Pvt. Ltd - 2006

OPERATIONS RESEARCH

Subject Code	: 10IP/IM 63	IA Marks	: 25
No. of Lecture Hrs./ Week	: 04	Exam Hours	: 03
Total No. of Lecture Hrs.	: 52	Exam Marks	: 100

PART - A

UNIT – 1

INTRODUCTION: OR Methodology, Definition of OR, Application of OR to Engineering and Managerial Problems, Features of OR models, Limitation of OR. Models of OR.

LINEAR PROGRAMMING: Definition, Mathematical formulation.

6 Hours

UNIT-2

LINEAR PROGRAMMING Standard form, solution space, Solution – Feasible, basic feasible, Optimal, Infeasible, Multiple, Optimal, Redundancy, Degeneracy. Graphical Method

6 Hours

UNIT -3

LINEAR PROGRAMMING: Simplex method, variants of simplex algorithm – Artificial basis techniques, Duality, Economic interpretation of Dual, Solution of LPP using duality concept, Dual simplex method.

7 Hours

UNIT - 4

TRANSPORTATION PROBLEM: Formulation of transportation model, Basic feasible solution using different methods (North-West corner, Least Cost, Vogel's Approximation Method) Optimality Methods. Unbalanced transportation problem, Degeneracy in transportation problems, Variants in Transportation Problems, Applications of Transportation problems.

7 Hours

PART – B

UNIT - 5

ASSIGNMENT PROBLEM: Formulation of the Assignment problem, unbalanced assignment problem, travelling salesman problem

6 Hours

UNIT - 6

QUEUING THEORY: Queuing system and their characteristics, The M/M/1 Queuing system, Steady state performance analysing of M/M/1 queuing model. M/M/K/ Model

6 Hours

UNIT - 7

PROJECT MANAGEMENT USING NETWORK ANALYSIS: Network construction, determination of critical path and duration, CPM Structured approach, Calculations of schedules and floats, Network crashing. PERT- Estimation of project duration and variance.

8 Hours

UNIT -8

GAME THEORY: Formulations of games, Two person zero sum game, games with and without saddle point, graphical solutions (2xn, mx2 game), dominance property. Solution of game through LPP.

6 Hours

TEXT BOOKS:

1. **Introduction to Operation Research** -Taha H A - Prentice Hall of India - 6th edition, 1999.
2. **Principles of Operations Research theory and Practice** -Philips, Ravindran and Soleberg – Wiley India Pvt Ltd.

REFERENCE BOOKS:

1. **Introduction to Operation Research** -Hiller and Libermann - McGraw Hill - 5th edn.
2. **Operations Research** -S.D. Sharma – Kedarnath, Ramnath & Co - 1996
3. **Operations Research Theory and Application** - J K Sharma - Pearson Education Pvt Ltd - 2nd Edn, ISBN-0333-92394-4.

Subject Code	: 10 IM 64	IA Marks	: 25
No. of Lecture Hrs./ Week	: 04	Exam Hours	: 03
Total No. of Lecture Hrs.	: 52	Exam Marks	: 100

PART - A

UNIT - 1

INTRODUCTION TO SIMULATION: Simulation, advantages & disadvantages, Areas of application, System environment, Components of a system, Model of a system, Types of models, Steps in a simulation study.

6 Hours

UNIT - 2

SIMULATION EXAMPLES: Simulation of Queuing systems, Simulation of Inventory System, Other simulation examples.

6 Hours

UNIT - 3

GENERAL PRINCIPLES: Concepts in discrete - events simulation, event scheduling / Time advance algorithm, simulation using event scheduling.

6 Hours

UNIT - 4

RANDOM NUMBERS: Properties, Generations methods, Tests for Random number- Frequency test, Runs test, Auto correlation test, Gap test, Poker test

6 Hours

PART - B

UNIT - 5

RAMDOM VARIATE GENERATION: Inverse Transform Technique- Exponential, Uniform, Weibull, Triangular distributions, Direct transformation for Normal and log normal Distributions, convolution methods- Erlang distribution, Acceptance – Rejection Techniques – Poisson Distribution, Gamma Distribution.

7 Hours

UNIT - 6

ANALYSIS OF SIMULATION DATA: Input Modelling: Data collection, Identification and distribution with data, parameter estimation, Goodness of fit tests, Selection of input models without data, Multivariate and time series analysis

Verification and Validation of Model – Model Building, Verification, Calibration and Validation of Models.

7 Hours

UNIT - 7

OUTPUT ANALYSIS: Stochastic Nature of output data, Measures of Performance and their estimation, Output analysis of terminating simulation, Output analysis of steady state simulations

7 Hours

UNIT - 8

OPTIMISATION VIA SIMULATION: Meaning, difficulty, Robust Heuristics, Random Search

APPLICATIONS

Simulation of Manufacturing and Material Handling Systems, Simulation of Computer Systems, Simulation of Plant Layout, Simulation of Project Management

SIMULATION SOFTWARES

Selection of Simulation Software, Simulation packages, Experiment and Statistical Analysis tool, Trend in Simulation Software

7 Hours

TEXT BOOKS:

1. **Discrete Event system Simulation** – Jerry Banks, John S Carson, II, Berry L Nelson, David M Nicol - Pearson Education, Asia - III Edition, ISBN - 81- 7808 – 505 - 4.

REFERENCE BOOKS:

1. **Systems Simulation with Digital Computer** – Narsingh Deo - PHI Publication (EEE), ISBN – 0-87692-028-8
2. **Simulation Modelling & Analysis** – Averill M Law, W David Kelton - McGraw Hill International Editions – Industrial Engineering series, ISBN – 0-07-100803-9.

Subject Code	: 10 IM 65	IA Marks	: 25
No. of Lecture Hrs./ Week	: 04	Exam Hours	: 03
Total No. of Lecture Hrs.	: 52	Exam Marks	: 100

PART - A

UNIT - 1

THE PRODUCT AND THE PROCESS: The product - Evolving role of Software, Characteristics, Components, and Applications. The Process - Software process, Models - Linear, sequential, Prototype, RAD, Process Technology, Software Development Life cycle.

6 Hours

UNIT - 2

SOFTWARE PROJECT MANAGEMENT CONCEPTS: The Management Specification, People, Problem, Process, project

6 Hours

UNIT - 3

SOFTWARE PROJECT PLANNING: Objectives, Scope, Resource, Project estimation, Décomposition Techniques, Empirical Estimation Models. Make-buy decision, Automated estimation tools.

7 Hours

UNIT - 4

RISK MANAGEMENT: Reactive v/s Proactive Risk Strategies, Software Risks, Risk identification, Risk projection, Monitoring.

6 Hours

PART - B

UNIT - 5

SOFTWARE PROJECT SCHEDULING AND TRACKING: Basic concepts, defining a task set selection, Defining Scheduling, Project Plan

SOFTWARE QUALITY ASSURANCE: Quality assurance concept, Cost impact of software defects, Technical review, statistical Quality assurance, software reliability, ISO 9000 Quality standards.

6 Hours

UNIT - 6

SYSTEM ANALYSIS CONCEPT AND PRINCIPLES: Requirement analysis, Principles, software prototyping, specifications, Data Modelling, Functional Modelling and Information Flow, Structured Analysis, Data Dictionary.

7 Hours

UNIT - 7

SYSTEM DESIGN CONCEPTS AND PRINCIPLES: Design Process Concept, Modular design, Documentation Design Methods, Data Design, Interface Design, Procedural Design, Design for Real Time Systems, System, Considerations in Real Time systems, Analysis and Simulation of Real Time Systems.

6 Hours**UNIT - 8**

SOFTWARE TESTING: Objectives, Principles, Testability

SOFTWARE QUALITY AND RELIABILITY: Introduction, Software failure modes, software structure and modularity, language, Data reliability, Fault tolerance, software checking and software testing.

OBJECT ORIENTED CONCEPT AND PRINCIPLES: Object Oriented Concepts, Identifying the elements of an object model, Examples.

8 Hours**TEXT BOOK:**

1. **Software Engineering** – Pressman - Computer Science Series - TATA McGraw-Hill Publications - 6th edition.
2. **Software Engineering** – Shooman - TATA Mc Graw Hill Publications - 6th Edn.

REFERENCE BOOKS:

1. **Software Engineering** – Somerville - Pearson Education, Delhi – 2001.

Subject Code	: 10IPL /IML 67	IA Marks	: 25
No. of Lab Hrs./ Week	: 03	Exam Hours	: 03
Total No. of Lab Hrs.	: 42	Exam Marks	: 50

PART - A

Modelling of simple machine parts using Graphics Package.

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Study of Finite Element Analysis Package - 1D, 2D, Structural problems, Evaluation of displacement (Strain) and Stress. Problems involving Beams and Trusses.

PART - B

Modelling and Simulation of Machining process of simple machine parts using CAM packages.

Suggested Software Packages: Solid Works/ Uni Graphics/Catia and MASTER CAM or any other similar packages.

Note: A minimum of 12 exercises are to be conducted.

SIMULATION LAB

Subject Code	: 10IML 68	IA Marks	: 25
No. of Lab Hrs./ Week	: 03	Exam Hours	: 03
Total No. of Lab Hrs.	: 42	Exam Marks	: 50

PART - A

Introduction to Simulation Packages
 Understanding the Simulation Package
 Identifying probability distributions for given data
 Building simulation models for manufacturing operations (Electronic assembly – With Basic templates)
 Building simulation models for manufacturing operations (Electronic assembly – With Common templates)
 Building simulation models for manufacturing operations with transport System
 Building simulation models for manufacturing operations with layout

PART - B

Building simulation models for manufacturing operations with layout and transport System
 Building simulation Models for Banking service (Bank teller problem)
 Building simulation Models for Mortgage application problem
 Building simulation Models for food processing problem
 Building simulation Models for Post office animation
 Statistical Analysis of Simulation models (input analysis)
 Statistical Analysis of Simulation models (output analysis)

Suggested Software Packages: Promodel/Arena/Quest/Witness/Extend.

Note: A minimum of 12 exercises are to be conducted.

Elective I (Group – A)

VALUE ENGINEERING

Subject Code	:	10IP / IM 661	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION TO VALUE ANALYSIS: Definition of Value, Value Analysis, Value Engineering, Value management, Value Analysis versus Value Engineering, Value Analysis versus Traditional cost reduction techniques, uses, applications, advantages and limitations of Value analysis. Symptoms to apply value analysis, Coaching of Champion concept.

6 Hours

UNIT - 2

TYPE OF VALUES: Reasons for unnecessary cost of product, Peeling cost Onion concept, unsuspected areas responsible for higher cost, Value Analysis Zone, attractive features of value analysis. Meaning of Value, types of value & their effect in cost reduction. Value analysis procedure by simulation. Detailed case studies of simple products.

7 Hours

UNIT - 3

FUNCTIONAL COST AND ITS EVALUATION: Meaning of Function and Functional cost, Rules for functional definition, Types of functions, primary and secondary functions using verb and noun, Function evaluation process, Methods of function evaluation. Evaluation of function by comparison, Evaluation of Interacting functions, Evaluation of function from available data, matrix technique, MISS technique, Numerical evaluation of functional relationships and case studies.

7 Hours

UNIT - 4

PROBLEM SETTING & SOLVING SYSTEM: A problem solvable stated is half solved, Steps in problem setting system, Identification, Separation and Grouping of functions. Case studies.

PROBLEM SETTING & SOLVING SYSTEM: Goods system contains everything the task requires. Various steps in problem solving, case studies.

6 Hours

PART - B

UNIT - 5

VALUE ENGINEERING JOB PLAN: Meaning and Importance of Value Engineering Job plan. Phases of job plan proposed by different value engineering experts, Information phase, Analysis phase, Creative phase,

Judgement phase, Development planning phase, and case studies. Cost reduction programs, criteria for cost reduction program, Value analysis change proposal. **6 Hours**

UNIT - 6

VALUE ENGINEERING TECHNIQUES: Result Accelerators or New Value Engineering Techniques, Listing, Role of techniques in Value Engineering, Details with Case examples for each of the Techniques.

6 Hours

UNIT - 7

ADVANCED VALUE ANALYSIS TECHNIQUES: Functional analysis system technique and case studies, Value Analysis of Management Practice (VAMP), steps involved in VAMP, application of VAMP to Government, University, College, Hospitals, School Problems etc., (service type problems).

TOTAL VALUE ENGINEERING: Concepts, need, methodology and benefits. **8 Hours**

UNIT - 8

APPLICATION OF VALUE ANALYSIS: Application of Value analysis in the field of Accounting, Appearance Design, Cost reduction, Engineering, manufacturing, Management, Purchasing, Quality Control, Sales, marketing, Material Management Etc., Comparison of approach of Value analysis & other management techniques. **6 Hours**

TEXT BOOKS:

1. **Techniques of Value Analysis and Engineering** – Lawrence D. Miles - McGraw Hill Book Company - 2nd Edn.
2. **Value engineering for Cost Reduction and Product Improvement** – M.S. Vittal - Systems Consultancy Services – Edn. 1993
3. **Value Management, Value Engineering and Cost Reduction** – Edward D Heller - Addison Wesley Publishing Company -1971.

REFERENCE BOOKS:

1. **Value Analysis for Better Management** – Warren J Ridge - American Management Association - Edn 1969
2. **Getting More at Less Cost** (The Value Engineering Way) – G.Jagannathan - Tata Mcgraw Hill Pub. Comp - Edn 1995.
3. **Value Engineering** – Arther E Mudge - McGraw Hill Book Comp.- Edn 1981.

THEORY OF METAL FORMING

Subject Code	: 10IP / IM 662	IA Marks	: 25
No. of Lecture Hrs./ Week	: 04	Exam Hours	: 03
Total No. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT – 1

BASICS OF PLASTIC DEFORMATION: Concept of true stress and true strain. Flow stress and strain hardening. State of stress (both biaxial and triaxial). Normal and shear stresses on a inclined plane. Principal stresses and maximum shear stress. Tresca's and Von-Mise's yield criteria and yield surface. **07 Hours**

UNIT – 2

INTRODUCTION TO METAL FORMING: Classification of forming processes. Importance of temperature in metal forming. Hot and cold working. Effect of strain rate. Friction and its role in metal forming. Influence of metallurgical structure and hydrostatic stress in metal forming. Different methods of analysis of metal forming. **06 Hours**

UNIT – 3

FORGING PROCESS: Open-die and close-die forging processes. Different types of forging operations. Brief description of the forging machines, equipments and heating furnaces. Slab analysis of upset forging of rectangular slab under plane strain condition and upset forging of circular disc. Forging load calculation. Common forging defects **06 Hours**

UNIT – 4

ROLLING OF METALS: Flat rolling and section rolling. Different types of rolling mills. Geometrical considerations in rolling. Role of friction in rolling and neutral point location. Simplified methods for calculating rolling load, torque and power required for rolling. Effect of back and front tension on rolling force. Elastic deformation of rolls, its effect and controlling methods. Residual stresses in rolling and common rolling defects **07 Hours**

PART – B

UNIT – 5

EXTRUSION: Types of extrusion processes. Metal flow pattern in extrusion. Extrusion dies and other equipments used. Extrusion of hollow sections. Slab analysis of extrusion of strips and circular sections and calculation of force and power required for extrusion. Common extrusion defects. **07 Hours**

UNIT – 6

DRAWING OF RODS, WIRES AND TUBES: Drawing equipments and dies. Tandem drawing of wires. Analysis of rod or wire drawing and calculation of draw force and power required. Maximum possible reduction in drawing. Tube drawing using different types of mandrels, residual stresses and defect in drawn products. **07 Hours**

UNIT – 7

SHEET METAL WORKING: Classification of sheet metal working and equipments used, Blanking and Piercing operation – Die design, cutting force required, slitting, trimming and shaving operations

Bending operation – Types of bending. Bend angle, bend radius, bend allowance and force required for bending. Springback effect in bending. Roll bending process. Brief description of spinning and stretch forming processes.

06 Hours

UNIT – 8

SHEET METAL DRAWING: Process, Die design, Number of draws required, Blank size calculation, and drawing force necessary. Drawability and defects in drawn products.

HIGH ENERGY RATE FORMING (HERF): Introduction to the process and brief description of Explosive forming, Electro discharge forming, and Electromagnetic forming. **06 Hours**

TEXT BOOKS:

1. **Mechanical Metallurgy** - Dieter G.E – McGraw Hill publication.
2. **Fundamentals of Metal Forming Processes** – Juneja B.L - New age International
3. **Principle of Industrial Metal Working Processes** – Rowe Edward - CBS Publication

REFERENCE BOOKS:

1. **Materials and Processes in Manufacturing** – E.Paul, DeGarmo etal - PHI publication.
2. **Fundamentals of Working of Metals** – Sach G. - Pergamon press.

FINITE ELEMENT METHOD

Subject Code	: 10IP / IM 663	IA Marks	: 25
No. of Lecture Hrs./ Week	: 04	Exam Hours	: 03
Total No. of Lecture Hrs.	: 52	Exam Marks	: 100

PART - A

UNIT - 1

INTRODUCTION TO FEM: Need for use of FEM – Advantages and Disadvantages of FEM Matrix algebra – Terminologies relating to matrices, methods of solution of linear algebraic equations. Eigen values and eigen vectors, Simple numeric Gaussian Quadrature – 1 pt. 2pt and 3pt formula.

7 Hours

UNIT - 2

BASIC OF THEORY OF ELASTICITY: Definition of stress and strain, stress-strain relations; strain-displacement, Relations in 2D and 3D Cartesian and Polar coordinates.

6 Hours

UNIT – 3

CONTINUUM METHODS: Variational methods Raleigh-Ritz method applied to simple problems on axially loaded members cantilever. Simply supported and fixed beam with point loads and UDL Galerkin method as applied to simple elasticity problem.

7 Hours

UNIT - 4

FEM- BASIC DEFINITIONS: Displacement method, Nodal degrees of freedom, different coordinate systems shape functions. Lagrangian polynomial; complete formulation of bar-truss-beam-triangular-quadrilateral Tetrahedral hexahedral elements.

6 Hours

PART - B

UNIT - 5

BOUNDARY CONDITIONS: SPC and MPC. Methods of handling boundary conditions eliminating method-penalty method. Simple numerical, ISO parametric sub parametric super parametric elements Convergence criteria – requirements of convergence of a displacement model.

7 Hours

UNIT - 6

HIGHER ORDER ELEMENTS: Bar – triangular-quadrilateral elements. Tetrahedral and hexahedral elements (non-Formulation) – Pascal triangle – Pascal pyramid. Introduction to axis symmetric problems-formulation of axis symmetric triangular element.

7 Hours

UNIT - 7

DYNAMIC ANALYSIS: Formulating-element mass matrices for 1D and 2D element, computation of Eigen value and vector for simple one Dimensional analysis.

6 Hours

UNIT - 8

One dimensional steady state heat conduction. Formulation of 1D element simple numerical using 1D element. Structure of a commercial FE package. Pre-processor. Solver post processor.

6 Hours

TEXT BOOKS:

1. **Finite Element Method** - J.N.Reddy – Tat McGraw Hill - edition 2002.
2. **Introduction to Finite elements in engineering** - Chandraupatla and Belegundu – Pearson edn - 2002.

REFERENCE BOOKS:

1. **A First course in Finite Element methods** - Daryl.L.Logon - Thomson Learning - 3rd edition, 2001.
2. **Fundamentals of Finite Element method** - Hutton – Mc Graw Hill - 2004.
3. **Concepts & applications of FEA** - Robert Cook et,al – Jonh willey & sons - 2002.
4. **Finite element analysis** – Chandrupatla - University press - 2002.
5. **Theory and Practice of Finite elements** - Alexandre ERN - I K International Publishing house Pvt. Ltd – 2004.

Subject Code	: 10IP / IM 664	IA Marks	: 25
No. of Lecture Hrs./ Week	: 04	Exam Hours	: 03
Total No. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

INTRODUCTION: Evolution of HRM, Objectives, Functions and Policies.

6 Hours

UNIT - 2

HUMAN RESOURCE PLANNING: Uses and benefits, Man Power Inventory, Man Power Forecasting, Methods of Man Power Forecasting, job Description, Job Specification

7 Hours

UNIT - 3

RECRUITMENT: Sources of Man power, Advertisement, Short Listing of Candidates calling Candidates for selection Process.

6 Hours

UNIT - 4

SELECTION: Selection procedure – Written Test, Group Discussion. Interview – Different methods, advantages and limitations, Psychological testing – Advantages and limitations, Induction procedure, transfers, promotion, exit interview, (Tutorial on written test, Group Discussion, Interviews)

7 Hours

PART - B

UNIT - 5

TRAINING AND DEVELOPMENT: Identification of Training needs, Training Evaluation, Training Budget, Executive Development – Different Approaches, Non-executive development – Different methods.

7 Hours

UNIT - 6

PERFORMANCE APPRAISAL: Components (all round performance appraisal), Methods. Advantages and limitations of different methods, Personal Counselling based on Annual Confidential Reports.

7 Hours

UNIT - 7

COUNSELLING AND HUMAN RESOURCE ACCOUNTING: Characteristics, Need, Function, Types, Suggestions for personnel development, communication function, communication process, effective communication. Human resource records, Advantages of HR accounting, Various methods of accounting.

6 Hours

UNIT - 8

INDUSTRIAL RELATIONS: Indian trade union act, standing orders act, Indian factories act,

INDUSTRIAL DISPUTES AND SETTLEMENT: Indian Industrial Disputes act, Industrial disputes settlement machinery. Works committee, Board of Conciliation, Voluntary Arbitration, Compulsory arbitration, Court of inquiry, Industrial tribunal, Adjudication.

6 Hours

TEXT BOOKS

1. **Human Resources Management** – Dr. K Ashwathappa - Tata McGraw Hill - Edition 1999.
2. **Management of Human Resources** – CB Mamoria – Himalaya Publication House – 2003.

REFERENCES BOOKS:

1. **Personnel / Human resource Management** – Decenzo and Robbins - PHI - 2002
2. **Industrial Relations** – Arun Monappa – TMH - ISBN – 0-07-451710-8.
3. **Human Resources Management** – VSP Rao
4. **Human Resources Management** – Ravi Dharma Rao

Subject Code	: 10 IM 665	IA Marks	: 25
No. of Lecture Hrs./ Week	: 04	Exam Hours	: 03
Total No. of Lecture Hrs.	: 52	Exam Marks	: 100

PART - A

UNIT - 1

INTRODUCTION: History, Classification, Comparison between conventional and non-conventional machining process selection.

MECHANICAL PROCESS: Ultrasonic machining (USM) : Introduction, Equipment, tool materials & tool Size, Abrasive slurry, Cutting tool system design : Magnetostriction assembly, Tool cone (Concentrator), Exponential concentrator of circular cross section & rectangular cross section Hollow cylindrical concentrator. Mechanics of cutting : Theory of Miller & Shaw Effect of parameter : Effect of amplitude and frequency and vibration, Effect of grain diameter , Effect of applied static load, Effect of slurry, Tool and work material, USM process Characteristics ; Material removal rate, tool wears, Accuracy, surface finish., Applications, Advantages & Disadvantages of USM.

8 Hours

UNIT - 2

ABRASIVE JET MACHINING (AJM): Introduction, Equipment, Variables in AJM: carrier Gas Type of abrasive, Size of abrasive grain, velocity of the abrasive jet, Mean No. abrasive particles per unit volume of the carrier gas, Work material, stand off distance (SOD) nozzle design shape of cut. Process characteristics – Material removal rate, Nozzle wear, Accuracy & surface finish. Applications, Advantages & Disadvantages of AJM.

6 Hours

UNIT - 3

ELECTROCHEMICAL AND CHEMICAL METAL REMOVAL PROCESS: Electrochemical machining (ECM): Introduction, Study of ECM machine, Elements of ECM process: Cathode tool, Anode work piece, source of DC power, Electrolyte, Chemistry of the process ECM process characteristics – Material removal rate, Accuracy, Surface finish.

6 Hours

UNIT - 4

ECM TOOLING: ECM tooling technique 7 example, Tool & insulation materials, Tool size Electrolyte flow arrangement, Handling of slug., Economics of ECM, Applications such as Electrochemical turning, Electrochemical Grinding, Electrochemical Honing, deburring, Advantages, Limitations.

6 Hours

PART - B

UNIT - 5

CHEMICAL MACHINING (CHM): Introduction, Elements of process
Chemical blanking process :- Preparation of work piece. Preparation of masters, masking with photo resists, etching for blanking, applications of chemical blanking, chemical milling (Contour machining) :- Process steps – masking, Etching, process characteristics of CHM :- material removal rate accuracy, surface finish, Hydrogen embrittlement, Advantages & application of CHM.

8 Hours

UNIT - 6

EDM PROCESS: Introduction, machine, mechanism of metal removal, dielectric fluid, spark generator, EDM tools (electrodes) Electrode feed control, Electrode manufacture, Electrode wear, EDM tool design : Choice of matching operation, electrode material selection, under sizing and length of electrode Machining time.

6 Hours

UNIT - 7

EDM PROCESS CHARACTERISTICS: Flushing – Pressure flushing synchronized with electrode movement, EDM process characteristic: Metal removal rate, Accuracy surface finish, Heat affected Zone. Machine tool selection, Application: EDM accessories / applications, electrical discharge grinding, Travelling wire EDM.

6 Hours

UNIT - 8

PLASMA ARC MACHINING (PAM): Introduction, equipment, generation of plasma, Mechanism of Metal removal, PAM parameters, Process characteristics.

LASER BEAM MACHINING & ION BEAM MACHINING:
Introduction, metal removal mechanism, advantages and application.

6 Hours

TEXT BOOKS:

1. **Modern machining process** - PANDEY AND SHAH - TATA Mc Graw Hill -2000.
2. **Unconventional Manufacturing process** – M K Singh, New age publications, ISBN 978-81-224-2244-3

REFERENCE BOOKS:

1. **Production Technology** - HMT - TATA McGraw Hill - 2001.
2. **Thermal Metal cutting processes** - B G Ranganath - I K International Publishing house Pvt. Ltd,
3. **Fundamentals of Machining and Machine Tools** - R.K.Singal - I K International Publishing house Pvt. Ltd.

VII SEMESTER

TOTAL QUALITY MANAGEMENT

Subject Code	: 10IP/IM 71	IA Marks	: 25
No. of Lecture Hrs./ Week	: 04	Exam Hours	: 03
Total No. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

OVERVIEW OF TOTAL QUALITY MANAGEMENT: History of TQM. Axioms of TQM, contributions of Quality Gurus – Deming’s approach, Juran,s quality trilogy, Crosby and quality treatment, Imai’s Kaizen, Ishikawa;s company wide quality control, and Fegenbaum;s theory of TQC, QFD.

7 Hours

UNIT - 2

EVOLUTION OF QUALITY CONCEPTS AND METHODS: Quality concepts. Development of four fitnesses, evolution of methodology, evolution of company integration, quality of conformance versus quality of design from deviations to weaknesses to opportunities. Future fitness’s, four revolutions in management thinking, and four levels of practice

7 Hours

UNIT - 3

FOUR REVOLUTIONS IN MANAGEMENT THINKING: Customer focus, Continuous Improvement, Total participation, and Societal Networking. FOCUS ON CUSTOMERS; Change in work concept marketing, and customers.

6 Hours

UNIT - 4

CONTINUOUS IMPROVEMENT: Improvement as problem solving process; Management by process, WV model of continuous improvement, process control, process control and process improvement, process versus creativity. Reactive Improvement; Identifying the problem, standard steps and tools, seven steps case study, seven QC tools.

6 Hours

PART - B

UNIT - 5

PROACTIVE IMPROVEMENT: Management diagnosis of seven steps of reactive improvement. General guidelines for management diagnosis of a QI story, Discussion on case study for diagnosis of the seven steps. Proactive Improvement; Introduction to proactive improvement, standard steps for proactive improvement, semantics, example-customer visitation, Applying proactive improvement to develop new products- three stages and nine steps.

6 Hours

UNIT - 6

TOTAL PARTICIPATION: Teamwork skill. Dual function of work, teams and teamwork, principles for activating teamwork, creativity in team processes, Initiation strategies, CEO involvement Example strategies for TQM introduction. Infrastructure for mobilization. Goal setting (Vision/Mission), organization setting, training and E education, promotional activities, diffusion of success stories, awards and incentives monitoring and diagnosis, phase-in, orientation phase, alignment phase, evolution of the parallel organization.

6 Hours

UNIT - 7

HOSHIN MANAGEMENT: Definition, phases in hoshin management-strategic planning (proactive), hoshin deployment, controlling with metiers (control), check and act (reactive). Hoshin management versus management by objective, hoshin management and conventional business planning, an alternative hoshin deployment system, hoshin management as “systems Engineering” for alignment.

6 Hours

UNIT - 8

SOCIETAL NETWORKING: Networking and societal diffusion – Regional and nationwide networking, infrastructure for networking, openness with real cases, change agents, Center for quality Management case study, dynamics of a societal learning system. TQM as learning system, keeping pace with the need for skill, a TQM model for skill development, summary of skill development.

8 Hours

TEXT BOOKS:

1. **A New American TQM Four Practical Revolutions in Management** - Shoji Shiba, Alan Graham and David Walden – Productivity Press, Portlans (USA) -1993.
2. **Management for Total Quality** - N Logothetis- Prentice Hall of India, New Delhi - 1994.(1st Chapter)

REFERENCE BOOK:

1. **The Quality Improvement Hand Book** -Roger C Swanson - Publisher Vanity Books International, New Delhi - 1995.
2. **Total Quality Management** - Kesavan R - I K International Publishing house Pvt. Ltd – 2008.

OPERATIONS MANAGEMENT

Subject Code	: 10IP/IM 72	IA Marks	: 25
No. of Lecture Hrs./ Week	: 04	Exam Hours	: 03
Total No. of Lecture Hrs.	: 52	Exam Marks	: 100

PART - A

UNIT - 1

OPERATIONS MANAGEMENT CONCEPTS: Introduction, Historical development, The trend: Information and Non-manufacturing systems, Operations management, Factors affecting productivity, International dimensions of productivity, The environment of operations, Production systems decisions- a look ahead.

6 Hours

UNIT - 2

OPERATIONS DECISION MAKING:

Introduction, Management as a science, Characteristics of decisions, Framework for decision making, Decision methodology, Decision support systems, Economic models, Statistical models.

SYSTEM DESIGN AND CAPACITY:

Introduction, Manufacturing and service systems, Design and systems capacity, Capacity planning.

7 Hours

UNIT - 3

FORECASTING DEMAND:

Forecasting objectives and uses, Forecasting variables, Opinion and Judgmental methods, Time series methods, Exponential smoothing, Regression and correlation methods, Application and control of forecasts.

7 Hours

UNIT - 4

AGGREGATE PLANNING AND MASTER SCHEDULING:

Introduction- planning and scheduling, Objectives of aggregate planning, Aggregate planning methods, Master scheduling objectives, Master scheduling methods.

6 Hours

PART -B

UNIT-5

MATERIAL AND CAPACITY REQUIREMENTS PLANNING:

Overview: MRP and CRP, MRP: Underlying concepts, System parameters, MRP logic, System refinements, Capacity management, CRP activities.

6 Hours

UNIT - 6

SCHEDULING AND CONTROLLING PRODUCTION ACTIVITIES:

Introduction, PAC, Objectives and Data requirements, Scheduling strategy and guide lines, Scheduling methodology, priority control, capacity control.

6 Hours

UNIT - 7

SINGLE MACHINE SCHEDULING: Concept, measures of performance, SPT rule, Weighted SPT rule, EDD rule, minimizing the number of tardy jobs.

FLOW -SHOP SCHEDULING: Introduction, Johnson's rule for 'n' jobs on 2 and 3 machines, CDS heuristic.

JOB-SHOP SCHEDULING: Types of schedules, Heuristic procedure, scheduling 2 jobs on 'm' machines.

7 Hours

UNIT - 8

LEAN SYSTEMS: Characteristics of Just-in-Time operations, Pull method of materials flow, consistently high quality, small lot sizes, Uniform workstation loads, Standardized components and work methods, close supplier Ties, Flexible workforce, Line flows, Automated production, Preventive maintenance, continuous improvement, Kaizen.

7 Hours

TEXT BOOKS:

1. **Operations Management** - Monks J.G. - McGraw-Hill International Editions - 1987.
2. **Production and Operations Management** - Pannerselvam. R – PHI – 2nd edition.
3. **An introductory book on lean systems**, TPS, Yasuhiro Monden

REFERENCE BOOKS:

1. **Modern Production/Operations Management** - Buffa - Wiely India Ltd. - 4th edition.
2. **Production and Operations Management** - Chary, S.N - Tata-McGraw Hill. - 3rd edition
3. **Production and Operations Management** – Adam & Ebert, PHI, 5th edition

FINANCIAL ACCOUNTING AND COSTING

Subject Code	: 10 IM 73	IA Marks	: 25
No. of Lecture Hrs./ Week	: 04	Exam Hours	: 03
Total No. of Lecture Hrs.	: 52	Exam Marks	: 100

PART - A

UNIT - 1

FINANCIAL ACCOUNTING: Introduction to Book keeping: double-entry accounting, journal & ledger posting.

6 Hours

UNIT - 2

FINANCIAL STATEMENTS & ANALYSIS: Trial balance, preparation of Trading and Profit & Loss account, and Balance sheet.

8 Hours

UNIT - 3

RATIO ANALYSIS: Balance sheet ratio's, profit – loss account ratio's, and combined ratio's.

6 Hours

UNIT - 4

COSTING: Objectives of costing, Elements of costing, methods of costing preparation of cost sheet (job costing)

6 Hours

PART - B

UNIT - 5

Process costing, Marginal costing and absorption costing.

7 Hours

UNIT - 6

STANDARD COSTING: Material, labour, overhead cost variance.

ACTIVITY BASED COSTING: Target Costing, Activity Based Costing and management

7 Hours

UNIT - 7

WORKING CAPITAL MANAGEMENT: Factors influencing working capital requirement, determination of operating cycle and working capital.

6 Hours

UNIT - 8

BUDGETING: Sales budget, production budget, raw materials purchasing budget, selling and administrative expense budget, cash budget, Flexible Budget & Master budget.

6 Hours

TEXT BOOKS:

1. **Cost Accounting** - Khan M Y and Jain P K - Tata McGraw-Hill - 4th Edition.
2. **Financial Management** - Prasanna Chandra - Tata McGraw-Hill - 4th Edition. 1998.
3. **Financial Management and Policy** - James. C Vanhorne - Peerason education - 12th edition.

REFERENCE BOOKS:

1. **Elements of Accountancy** - B.S Raman,
2. **Practical Costing** - Ahuja, Pandey, Khanna and Arora - S. Chand & Co. Ltd - 2005.
3. **Financial Management & Costing** - KHAN & JAIN - TMH - 2000

Subject Code	: 10IM 74	IA Marks	: 25
No. of Lecture Hrs./ Week	: 04	Exam Hours	: 03
Total No. of Lecture Hrs.	: 52	Exam Marks	: 100

PART - A

UNIT - 1

FUNDAMENTALS OF INFORMATION SYSTEMS: Information systems in business, fundamentals of information systems solving business problems with information systems.

6 Hours

UNIT - 2

INFORMATION SYSTEMS FOR BUSINESS OPERATIONS: Business information systems, Transaction processing systems, management, information systems and decision support systems. Artificial intelligence technologies in business, information system for strategic applications and issues in information technology.

8 Hours

UNIT - 3

ISSUES IN MANAGING INFORMATION TECHNOLOGY: Managing information resources and technologies global information technology, management, planning and implementing change, integrating business change with IT, security and ethical challenges in managing IT, social challenges of information technology.

8 Hours

UNIT - 4

INTRODUCTION TO E-BUSINESS: E-commerce frame work, Media convergence, Consumer applications, Organization applications.

6 Hours

PART - B

UNIT - 5

E-BUSINESS MODEL: Architectural frame work for E-commerce, Application services and transaction Models – B2C Transactions, B2B Transactions, Intra-Organizational Transactions.

6 Hours

UNIT - 6

E-BUSINESS MODEL: WWW Architecture: Client server structure of the web, e-Commerce architecture, Technology behind the web.

6 Hours

UNIT - 7

CONSUMER-ORIENTED E-COMMERCE: Consumer oriented Application: Finance and Home Banking, Home shopping, Home Entertainment, Mercantile Process Models, Consumers perspective, Merchants perspective. **6 Hours**

UNIT - 8

ELECTRONIC DATA INTERCHANGE (EDI): EDI Concepts, Applications in business – components of international trade, Customs Financial EDI, Electronic fund transfer, Manufacturing using EDI, Digital Signatures and EDI.

6 Hours

TEXT BOOKS:

1. **Management Information systems-** Managing information technology in the internet worked enterprise- James. O'Brien - Tata McGraw Hill publishing company limited - 2002.
2. **Management Information Systems** - Laudon & Laudon - PHI - ISBN 81-203-1282- 1.1998.

REFERENCE BOOKS:

1. **Management Information systems-** S. Sadogopan - PHI – 1998 Edn. - ISBN 81-203-1180-9.

Subject Code	: 10IML 77	IA Marks	: 25
No. of Lab Hrs./ Week	: 03	Exam Hours	: 03
Total No. of Lab Hrs.	: 42	Exam Marks	: 50

PART - A

1. Process of customer orders under seasonal / unseasonable and Blanket orders.
2. Generating Bill of Materials for Various Engineering Designs
3. Creating Item Master for various Engineering Designs
4. Conduction of vendor Evaluation exercise
5. Basic Statistical Analysis
6. Creating Purchase order for Items
7. Creating Work order for Items
8. Perform inventory transaction

PART - B

1. Creating quotation process for Items
2. Creating Dispatch Instruction for Items
3. Creating Payment reconciliation.
4. MRP - II Generating of Various reports for confirmed orders
5. Basic statistical analysis
6. Analyse of existing capacity and defining routes optimizing the resources along routes.
7. Optimization problems using OR packages (two exercises only).
8. Scheduling of activities

Suggested Software Packages

1. Statistical Packages : SYSTAT / MINITAB / SPSS and such others
2. ERP Packages: SIXTH SENSE / RAMCO / MAARSMAN / CIMAS / UNISOFT / OPTIMIIZER 10.6 and such others.
3. Preactor – Scheduling Software OR Packages : Lindo / Lingo / STORM / such others

Note: A minimum of 12 exercises are to be conducted.

QUALITY ENGINEERING LAB

Subject Code	: 10IML 78	IA Marks	: 25
No. of Lab Hrs./ Week	: 03	Exam Hours	: 03
Total No. of Lab Hrs.	: 42	Exam Marks	: 50

PART - A

To test the Goodness of fit for the given quality characteristic using: Uniform distribution, Binomial distribution, Poisson distribution & Normal distribution.

Conduction of Repeatability and Reproducibility studies for appraiser and instrument using R&R Software

Assessing Process Capability of the given manufacturing process using Normal Probability paper method and process capability indices

Assessing Process Capability of the given manufacturing process using Digital Motorized Multifunctional Height Gauge and SQC Display unit

PART – B

1. Experiments on Application of 7 QC Tools as applied to Manufacturing and Service Operations.
2. Construction of control chart for variable quality characteristic using
3. Digital Motorized Multifunctional Height Gauge
4. SQC Display unit
5. SQC/SPC software
6. Construction of control chart for attribute quality characteristic
7. Construction of control charts using SYSTAT Software
8. Attribute sampling Plans – Single, Double and Multiple sampling plans.
9. Experiments on correlation and Simple linear regressions
10. Experiments on multiple linear regressions
11. Conduction of Design of Experiments – Full Factorial approach for the given quality characteristic for machining operations.
12. Exercises to demonstrate Taguchi's Orthogonal Array technique through DOE software.
13. Exercises on FMEA and Reliability
14. Exercises on QFD

Note: A minimum of 12 exercisers are to be conducted

REFERENCE BOOKS:

1. **Introduction to statistical Quality Control** - D C Montgomery - John Wiley and Sons - 3rd Edition.
2. **Quality Planning & Analysis**- J M Juran, Frank M Gryna - Tata McGraw Hill - 3rd edn.

ELECTIVE-II (GROUP B)

ENTERPRISE RESOURCE PLANNING

Subject Code	: 10IP / IM 751	IA Marks	: 25
No. of Lecture Hrs./ Week	: 04	Exam Hours	: 03
Total No. of Lecture Hrs.	: 52	Exam Marks	: 100

PART - A

UNIT - 1

INTRODUCTION TO ERP: Introduction, Evolution of ERP, What is ERP, Reasons for the growth of the ERP market, The advantages of ERP, Why do Man ERP Implementations Fail? Why are ERP packages being used now?

ENTERPRISE – AN OVERVIEW: Introduction, Integrated Management Information, Business modelling, Integrated Data Model.

7 Hours

UNIT - 2

ERP AND RELATED TECHNOLOGIES: Introduction, Business Process Reengineering, Management Information System, Decision Support System, Executive Information Systems, Data Warehousing, Data Mining, On-line Analytical Processing, Supply Chain Management.

7 Hours

UNIT - 3

ERP- MANUFACTURING PERSPECTIVE: Introduction, ERP. CAD/CAM, Materials Requirements Planning, Bill of Material, Closed Loop MRP. Manufacturing Resource Planning, Distribution Requirements Planning.

6 Hours

UNIT - 4

KANBAN: JIT and Kanban, Product Data Management, Benefits of PDM, Make-to-order, and Make-to Stock, Assemble to order, Engineer to order, Configure-to order.

6 Hours

PART - B

UNIT - 5

ERP MODULES: Introduction, Finance, Plant Maintenance, Quality Management, Materials Management.

6 Hours

UNIT - 6

BENEFITS OF ERP: Introduction, Reduction of Lead time, On-time shipment, Reduction in Cycle Time, Improved Resource Utilisation, Better Customer Satisfaction, Improved Supplier Performance, Increased Flexibility, Reduced Quality Costs, Improved Information Accuracy and Decision – making capability.

6 Hours

UNIT – 7

ERP MARKET: Overview of ERP Software Introduction, SAP AG, Baan Company, Oracle Corporation, PeopleSoft, JD Edwards World Solutions Company, System Software Associates, Inc. QAD

6 Hours

UNIT – 8

ERP Implementation Life Cycle: Pre-Evaluations Screening, Package Evaluation, Project Planning Phase, Gap Analysis, Reengineering, Configuration, Implementation of Team Training, Testing, Going Live, end user Training, Post Implementation

VENDOR, CONSULTANTS AND USERS: Introduction, In-house implementation – Pros and Cons, Vendors, Consultants, End-users.

FUTURE DIRECTION IN ERP: Introductions, New Markets, New Channels, Faster Implementation Methodologies, Business models and BAPIs, Convergence on Windows NT, Application Platforms, New business segments, web enabling, market snapshot

ERP- Case studies

8 Hours

TEXT BOOKS:

1. **Enterprise Resource Planning** - Alexis Leon - Tata Mc Graw Hill Publishing Company Ltd -1999.
2. **Enterprise Resource Planning Concept and Practice** -Vinod Kumar Garg and Venkitakrishnan - Prentice Hall, India - 2nd Edition.

REFERENCE TEXT BOOK:

1. **Manufacturing Planning & Controls** -Thomas Volloman, et,al.

CONCURRENT ENGINEERING

Subject Code	: 10IP/IM 752	IA Marks	: 25
No. of Lecture Hrs./ Week	: 04	Exam Hours	: 03
Total No. of Lecture Hrs.	: 52	Exam Marks	: 100

PART - A

UNIT - 1

MANUFACTURING COMPETITIVENESS: Review, Product and Services, Process and Methodologies, performance, the need for change, Sequential versus concurrent Engg.

7 Hours

UNIT - 2

PROCESS REENGINEERING: Managing change, Reengineering approaches, Enterprise models, concurrent process reengineering.

7 Hours

UNIT - 3

CONCURRENT ENGINEERING: Introduction, Basic principles, components of CE models.

6 Hours

UNIT - 4

CONCURRENT ENGINEERING ORGANIZATIONS: Benefits, co-operative concurrent teams, Types of CE organisations.

6 Hours

PART - B

UNIT - 5

SYSTEM ENGINEERING: Introduction, System thinking, System complexity, System Integration, Angle virtual company.

6 Hours

UNIT - 6

INFORMATION MODELLING: Methodology, foundation of information modelling.

6 Hours

UNIT - 7

C. E. PROCESS: Concurrent engineering process invariant enterprise model class, product mode class, cognitive models.

6 Hours

UNIT - 8

CE METRICS FOR IT: Based manufacturing – process efficiency metrics, Process effectiveness metrics.

8 Hours

TEXT BOOK:

1. **Concurrent Engineering Fundamentals** - Prasad. B - Integrated Product and process organization Vol. 1 & 2, Prentice Hall Englewood, Cliffs, New Jersey -1996.
2. **Concurrent Engineering** - Hartely R John– Shortening lead times, raising quality & Lowering costs, Productivity press, Portland, Oregon -1992.

REFERENCE BOOKS:

1. **Concurrent Engineering** - Carter DE & Baker BS, - The product development environment for the 1990's. Addison – Wesley Publishing company, Reading MA -1992.

Subject Code	: 10IP/IM 753	IA Marks	: 25
No. of Lecture Hrs./ Week	: 04	Exam Hours	: 03
Total No. of Lecture Hrs.	: 52	Exam Marks	: 100

PART - A

UNIT - 1

INTRODUCTION: Historical development of marketing management, Definition of Marketing, Core marketing concepts, Marketing Management philosophies, Micro and Macro Environment, importance of marketing in the India Socio – economics system.

7 Hours

UNIT - 2

CONSUMER MARKETS AND BUYING BEHAVIOR: Characteristics affecting consumer behaviour, Types of buying decisions, Buying decision process, Classification of consumer products, Market segmentation.

6 Hours

UNIT - 3

MARKETING INFORMATION SYSTEMS AND RESEARCH: Components of marketing information system–benefits & uses marketing research system, marketing research procedure, measurement of market demand.

6 Hours

UNIT - 4

MARKETING OF INDUSTRIAL GOODS: Nature and importance of the Industrial market, classification of industrial products, participants in the industrial buying process, major factors influencing industrial buying behaviour, characteristics of industrial market demand. Determinants of industrial market demand Buying power of Industrial users, buying motives of Industrials users, the industrial buying process, buying patterns of industrial users

7 Hours

PART - B

UNIT - 5

PRODUCT PLANNING AND DEVELOPMENT: The concept of a product, features of a product, classification of products, product policies – product planning and development, product line, product mix – factors influencing change in product mix, product mix strategies, meaning of New – product; major stages in new – product development, product life cycle.

7 Hours

UNIT - 6

BRANDING, LABELLING AND PACKAGING: Branding, Reasons for branding, functions of branding, features and types of brands, kinds of brand name.

LABELLING: Types, functions, advantages and disadvantages

PACKAGING: Meaning, growth of packaging, function of packaging, kinds of packaging.

6 Hours

UNIT - 7

PRICING: Importance of Price, pricing objectives, factors affecting pricing decisions, procedure for price determination, kinds of pricing, pricing strategies and decisions.

DISTRIBUTION: Marketing channels – functions, types of channels of distribution, number of channel levels. Physical distribution – importance, total systems concept, strategy, use of physical distribution.

7 Hours

UNIT - 8

ADVERTISING AND SALES PROMOTION: Objectives of advertisement function of advertising, classification of advertisement copy, advertisement media – kinds of media, advantages of advertising. Objectives of sales promotion, advantages sales promotion.

PERSONAL SELLING: Objectives of personal selling, establishing the Sales force objectives, sales – force strategy, sales force structure and size, salesmanship, qualities of good salesman, types of salesman, major steps in effective selling.

6 Hours

TEXT BOOKS:

1. **Principles of Marketing** - Philip Kotler - Prentice Hall - 11th Edn.
2. **Marketing Management** - Philip Kotler , Prentice Hall - 12th Edn.

REFERENCE BOOKS:

1. **Fundamentals of Marketing** - Wiliam J Stanton - McGraw Hill – 1994.
2. **Marketing Management Text & Cases** - Rajagopal - Vikas Publishing House - ISBN 81-259-0773-4.
3. **Marketing Management** - Michael R Czinkota - Vikas Publishing House - 2nd Edition ISBN 981-240-366-3.

TECHNOLOGY MANAGEMENT

Subject Code	: 10IP/IM 754	IA Marks	: 25
No. of Lecture Hrs./ Week	: 04	Exam Hours	: 03
Total No. of Lecture Hrs.	: 52	Exam Marks	: 100

PART - A

UNIT - 1

THE CONCEPT OF TECHNOLOGY: Introduction, The nature of knowledge, Aspects of classification, Concept and Meaning of technology, The character of a specific technology, Scope of technology, Examples of classification of technology, Scale of technology information, Levels of technology, Technology portfolios, Technology as an environment.

6 Hours

UNIT - 2

THE NATURE OF TECHNOLOGICAL CHANGE: Introduction, Meaning of technological change, Concept of invention, Nature of innovation, Emergence of new technologies, Life cycle of a technology, Motivation for technological change, Nature of technological progress, Nature of mature technology, Nature of diffusion, Technological convergence.

7 Hours

UNIT - 3

THE ECONOMICS OF TECHNOLOGY: Introduction, Meaning of technological economics, Examples of technological economics, Scope of technological economics, Engineering economics, Production economics, Concept of economy of scale, Concept of optimum size, Technology as a commodity, Technology at the macro-economic level.

7 Hours

UNIT - 4

CORPORATE TECHNOLOGY STRATEGY: Introduction, The Business Mission, Where Is The Business? Concept Of Business Strategy, Capability For Strategic Planning, Corporate Technology Strategy, Competitive Technology, Focus Of Strategy, Technological Alliances, Realization Of Strategy, Technology Crisis.

6 Hours

PART - B

UNIT - 5

ANALYSIS FOR TECHNOLOGY STRATEGY: Introduction, Technology assessment, Technology forecasting, Main techniques of technology forecasting, Technology forecasting system, Yield of technology forecasting.

7 Hours

UNIT - 6

THE REALIZATION OF NEW TECHNOLOGY: Introduction, Concept of R&D policy, Stimuli for innovation, Sources of innovation, Intelligence function of R&D, Management of R&D, R&D team, Effectiveness of R&D, Marketing aspects of R&D, Finance for Design, Development, Manufacture and Marketing, reduction of development lead time, Patterns for new technology development, Remaining a going concern.

7 Hours

UNIT - 7

THE ADOPTION OF NEW MANUFACTURING TECHNOLOGY: Introduction, manufacturing strategy, Introduction of new technology, Challenges of factory automation, Stages of factory automation, Manufacturing FMS, CIM, CAD/CAM, Intelligent manufacturing systems, operation of new technology, Change management, People and technology at work, Work structures.

6 Hours

UNIT - 8

TECHNOLOGY- AN INSTRUMENT OF COMPETITION: Introduction, securing competitive advantage, Technological competition analysis, Technological leadership, Adoption of new technology, marketing a new technology product, Retention of competitive advantages.

6 Hours

TEXT BOOK:

1. **The Management of Technology Perceptions & Opportunities** - Paul Lowe -Chapman & Hall, London - 1995.

REFERENCE BOOKS:

1. **Strategic Management of Technology** -Frederick Betz - McGraw- Hill Inc -1993.
2. **Management of Technology & Innovation competing Through Technological Excellence** - Rastogi P.N - Sage Publications – 1995.
3. **Mastering the dynamics of innovation** – J Utterback

Subject Code	: 10IM 755	IA Marks	: 25
No. of Lecture Hrs./ Week	: 04	Exam Hours	: 03
Total No. of Lecture Hrs.	: 52	Exam Marks	: 100

PART - A

UNIT - 1

DEFINITION AND CONCEPT OF ENTERPRISE: Profile of an entrepreneur-need scope and characteristics of entrepreneurs.

6 Hours

UNIT - 2

DEFINITION AND CONCEPT OF ENTERPRISE: Attitude development, creativity–stress management-positive reinforcement.

7 Hours

UNIT - 3

METHODOLOGY OF PROJECT IDENTIFICATION: Short listing and zeroing on to product/service-project in outline project planning- technical and feasibility analysis-evaluation of project report.

6 Hours

UNIT - 4

METHODOLOGY OF PROJECT IDENTIFICATION: Project appraisal technical, commercial and financial appraisal - problems in project equation - legal, financial and environmental aspects.

6 Hours

PART - B

UNIT - 5

MARKETING: Market share-distribution-sale strategies-certification agencies-term finance-source and management working capital-coating and cost control (basic principles only) need analysis-product design (basic principles only)- developing operational expertise- innovation and change.

6 Hours

UNIT - 6

SMALL INDUSTRIES DEVELOPMENT: Small Industries development in India and its concepts- ancillary industries-starting a small scale industry-steps involved-role of financing and other institutions providing assistance to small industries- preparation of project (case study).

7 Hours

UNIT - 7

ACCOUNTING PRINCIPLES: Conventions and concepts-balance sheet-profit and loss account.

7 Hours

UNIT - 8

ACCOUNTING PRINCIPLES: Accounting rate of return, pay back period, SSI duty practice. **7 Hours**

TEXT BOOK:

1. **Developing Entrepreneurship** -Udai Pareek and T.V. Venkateswara Rao, – A Hand Book Learning systems - ND. 1978.

REFERENCE BOOKS:

1. **EDI - 1 Faculty and External Experts**, A handbook for new entrepreneurs, Entrepreneurship development institute of India -1986.
2. **Entrepreneurship Development** - P. Saravanel - Ess Pee Kay publishing house -1st Edition.
3. **Entrepreneurship and Small Business** - Anil Kumar - I K International Publishing house Pvt. Ltd - 1st Edition.

ELECTIVE III (GROUP C)

FINANCIAL MANAGEMENT

Subject Code	: 10IP/IM	IA Marks	: 25
	761		
No. of Lecture Hrs./ Week	: 04	Exam Hours	: 03
Total No. of Lecture Hrs.	: 52	Exam Marks	: 100

PART - A

UNIT - 1

INTRODUCTION: Evolution of Financial Management, Goals, Forms of Business.

RISK AND REQUIRED RETURN: Risk and return relationship, Business risk, financial risk, and risk in portfolio context, expected rate of return, Capital asset pricing model.

7 Hours

UNIT - 2

CAPITAL BUDGETING: Risk analysis in Capital Budgeting, Cost of Capital – Debt, Preference Equity forms of capital.

WORKING CAPITAL MANAGEMENT: Factors influencing working capital requirement, determination of operating cycle and working capital.

7 Hours

UNIT - 3

LONG TERM FINANCING: Raising of finance form primary and secondary markets, Valuation of securities, features of convertibility securities and warrants, SEBI guide lines on capital issues, stock market in India, Venture capital, Initial Public Offering.

7 Hours

UNIT - 4

CAPITAL STRUCTURE AND FIRM VALUE: Assumption, Definition and approaches, Modigliani and Miller Mode, Capital Structure decisions – EBIT, EPS analysis, ROI, REI analysis and Cash Flow comparative Analysis

DIVIDEND VALUE AND FIRM VALUE: Models, Reasons for payment of dividends, Dividend Policy, Bonus shares and stock splits, Dividend policies in practice.

6 Hours

PART - B

UNIT - 5

SECURITIES AND PORTFOLIO ANALYSIS: Derivatives, Futures Trading,

6 Hours

UNIT - 6

MERGER ACQUISITION AND RESTRUCTURING: Reasons, Mechanics, Cost and benefits of a merger, Evolution, terms and purchase of a division, Takeovers, Acquisitions, Portfolio and financial restructuring.

6 Hours

UNIT - 7

INTERNATIONAL FINANCIAL MANAGEMENT: World Monitoring system, Foreign Exchange Markets, International Parity Relationships, International Capital budgeting, Financing Foreign Operations, Raising Foreign Currency Finance, Financing Exports, Documents in International Trade, Foreign Exchange Exposure, Management of Foreign Exchange Exposure.

6 Hours

UNIT - 8

FINANCIAL MANAGEMENT IN SICK UNITS: Definition of sickness, Causes of sickness, Symptoms of sickness, Prediction of sickness, Revival of a sick unit

7 Hours

TEXT BOOKS:

1. **Financial Management Theory and practice** - Prasanna Chandra -TMH ISBN– 0-07-044501-X, 5th edn.
2. **Financial accounting** - B.S. Raman - United publication – Vol - II

REFERENCE BOOKS:

1. **Financial Management Text & Problems** - Khan & Jain - TMH - ISBN 0—07-460208-X
2. **Financial management** - IM Pandey - Vikas Pub. House - ISBN 0-7069-5435-1.

PROJECT MANAGEMENT

Subject Code	: 10IP/IM 762	IA Marks	: 25
No. of Lecture Hrs./ Week	: 04	Exam Hours	: 03
Total No. of Lecture Hrs.	: 52	Exam Marks	: 100

PART - A

UNIT - 1

CONCEPTS OF PROJECT MANAGEMENT: Concepts of a Project, Categories of projects, Phases of project life cycle, Roles and responsibility of project leader, tools and techniques for project management.

6 Hours

UNIT - 2

PROJECT PLANNING AND ESTIMATING: Feasibility report, phased planning, Project planning steps, Objective and goals of the project, preparation of cost estimation, evaluation of the project profitability.

7 Hours

UNIT - 3

ORGANIZING AND STAFFING THE PROJECT TEAM: Skills / abilities required for project manager, Authorities and responsibilities of project manager, Project organization and types accountability in project execution, controls, tendering and selection of contractors.

7 Hours

UNIT - 4

PROJECT SCHEDULING: Project implementation scheduling, effective time management, different scheduling techniques, resources allocation method.

6 Hours

PART - B

UNIT - 5

TOOLS & TECHNIQUES OF PROJECT MANAGEMENT: Bar (GANTT) chart, bar chart for combined activities, logic diagrams and networks, Project evaluation and review Techniques (PERT) Planning, Computerized project management

7 Hours

UNIT - 6

CO-ORDINATION AND CONTROL: Project direction communication in a project, MIS project co-ordination, project control requirement for better control of project or role of MIS in project control, performance, control, schedule control, cost Control

7 Hours

UNIT - 7

PERFORMANCE MEASURES IN PROJECT MANAGEMENT:

Performance indicators, Performance improvement for the CM & DM companies for better project management, project management and environment, Software Project Management, Construction Project Management.

6 Hours

UNIT - 8

CASE STUDIES ON PROJECT MANAGEMENT: Over view of project management software, Case studies covering project planning, scheduling, use of tools & techniques, performance measurement.

6 Hours

TEXT BOOKS:

1. **Project Management a System approach to Planning Scheduling & Controlling** - Harold Kerzner - CBS Publishers and Distributors - 2002.
2. **Project Execution Plan: Plan for project Execution interaction** – Chaudhry. S – 2001.

REFERENCES BOOKS:

1. **A Management Guide to PERT and CPM** - WEIST & LeVY - Eastern Economy of PH 2002.
2. **PERT & CPM.**- L.S.Srinath - Affiliated East West Press Pvt. Ltd. - 2002.
3. **Project Management with PERT and CPM** - Moder Joseph and Philips cerel R.
4. **Project planning analysis selection implementation & review** – Prasanna Chandra -ISBNO-07-462049-5 – 2002.

COMPOSITE MATERIALS

Subject Code	: 10IP/IM 763	IA Marks	: 25
No. of Lecture Hrs./ Week	: 04	Exam Hours	: 03
Total No. of Lecture Hrs.	: 52	Exam Marks	: 100

PART - A

UNIT - 1

INTRODUCTION TO COMPOSITE MATERIALS: Definition, classification and characteristics of composite materials – fibrous composites, laminated composites, particulate composites. Properties and types of reinforcement and matrix materials.

6 Hours

UNIT - 2

FIBRE REINFORCEMENT PLASTIC PROCESSING: Lay up and curing, fabricating process – open and closed mould process – hand lay up techniques – structural laminate bag molding, production procedures for bag molding – filament winding, pultrusion, pulforming, thermo – forming, injection, injection molding, liquid molding, blow molding.

7 Hours

UNIT - 3

FABRICATION OF COMPOSITES: Cutting, machining, drilling, mechanical fasteners and adhesive bonding, joining, computer aided design and manufacturing, tooling, fabrication equipment.

7 Hours

UNIT - 4

Ceramic Matrix composites and their fabrication technologies.

6 Hours

PART - B

UNIT - 5

Application of composites Characterisation of composites, computer aided design and analysis of composites

7 Hours

UNIT - 6

Application of industrial experimentation for fabrication and testing of composites

6 Hours

UNIT - 7

STUDY PROPERTIES OF MMC'S: Physical Mechanical, wear, machinability and other properties. Effect of size, shape and distribution of particulate on properties.

6 Hours

UNIT - 8

Advanced composites such as Polymer based Sandwich structures of nano composites. **5 Hours**

Introduction to shape memory alloys.

2 Hours

TEXT BOOKS:

1. **Composite Science and Engineering** - K.K.Chawla - Springer Verlag - 1998.
2. **Introduction to composite materials** - Hull and Clyne - Cambridge University Press - 2nd Edition, 1990.
3. **Composite Materials** - S.C. Sharma - Narora publishing house - 2000.

REFERENCE BOOKS:

1. **Composite Materials hand book** - Meing Schwaitz - McGraw Hill Book Company - 1984.
2. **Forming Metal hand book** - 9th edition, ASM handbook, V15, 1988, P327-338.
3. **Mechanics of composites** - Autar K kaw - CRC Press - 2002.

Subject Code	: 10IP/IM 764	IA Marks	: 25
No. of Lecture Hrs./ Week	: 04	Exam Hours	: 03
Total No. of Lecture Hrs.	: 52	Exam Marks	: 100

PART - A

UNIT - 1

INTRODUCTION TO WORLD CLASS MANUFACTURING:

Manufacturing Excellence and Competitiveness, What is world-Class Manufacturing?-Hall's framework of world-Class Manufacturing (WCM), Gunn's Model of World-Class Manufacturing, Maskell's Model of World-Class Manufacturing, America's Best Plants Model of World Class Manufacturing.

6 Hours

UNIT - 2

WORLD CLASS MANUFACTURING: The philosophy of world-class Manufacturing-The First Principles of World-Class Manufacturing, The practices of World-Class Manufacturing-The customers Interface, The Supplier Interface, World-Class Practices in the factory, Quality Management, Shingo's.

7 Hours

UNIT - 3

PRINCIPLES AND PRACTICES OF WCM: Data collection plan, research-internal public domain sources, outside experts etc. original research, site visits, and code of conduct. Analyzing the gap: Top displaying data, deciding and combining best work practices, Balance Score Card Technique, Value Stream Mapping, validation, recommendations etc

6 Hours

UNIT - 4

BENCHMARKING:

Definition, mission and objectives, managing benchmarking process, training and code of conduct, future scope and benchmarking process. What to benchmark: concept of step zero, priorities, business processes – linking to goals etc, investigation, documentation, performance measures, improving business processes. Whom to benchmarks: Developing candidate list, systematic search, refining the initial list.

7 Hours

PART - B

UNIT - 5

DEFINITION OF REENGINEERING: Importance of 3Cs-customers takes charges, competition intensifies, and change becomes constant. Definition of Business Process Reengineering – fundamentals rethinking, radical redesign, and dramatic improvement.

6 Hours

UNIT - 6

Rethinking business process, new world of and enabling role of information technology.

QUALITY MANAGEMENT SYSTEMS:

ISO 9000-2000, IS 14000, Frame Work for Business Excellence - Malcolm Baldrige Award, Deming's Award

7 Hours

UNIT - 7

SIX SIGMA: The Basics, The core of Six Sigma(DMAIC), design for Six Sigma, DFSS and the customer, Quality time and the Bottom line , core of DFSS-IDOV method , DFSS Metrics, DFSS Infrastructure –People and resources, Implementing DFSS

7 Hours

UNIT - 8

ACTIVITY BASED MANAGEMENT (ABM):

Introduction, Traditional Cost Systems, Activity Based activity Based Costing, Activity Based Management, ABM Implementation, Case Study.

Introduction to Theory Of Constraints (TOC)

5 Hours

TEXT BOOKS:

1. **World Class Manufacturing- A Strategic Perspective** - Sahay B S, Saxena K B C, Ashish Kumar - MacMillan India Ltd - ISBN 0333-93-4741. (unit 1 & 2)
2. **Finding and Implementing Best Practices- Business Process Benchmarking** -Champ, Robert C. - Vision Books, New Delhi – 2008.(unit 3 & 4)
3. **Reengineering the corporation - A Manifesto for Business revolution** - Hammer, Michael and James Champy - Nicholas Brealey Publishing , London.- 1993(unit 5 & 6)
4. **Six sigma for Managers-** Greg Brue - TMH - ISBN- 0-07-048639-5 -2002.(unit 7)

REFERENCE BOOKS:

1. **Design for Six Sigma** –Grege – TMH - ISBN 0-07-058120. – 2003.
2. **Design for Six Sigma Technology and Product Development** – Creveling -Pearson Education – 2008.
3. **Total Quality Management** -Dale H. Besterfield, carol Besterfield-Minchna, glen H Besterfield and Mary Besterfield scare - Pearson education - 3rd edition - ISBN 81-297-0260-6 (part of unit 6)
4. **Total Quality Management** - Kesavan R - I K International Publishing house Pvt. Ltd - 2008

COMBINATORIAL OPTIMIZATION

Subject Code	: 10 IM 765	IA Marks	: 25
No. of Lecture Hrs./ Week	: 04	Exam Hours	: 03
Total No. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

CLASSIFICATION OF OPTIMIZATION THEORY: Unconstrained Problems – Necessary and Sufficient Conditions, The Newton – Raphson Method, Constrain Problems – Equality Constraints, Inequality Constraints.

6 Hours

UNIT - 2

NP HARD AND NP COMPLETE PROBLEMS: Basic concepts, Non deterministic Algorithms, The classes NP Hard and NP Complete, NP Hard Scheduling Problems – Scheduling Identical Processors, Flow Shop Scheduling, Job Shop Scheduling.

6 Hours

UNIT - 3

Review of graphs and network, review of computational complexity

6 Hours

UNIT - 4

Spanning Trees

6 Hours

PART - B

UNIT - 5

Shortest Path Algorithm, Minimum Cost Network Flows, Maximum Flow Algorithm

7 Hours

UNIT - 6

MATCHING ALGORITHM: Travelling Salesmen Problem, Postman Problems, Machine Scheduling Problem.

7 Hours

UNIT - 7

META HEURISTICS: Simulated Annealing, Tabu Search

7 Hours

UNIT - 8

GENETIC ALGORITHMS: What are Genetic Algorithms?, Robustness of Traditional Optimization and Search Methods, The Goals of Optimization, How are Genetic Algorithms Different from Traditional Methods? A Simple Genetic Algorithm, Genetic Algorithms at Work – a simulation by hand, Grist for the Search Mill – Important similarities, Similarity Templates (Schemata)

7 Hours

TEXT BOOKS:

1. **Optimization Algorithms for Networks and Graphs** – Jrevans and E Mineika - 1st Edition
2. **Genetic Algorithm** - David E Goldberg -Pearson Education Asia - 2nd Edition
3. **Operations Research** – H. A Taha – Pearson Education - 7th Edn.
4. **Fundamentals of Computer Algorithms** -Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran – Galgotia Publications -1st Edition.

REFERENCE BOOKS

1. **Operations Research** -Ravindran, Phillips and Solberg - Wiley International - 2nd edition
2. **Operation Research** -Hiller Leiberman — Holdenday / CBS Publishers - 1994 Edn.
3. **Operations Research** -S.D. Sharma – Kedarnath Ramanth & Co.- 2000

SUPPLY CHAIN MANAGEMENT

Subject Code	:	10IP/IM81	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

BUILDING A STRATEGIC FRAME WORK TO ANALYSE SUPPLY CHAINS: Supply chain stages and decision phase, process view of a supply chain. Supply chain flows. Examples of supply chains. Competitive and supply chain strategies. Achieving strategic fit. Expanding strategic scope. Drivers of supply chain performance. Framework for structuring drivers – Inventory, Transportation, Facilities, Information. Obstacles to achieving fit, Case discussions.

7 Hours

UNIT - 2

DESIGNING THE SUPPLY CHAIN NETWORK: Distribution Networking – Role, Design. Supply Chain Network (SCN) – Role, Factors, Framework for Design Decisions.

6 Hours

UNIT - 3

FACILITY LOCATION AND NETWORK DESIGN: Models for facility location and capacity allocation. Impact of uncertainty on SCN – discounted cash flow analysis, evaluating network design decisions using decision trees. Analytical problems.

6 Hours

UNIT - 4

PLANNING AND MANAGING INVENTORIES IN A SUPPLY CHAIN: Review of inventory concepts. Trade promotions, Managing multi-echelon cycle inventory, safety inventory determination. Impact of supply uncertainty aggregation and replenishment policies on safety inventory. Optimum level of product availability; importance factors. Managerial levers to improve supply chain profitability.

7 Hours

PART - B

UNIT - 5

SOURCING, TRANSPORTATION AND PRICING PRODUCTS: Role of sourcing, supplier – scoring & assessment, selection and contracts. Design collaboration.

6 Hours

UNIT - 6

SOURCING, TRANSPORTATION AND PRICING PRODUCTS: Role of transportation, Factors affecting transportation decisions. Modes of transportation and their performance characteristics. Designing transportation network. Trade-off in transportation design. Tailored transportation, Routing and scheduling in transportation. International transportation. Analytical problems. Role of Revenue Management in the supply chain, Revenue management for: Multiple customer segments, perishable assets, seasonal demand, bulk and spot contracts.

7 Hours

UNIT - 7

COORDINATION AND TECHNOLOGY IN THE SUPPLY CHAIN: Co-ordination in a supply chain: Bullwhip effect. Obstacles to coordination. Managerial levers to achieve co-ordination, Building strategic partnerships.

6 Hours

UNIT - 8

COORDINATION AND TECHNOLOGY IN THE SUPPLY CHAIN: The role of IT supply Chain, The Supply Chain IT framework, CRM, Internal SCM, SRM. The role of e-business in a supply chain, The e-business framework, e-business in practice. Case discussion.

4 Hours

EMERGING CONCEPTS: Reverse Logistics, Reasons, Activities, Role. RFID Systems; Components, applications, implementation. Lean supply chains, Implementation of Six Sigma in Supply Chains.

3 Hours

SUGGESTED TEXT BOOK:

1. **Supply Chain Management – Strategy, Planning & Operation** - Sunil Chopra & Peter Meindl - Pearson Education Asia - ISBN: 81-7808-272-1. – 2001.

REFERENCE BOOKS:

1. **Supply Chain Redesign – Transforming Supply Chains into Integrated Value Systems** - Robert B Handfield, Ernest L Nichols, Jr. - Pearson Education Inc - ISBN: 81-297-0113-8. - 2002.
2. **Modelling the Supply Chain** -Jeremy F Shapiro, Duxbury - Thomson Learning – ISBN 0-534-37363. -2002.
3. **Designing & Managing the Supply Chain** -David Simchi Levi, Philip Kaminsky & Edith Simchi Levi - Mc Graw Hill.
4. **Supply Chain and Logistics Management** – Upendra Kachuru

FACILITIES PLANNING AND DESIGN

Subject Code	: 10IP/IM82	IA Marks	: 25
No. of Lecture Hrs./ Week	: 04	Exam Hours	: 03
Total No. of Lecture Hrs.	: 52	Exam Marks	: 100

PART - A

UNIT - 1

PLANT LOCATION: Factors influencing plant location, Theories of plant location and location economics. Plant layout-Objectives of plant layout, Principles of plant layout, types of plant layout, their merits and demerits, facilities design function: Objectives, Types of Layout Problems.

7 Hours

UNIT - 2

MATERIAL HANDLING: Objectives and principles of Material handling, Unit load concept, classification of material handling equipment based systems, different types of material handling equipments

6 Hours

UNIT - 3

PLANT DESIGN: Layout procedures: Immer, Nadler, Muther, Apple James and Reed's approaches, systematic layout planning, activity relationship chart, relationship Diagram, Space relationship diagram to plant layout

7 Hours

UNIT - 4

COMPUTERIZED LAYOUT PLANNING: CRAFT, COFAD, PLANET, CORELAP, ALDEP

6 Hours

PART - B

UNIT - 5

SPACE DETERMINATION AND AREA ALLOCATION: Factors for consideration in space planning, receiving, storage, production, shipping, tool room and tool crib, other auxiliary service actions, Establishing total space requirement, area allocation factors to be considered, expansion, flexibility, aisles column, area allocation procedure, the plot plan. Sequence demand, Straight line and non directional methods

7 Hours

UNIT - 6

CONSTRUCTION OF THE LAYOUT: Methods of constructing the layout, evaluation of layout, efficiency indices, presenting layout to management

3 Hours

LOCATION MODELS: Single and Multi facility location models, Location allocation problems – quadratic assignment problems.

3 Hours

UNIT - 7

QUANTITATIVE APPROACHES TO FACILITIES PLANNING:

Deterministic models, single and multi facility location models, Location allocation problems – quadratic assignment problem, Warehouse layout models, plant location problems.

6 Hours

UNIT - 8

LAYOUT MODELS: Warehouse Layout Models, Waiting line models, Storage models – simple problems, Evaluation, selection and implementation of facilities plan

6 Hours

TEXT BOOKS:

1. **Plant layout and material handling** - James M Apple - John Wiley India Pvt Ltd - 2nd Edition.
2. **Facility Layout and location** - Francies R.L and White J A - Mc Graw Hill - 2nd Edition.

REFERENCE BOOKS:

1. **Facilities Design** -Sunderesh Heragu - PWS Publishing Company-ISBN-0-534-95183.
2. **Plant Layout Design** -James M Moore - Mac Millon Co. -1962 – LCCCN61- 5204
3. **Facility Planning** - Tompkins White - Wiley India Pvt Ltd - 3rd Edition.

Elective IV (Group D)

ORGANIZATIONAL BEHAVIOUR

Subject Code	: 10IP/IM 831	IA Marks	: 25
No. of Lecture Hrs./ Week	: 04	Exam Hours	: 03
Total No. of Lecture Hrs.	: 52	Exam Marks	: 100

PART - A

UNIT - 1

INTRODUCTION: Definition of Organisation Behaviour and Historical development, Environmental context (Information Technology and Globalization, Diversity and Ethics, Design and Cultural, Reward Systems).

4 Hours

THE INDIVIDUAL: Foundation of individual behaviour, Ability

2 Hours

UNIT - 2

LEARNING: Definition, Theories of Learning, Individual Decision Making, classical conditioning, operant conditioning, social learning theory, continuous and intermittent reinforcement.

6 Hours

UNIT - 3

PERCEPTION: Definition, Factors influencing perception, attribution theory, selective perception, projection, stereotyping, Halo effect.

6 Hours

UNIT - 4

VALUES AND ATTITUDES: Definition – values, Attitudes: Types of values, job satisfaction, job involvement, professional Ethics, Organizational commitment, cognitive dissonance.

6 Hours

PART - B

UNIT - 5

MOTIVATION: Maslow's Hierarchy of Needs, Mc. Gregor's theory X and Y, Herzberg's motivation Hygiene theory, David Mc Clelland three needs theory, Victor Vroom's expectancy theory of motivation.

7 Hours

UNIT - 6

THE GROUP: Definition and classification of groups, Factors affecting group formation, stages of group development, Norms, Hawthorne studies, group processes, group tasks, group decision making.

CONFLICT MANAGEMENT: Definition of conflict, functional and disfunctional conflict, stages of conflict process.

7 Hours

UNIT - 7

LEADER SHIP: Definition, Behavioural theories – Blake and Mouton managerial grid, Contingency theories – Hersey - Blanchard's situational theory, Leadership styles – characteristics, Transactional, transformation leaders.

8 Hours

UNIT - 8

THE ORGANIZATION: Mechanistic and Organic structures, Minitberg's basic elements of organization, Organizational Desings and Employee behaviour, organization development – quality of work life (QWL), Team building.

6 Hours

TEXT BOOKS:

1. **Organizational Behaviour** - Stephen P Robbins -Pearson Education Publications - 9th Edn, ISBN-81-7808-561-5.
2. **Organizational Behaviour** – Schermerhorn - Wiley India Pvt Ltd - 9th Edn.
3. **Management of Organizational Behavious** - Paul Henry and Kenneth H. Blanchard - Prentice Hall of India - 1996.
4. **Organizational Behaviour** – Fred Luthans - Mc Graw Hill International Edition - 9th Edn., ISBN-0-07- 20412-1

REFERENCE BOOKS:

1. **Organisation Behaviour** – Hellriegel, Srocum and woodman, Thompson Learning - Prentice Hall India - 9th Edition, 2001.
2. **Organizational Behaviour** – VSP Rao and others - Konark Publishers - 2002.

KNOWLEDGE MANAGEMENT

Subject Code	: 10IP/IM 832	IA Marks	: 25
No. of Lecture Hrs./ Week	: 04	Exam Hours	: 03
Total No. of Lecture Hrs.	: 52	Exam Marks	: 100

PART - A

UNIT - 1

ESSENTIALS OF COMPUTING: Birth of Computing, Evolution of Modern Computing, What is data?, Information Processing, Information Technologies, Evolution of Information Systems, Evolution of Information Systems, Implementation of Organization, Organizational Learning, Traditional Organizational Information Systems, Moderns Organizational Information System, Deployment of Information System.

6 Hours

UNIT - 2

QUALITY, RE-ENGINEERING METHODOLOGIES AND BUSINESS PARADIGMS: Introduction, Industrial Evolution, Quality Methodologies, Control charts, Lot sampling, Process Capability, Value Analysis, Key Characteristics, Total Quality Management – Basic Principles, TQM Structure, Hoshin, TQM Tools, Six Sigma, Re-engineering Methodologies, Business Process Re-engineering, Artificial Intelligence – beginning, Advancements, Approaches, Neural Networks, Expert Systems, Branches of AI, Emerging Business Paradigms – e-business, classification, system, anwendungen, Produkte in der Datenverarbeitung, e-business and knowledge Management, Knowledge Management – The information processing paradigm, Knowledge organization.

8 Hours

UNIT - 3

KNOWLEDGE MANAGEMENT – AN INSIGHT: Knowledge Management – Evolution, why now, Limitation of Existing initiatives, value of knowledge, Minimize effort duplication, sharing of best practices, enhanced innovation, imperatives, Organizational knowledge management – The need, key benefits, key benefits parameters, Organizational benefits, core implementation areas, organizational performance, implementation responsibilities, core groups involved, organization barriers, key elements, Organizational knowledge management.

6 Hours

UNIT - 4

KNOWLEDGE MANAGEMENT – AN INSIGHT: The Drivers, Knowledge based driver, technology drivers, Intra – organizational drivers, process drivers, economic drivers, Knowledge Management – Future, Global knowledge economy – characteristics of the knowledge economy, policy implications, business implications, What is knowledge Management, Organizational Knowledge Management Approaches – management structure, funding, Organizational culture and enablers, Technology

infrastructure, Organizational knowledge management strategies, Components and function, Learning organization – Knowledge sources, focus on products and processes, Documentation, knowledge dissemination, Organisational learning, value-chaining, skill development.

6 Hours

PART - B

UNIT - 5

ESSENTIALS OF KNOWLEDGE MANAGEMENT: Introduction, What is Knowledge? – Data, Information and Knowledge, Wisdom, basic Types of Knowledge, Organizational Knowledge management – types, Capital, classification, Knowledge life cycle, Sources, processes, Knowledge Conversion – Organizational knowledge progression, Organizational knowledge management – technology enablers, organizational intellectual / human capital organizational meta knowledge.

6 Hours

UNIT - 6

KNOWLEDGE MANAGEMENT TECHNIQUES, SYSTEMS AND TOOLS: Introduction, Organizational Knowledge creation – Knowledge networks, Organizational knowledge mapping techniques, core implementation issues, usage, Organizational knowledge spiral, Organizational Knowledge / capture – Implementation methodology, Knowledge Acquisition Tools, Organizational Knowledge indexing, processing, Document Management System, Database Management Systems Data warehouse, Knowledge Analysis – Data mining, On-line analytical processing, Organizational knowledge dissemination.

6 Hours

UNIT - 7

ORGANIZATION KNOWLEDGE MANAGEMENT ARCHITECTURE AND IMPLEMENTATION STRATEGIES: Introduction, Developing a KM Framework, Implementation Phases, Architectural Components, KM Systems Requirements, Tools, KM Systems Components – Implementation Strategies – Awakening phase, Actionable phase, Implementation phase, maintenance and measurement phase, Organizational Organic capabilities architecture – business, Information, Data, Systems, Computer, Layered Knowledge. Organizational knowledge management architecture – key considerations, Organizational knowledge Repositories – structure, Life cycle, Organizational knowledge refineries, KM applications – Integrative application Interactive application, knowledge processing applicants management, composite application, organizational KM context, Organizational platforms – Enterprises information portals, competitive advantages, enterprise knowledge portal, characteristics, Organizational knowledge measurement framework - Awakening stage,

actionable phase, implementation phase, Support phase, Organizational deployment, Organisational knowledge Measurement Techniques – Intangible Assets measurement, intangible Assets Monitor, balanced Scorecard, organizational implementation barriers.

8 Hours

UNIT - 8

K-CAREERS: Introduction, Knowledge Management roles, New organizational roles, Organisational k-role classification, Knowledge management job opportunities – knowledge job approach, generic role requirements, role description, Knowledge architect, Knowledge strategist, Knowledge manager, Research analyst / manager, knowledge management consultant, media specialist, senior market intelligence librarian, ontologies / knowledge engineer, knowledge management specialist, intranet developer / knowledge management content developer, knowledge management director, director of ontologies, ontologist (biological domain), natural language processing specialist (medical/biomedical), knowledge development manager.

6 Hours

TEXT BOOK:

1. **Knowledge Management** -Sudhir Warier - Vikas Publishing House - ISBN: 81-259-1363-7.

REFERENCE BOOK:

1. **Hand book on Knowledge Management** - C W Holsapple, Springer - 2003 Porter M.
2. **Management Toolkit - Practical Techniques for Building a Knowledge Management System** - Prentice Hall - 1999
3. **An investigation of Knowledge Management characteristics** - Joshi K -exington, KY – 1998.

DESIGN OF EXPERIMENTS

Subject Code	: 10IP/IM 833	IA Marks	: 25
No. of Lecture Hrs./ Week	: 04	Exam Hours	: 03
Total No. of Lecture Hrs.	: 52	Exam Marks	: 100

PART - A

UNIT - 1

INTRODUCTION: History of quality engineering: Japan versus U.S. track records. Taguchi Approach to Quality: Definition of quality loss function, Off-line and On-line quality control. Taguchi's quality philosophy.

6 Hours

UNIT - 2

BASIC DESIGNS: Completely Randomised Design, Randomised Block Design, Latin Square Designs, one way analysis of variance and two way analysis of variance.

6 Hours

UNIT - 3

FACTORIAL EXPERIMENTATION -TWO LEVELS: Full Factorial Designs: Experimentation as a learning process. Traditional scientific experiments. Two-factor design. Four-factor design, Replicating experiments. Factor interactions.

6 Hours

UNIT - 4

FACTORIAL EXPERIMENTATION-EIGHT AND SIXTEEN RUN EXPERIMENTS: Fractional factorial designs based on eight-run experiments, folding over an eight run and sixteen – run experiment

6 Hours

PART - B

UNIT - 5

CONSTRUCTING ORTHOGONAL ARRAYS: Counting degrees of freedom, selecting a standard orthogonal array, dummy level technique and compound factor method. Linear graphs and interaction assignment. Modification of linear graphs, column merging method, branching design. Strategy for constructing an orthogonal array. Comparison with the classical statistical experiment design.

7 Hours

UNIT - 6

STEPS IN ROBUST DESIGN: Case study discussion. Noise factors and testing conditions. Quality characteristics and objective functions. Control factors and their levels. Matrix experiment and data analysis plan. Conducting the matrix experiment, data analysis, verification experiment and future plan.

7 Hours

UNIT - 7

SIGNAL-TO-NOISE RATIO FOR STATIC PROBLEMS: Evaluation of sensitivity to noise. S/N ratios for Smaller-the-better, Larger-the-better, Nominal-the-best and Asymmetric Cases

7 Hours

UNIT -8

SIGNAL-TO-NOISE RATIO FOR DYNAMIC PROBLEMS: S/N ratios for Continuous-continuous, continuous-digital, digital-continuous, digital-digital cases. Introduction to Taguchi Inner and Outer Arrays

7 Hours

TEXTBOOKS:

1. **Quality Engineering Using Robust Design** - Madhav S. Phadke - Prentice Hall PTR, Englewood Cliffs, New Jersey 07632.
2. **Design of Experiments** - D.C. Montgomery - John Wiley and Sons - 2002.

REFERENCE BOOK:

1. **Designing for Quality** - Robert H. Lochner and Joseph E. Matar, - an Introduction Best of Taghuchi and Western Methods or Statistical Experimental Design - Chapman and Hall Madras - 2nd edition.

ADVANCED OPERATIONS RESEARCH

Subject Code	: 10IP/IM 834	IA Marks	: 25
No. of Lecture Hrs./ Week	: 04	Exam Hours	: 03
Total No. of Lecture Hrs.	: 52	Exam Marks	: 100

PART - A

UNIT - 1

LINEAR PROGRAMMING: Two phase simplex method, Revised simplex algorithm and its applications.

6 Hours

UNIT - 2

ADVANCED LINEAR PROGRAMMING: Sensitivity analysis, Integer Programming –graphical technique and Gomory’s technique.

7 Hours

UNIT - 3

SPECIAL TYPE OF LPP: Solutions of Assignment and Travelling salesman problems using Branch and Bound Approach.

GOAL PROGRAMMING: Introduction and simple formulation.

6 Hours

UNIT - 4

NON-LINEAR PROGRAMMING: Kuhn – Tucker conditions, QPP - solution using Wolfes algorithm

6 Hours

PART - B

UNIT - 5

DYNAMIC PROGRAMMING: Characteristics and DP model, Computational procedure -Simple problems only

6 Hours

UNIT - 6

ADVANCED CPM TECHNIQUES: CPM - Elements of crashing, least cost project scheduling. Flow in networks; Determination of shortest route, Determination of Maximum flow through the networks, Minimal Spanning Tree. Resource Allocation for optimal utilisation of resources

8 Hours

UNIT - 7

QUEING THEORY: M/Ek/1, M/D/1, M/M/C and MG1

6 Hours

UNIT - 8

MARKOV CHAINS: Discrete Stochastic Process, Markovian process, Stationary Markov chains, Markov diagrams, Ergodic and Absorbing Markov chains, Steady State probabilities, stochastic matrix, transition matrix and their applications.

7 Hours

TEXT BOOKS:

1. **Introduction to Operation Research** -Taha H A - Prentice Hall of India - 6th edition, 1999.
2. **Principles of Operations Research theory and Practice** -Philips, Ravindram and Soleberg– Theory and Practice - Wiley India Pvt Ltd.

REFERENCE BOOKS:

1. **Introduction to Operation Research** -Hiller and Libermann - McGraw Hill - 5th edn.
2. **Operations Research** -S.D. Sharma - Kedarnath, Ramnath & Co - 1996
3. **Operations Research Theory and Application** - J K Sharma - Pearson Education Pvt Ltd - 2nd Edn - ISBN-0333-92394-4.

DATA BASE MANAGEMENT SYSTEM

Subject Code	: 10IP/IM 835	IA Marks	: 25
No. of Lecture Hrs./ Week	: 04	Exam Hours	: 03
Total No. of Lecture Hrs.	: 52	Exam Marks	: 100

PART - A

UNIT - 1

DATABASES AND DATABASE USERS: Introduction, characteristics of data base approach, intended uses of a DBMS, advantages and implication of database approach.

2 Hours

DATABASE SYSTEMS CONCEPTS AND ARCHITECTURE: Data models, Schemas and instances, DBMS architecture and data independence, database languages and interfaces, database system environment, classification of data base management systems.

5 Hours

UNIT - 2

DATA MODELING: High level conceptual data models for database design. Entity types, entity sets, attributes, and keys. Relationships, relationship types, roles and structural constraints. Weak entity types. ER diagrams

6 Hours

UNIT - 3

RECORD STORAGE AND PRIMARY FILE ORGANIZATION: Secondary storage devices, buffering of blocks, placing file records on disk, operations on files, heap files and sorted files, hashing techniques.

6 Hours

UNIT - 4

INDEX STRUCTURE OF FILES: Single-level and multilevel ordered indexes, dynamic multi level indices using B-trees and B+ trees.

6 Hours

PART - B

UNIT - 5

RELATIONAL DATA MODEL AND RELATIONAL ALGEBRA: Brief discussion on **Codd** rules, relational model concepts, constraints and schemas. Update operation on relations, basic and additional relational algebra operations and queries in relational algebra.

Structured Query Language (SQL): Data definition in SQL2. Basic and complex queries in SQL. Insert, delete, update statements, and views in SQL, embedded SQL.

9 Hours

UNIT - 6

DATABASE DESIGN: Design guidelines for relational schemes, functional Dependencies, normalization -1st, 2nd, 3rd, 4th, and 5th normal forms. Database design process, factors influencing physical database design guidelines and guidelines for relational systems.

6 Hours

UNIT - 7

SYSTEM IMPLEMENTATION: System cat log for RDBMS, transaction processing and system concepts, properties of transactions, brief discussion on concurrency, control and recovery techniques, database security and authorization.

6 Hours

UNIT - 8

BRIEF DISCUSSION ON: Distributed databases, Objected oriented databases, next generation databases and interfacing with other technologies.

6 Hours

TEXT BOOKS:

1. **Fundamentals of database systems** -Ramez Elmasri and Shamkanth B. Navathe - Addison Wesley Publishing Company - 6th Edition.
2. **Database Management System** - Raghu Ramakrishnan and Johannes Gehrke - TATA McGraw Hill - 3rd Edition - ISBN 0-07-1231511

REFERENCE BOOKS:

1. **Database Management Design** - Gary W. Hansen and James V. Hanesn - PHI Pvt. Ltd. - 2nd Edition.

STRATEGIC MANAGEMENT

Subject Code	:	10IM 836	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

STRATEGIC MANAGEMENT INTRODUCTION: Definition- Levels of strategy- Roles of Strategist- Strategic Management Process benefits and limitations. Mission-Objectives -Social responsibilities.

6 Hours

UNIT - 2

STRATEGY FORMULATION: Strategic Thinking, SWOT analysis- Techniques for environmental analysis- TOWS matrix, Balanced Score Card, Steps in strategy implementation -formulation of SBU strategy.

6 Hours

UNIT - 3

STRATEGY FORMULATION: Leadership implementation communicating the strategy- Annual and Functional objectives- Development of policies- Organisational Implementation- Evaluation and control. reward system.

7 Hours

UNIT - 4

STRATEGY AND STRUCTURE: Strategy- Structure relationship. Organizational restructuring and Transformation, Principles of Organization.

6 Hours

PART - B

UNIT - 5

STRATEGY EVALUATION AND CONTROL: Strategic control- Premise and Implementation control strategic Surveillance special alert control- Operational control- Steps in Operational Control, Types of Operational control.

7 Hours

UNIT - 6

PORTFOLIO STRATEGY: Business portfolio analysis- BGC matrix, GE multi matrix, an evaluation of Portfolio models - factors influencing portfolio strategy.

6 Hours

UNIT - 7

COMPETITIVE ANALYSIS AND STRATEGIES: Structural analysis of industries threat of entry rivalry among existing competitors, threat of substitutes; Bargaining power of suppliers; structural analysis and competitive strategy -competitor analysis value chain.

7 Hours

UNIT - 8

BUSINESS GROWTH: Reasons, Risks and indicators of Business growth- Mergers and acquisitions. Management of M& A, determination of strategic purpose; screening, evaluation and choice, pitfalls in M&A, Defence strategies.

GLOBALIZATION: Meaning and Dimensions, Globalization of Indian business, Barriers to change, Implementation of marketing and change.

7 Hours

TEXT BOOKS:

1. **Strategic Management** - Francis Cherunilam - Himalya Publishers,
2. **Business Policy and Strategic Management** - Azhar Kazmi - Tata McGraw Hill -2nd Edn.
3. **Strategic Management** - Michael Porter - Prentice-Hall – 1984.

REFERENCE BOOKS:

1. **Business Policy and Strategic Management** - P Subba Rao - Himalya Publishers - 1st Edition.
2. **Corporate Strategic Management** -R.M.Srivastava, Pragati Prakashan , Meerut - 1st Edition.
3. **Strategic Management** – Robert A Pitts and David Lei - Vikas Publishing House- 1st Edition.
4. **Business Environment for Strategic Management** - K.Aswantappa - Himalaya Publishers -1st Edition.

Elective V (Group E)

ARTIFICIAL INTELLIGENCE & EXPERT SYSTEMS

Subject Code	:	10IP/IM841	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

ARTIFICIAL INTELLIGENCE: Introduction, definition, underlying assumption, important of AI, AI & related fields State space representations, defining a problem, production systems and its characteristic, search and control strategies – Introduction, preliminary concepts, examples of Search problems.

6 Hours

UNIT - 2

UNIFORMED OR PRELIMINARY CONCEPTS: Examples of search problems, Uniformed or Blind Search, Informed Search, Or Graphs, Heuristic Search techniques – Generate and Test, Hill climbing, best first search, problem reduction, constraint satisfaction, Means – Ends Analysis.

8 Hours

UNIT - 3

KNOWLEDGE REPRESENTATION ISSUES: Representations and Mapping, Approaches, Issues in Kr, Types of Knowledge procedural Vs Declarative, Logic programming, Forward Vs Backward reasoning, Matching, Non monotonic reasoning and it logic.

6 Hours

UNIT - 4

USE OF PREDICATE LOGIC: Representing simple facts, Instance and is a relationships, Syntax and Semantics for Propositional logic, FOPL, and properties of Wffs, conversion to causal form, Resolution, Natural deduction

6 Hours

PART - B

UNIT - 5

STATISTICAL AND PROBABILISTIC REASONING: Symbolic reasoning under uncertainly, Probability and Bayes' theorem, Certainty factors and Rule based systems, Bayesian Networks, Dempster – Shafer Theory, Fuzzy Logic

8 Hours

UNIT - 6

EXPERT SYSTEMS: Introduction, Structure and uses, Representing and using domain knowledge, Expert system shells. Pattern recognition, Introduction, Recognition and classification process, Learning classification Patterns, Recognizing and Understanding Speech.

6 Hours

UNIT - 7

INTRODUCTION TO KNOWLEDGE ACQUISITION: Types of learning, General learning model, and performance measures.

6 Hours

UNIT - 8

TYPICAL EXPERT SYSTEMS: MYCIN, Variants of MYCIN, PROSPECTOR, DENDRAL, PUFF etc.

INTRODUCTION TO MACHINE LEARNING: Perceptrons, Checker Playing examples, Learning, Automata, Genetic Algorithms, Intelligent Editors.

6 Hours

TEXT BOOKS:

1. **Artificial intelligence** – Elaine Rich & Kevin Knight - M/H 1983.
2. **Artificial intelligence in business, Science & Industry** – Wendry B.Ranch, Vol - II application - Ph 1985.
3. **A guide to expert systems** – waterman, D.A., Addison – wesley inc.- 1986.
4. **Building expert systems** – Hayes, Roth, Waterman, D.A (ed) - AW 1983.
5. **Designing expert systems** – weis, S.M. and Kulliknowske, London Champion Hull - 1984.

Subject Code	: 10IP/IM 842	IA Marks	: 25
No. of Lecture Hrs./ Week	: 04	Exam Hours	: 03
Total No. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

JIT-AN INTRODUCTION: Speed of JIT movement, the new production system research association of Japan, some definitions of JIT, core Japanese practices of JIT, creating continuous manufacture, enabling JIT to occur, basic element of JIT, benefits of JIT.

6 Hours

UNIT - 2

MODERN PRODUCTION SYSTEM: Key feature of Toyota's production system, basic framework of Toyota production system. **KANBAN SYSTEM** – other types of kanban's, kanban rules, adapting to fluctuations in demand through kanban, whirligig, determining the number of kanban's in Toyota production system, detailed kanban system example, supplier kanban and the sequence schedule for use by suppliers.

6 Hours

UNIT - 3

PRODUCTION SMOOTHING IN TOYOTA PRODUCTION SYSTEM: production planning, production smoothing, adaptability to demand fluctuations, sequencing method for the mixed model assembly line to realize smoothed production, Criticism of Toyota production system by the communist party of Japan. EDP system for support of the Toyota Production system. Shortening lead time in Toyota Production system – reducing the setup time. Automation in Toyota production system, some comparisons with other manufacturers.

6 Hours

UNIT - 4

GLOBAL IMPLEMENTATION OF JIT: JIT in automotive industry, JIT in electronics, computer, telecommunication and instrumentation, JIT in process type industry, JIT in seasonal demand industry, other manufacturing industries, JIT in service and administrative operations, conclusion.

6 Hours

PART - B

UNIT - 5

JIT IMPLIMENTATION SURVEYS: JIT implementation in US manufacturing firms-analysis of survey results, just in time manufacturing industries, just in time production in West Germany, just in time production in Hong Kong electronics indu8stry, conclusion.

6 Hours

UNIT - 6

DESIGN, DEVELOPMENT AND MANAGEMENT OF JIT MANUFACTURING SYSTEMS: plant configurations and flow analysis for JIT manufacturing, comparison of JIT's "demand pull" system with conventional "push type" planning and control systems, quality management system for JIT, product design for JIT human resource management in JIT, flexible workforce system at Toyota, creation and maintenance of teams for JIT, union organization and conduct of industrial relations in JIT, interface of JIT with advanced manufacturing technology, assessing performance in JIT manufacturing systems, product costing information systems in JIT manufacturing, an example of overhead allocation in JIT, potential for developing countries, potential for small manufacturing.

9 Hours

UNIT - 7

SUPPLY MANAGEMENT FOR JIT: JIT purchasing-the Japanese way, some studies in JIT purchasing, experience of implementation organizations, surveys of JIT purchasing, buyer-seller relationship in JIT purchasing, Quality certification of suppliers in JIT purchasing, some problems in implementation of JIT purchasing, reduction freight costs in JIT purchasing, monitoring supplier performance for JIT purchasing, audit in JIT purchasing, implementation of JIT to international sourcing, frequency of shipments, inventory policy, supplier reaction capability, quality, communication sole sourcing, delivery performance and supplier flexibility, conclusion.

7 Hours

UNIT - 8

FRAMEWORK FOR IMPLEMENTATION OF JIT: Implementation risk, risks Due to inappropriate understanding of JIT, risks due to technical, operational and people problems, risks associated with kanban system, some important activities to be performed during implementation, steps in implementation, a project work to approach to implementation, conclusion.

6 Hours

TEXT BOOKS:

1. **Just In Time Manufacturing** - M.G. Korgaonker - Macmillan India Ltd.- 1992,
2. **Japanese Manufacturing Techniques** - Richard J. Schonberger - The Free Press – Macmillan Pub. Co., Inc. New York - 1988.

AUTOMATION IN MANUFACTURE

Subject Code	: 10IP/IM843	IA Marks	: 25
No. of Lecture Hrs./ Week	: 04	Exam Hours	: 03
Total No. of Lecture Hrs.	: 52	Exam Marks	: 100

PART - A

UNIT -1

INTRODUCTION: Definition of Automation, Reasons for Automation, Arguments for and against Automation, Manufacturing industries, Types of Productions, Functions in Manufacturing, Organization & Information processing in Manufacturing.

6 Hours

UNIT -2

PRODUCTION CONCEPTS & MATHEMATICAL MODELS: Manufacturing Load Time (MLT), Components of operation time, Capacity, Utilization, Availability, Work in Process(WIP), Automation Strategies. (Numerical treats).

7 Hours

UNIT - 3

PRODUCTION COST ANALYSIS METHODS OF EVALUATING INVESTMENT ALTERNATIVES: Costs in Manufacturing, Break-even Analysis, Unit Cost of Production, Cost of Manufacturing Lead Time & Work-in-process, Other Difficult-to-quantify Factors.

7 Hours

UNIT - 4

DETROIT-TYPE OF AUTOMATION: Automated Flow Lines, Methods of Work part Transport, Transfer Mechanism, Buffer Storage, Control Functions, Automation for Machining Operations, Design & Fabrication Considerations.

6 Hours

PART - B

UNIT -5

ANALYSIS OF AUTOMATED FLOW LINES: General Terminology & Analysis, Analysis of Transfer Lines without storage, Partial Automation, Automated Flow Lines with storage buffers, Computer simulation of Automated Flow Lines. (Including Numericals).

7 Hours

UNIT - 6

ANALYSIS OF ASSEMBLY SYSTEMS & LINE BALANCING: The assembly process, Assembly Systems, Manual Assembly Lines, Line balancing problem, Methods of line balancing, Computerized Line Balancing Methods, Other ways to improve line balancing, Flexible Manual Assembly Lines, Design for automated assembly, Types of automated assembly systems, Parts feeding devices, Analysis of multi station assembly machines, Analysis of single station assembly machine. (Including Numericals).

7Hours

UNIT - 7

AUTOMATED MATERIAL HANDLING AND STORAGE SYSTEMS: The Materials Handling Function, Types of material handling equipments, Analysis for Material Handling Systems, Design of systems, Conveyor systems, Automated guided vehicle systems, Storage system performance, Automated storage & retrieval system, Carousal storage system, Work in process storage, Interfacing handling & storage with manufacturing.

6 Hours

UNIT - 8

AUTOMATED INSPECTION AND TESTING: Statistical quality control, Automated inspection principles & methods, Sensor technologies for automated inspection, Co-ordinate measuring machines, other contact inspection methods, Machine vision, Optical inspection methods, Non-Contact inspection methods.

6 Hours

TEXT BOOKS:

1. **Automation Production Systems and Computer Integrated Manufacturing** - Mikell P. Groover – PHI, New Delhi - 2003.

REFERENCE BOOKS:

1. **CAD/CAM** - Mikell P. Groover and Emory W. Zimmers - PHI, New Delhi - 2003.
2. **Numerical Control and Computer aided Manufacture** - Pressman and Williams - PHI – 1991.

DECISION SUPPORT SYSTEMS

Subject Code	: 10IM844	IA Marks	: 25
No. of Lecture Hrs./ Week	: 04	Exam Hours	: 03
Total No. of Lecture Hrs.	: 52	Exam Marks	: 100

PART - A

UNIT - 1

DECISION SUPPORT SYSTEMS: An Overview, Opening Vignette: Evaluating the Quality of Journals in Hong Kong, DSS Configuration, What is a DSS? Characteristics and Capabilities, Components of DSS, The Data Management Subsystem.

6 Hours

UNIT - 2

DECISION SUPPORT SYSTEMS: The Model Management Subsystem, The Knowledge-Based Management Subsystem, The User Interface (Dialog) Subsystem, The User, DSS Hardware, Distinguishing DSS from Management Science and MIS, DSS Classifications.

7 Hours

UNIT - 3

DATA WAREHOUSING, ACCESS, ANALYSIS, MINING AND VISUALIZATION: Opening Vignette: OBI Makes the best out of the Data Warehouse, Data Warehousing, Access, Analysis and Visualization, The Nature and Sources of Data, Data Collection, Problems and Quality, The Internet and Commercial Database Services.

6 Hours

UNIT - 4

DATA WAREHOUSING, ACCESS, ANALYSIS, MINING AND VISUALIZATION: Database management Systems in DSS, Database Organization and Structures, Data Warehousing, OLAP: Data Access, Querying and Analysis, Data Mining, Data Visualization and Multidimensionality, Geographic Information Systems and Virtual Reality, business Intelligence and the Web.

7 Hours

PART - B

UNIT - 5

MODELING AND ANALYSIS: Opening Vignette: Dupont Simulates Rail Transportation System and Avoids Costly Capital Expense, Modeling for MSS, Static and Dynamic Models, Treating Certainty, Uncertainty and Risk, Influence Diagrams, MSS Modeling in Spreadsheets.

6 Hours

UNIT - 6

MODELING AND ANALYSIS: Decision analysis of a few alternatives (decision tables and decision trees), Optimization via Mathematical Programming, Heuristic Programming, Simulation, Multidimensional Modelling – OLAP, Visual Interactive Modeling And Visual Interactive Simulation, Quantitative Software Package – OLAP,. Model Base Management.

7 Hours

UNIT - 7

DECISION SUPPORT SYSTEM DEVELOPMENT: Opening Vignette: Osram Sylvania Thinks Small, Strategizes Big Develops the Info Net HR Portal System, Introduction to DSS Development, The Traditional System Development Life Cycle, Alternate Development Methodologies, Prototyping:

6 Hours

UNIT - 8

DECISION SUPPORT SYSTEM DEVELOPMENT: The DSS Development Methodology, DSS Technology Levels and Tools, DSS Development Platforms, DSS Development Tool Selection, Team – Developed DSS, End User-Developed DSS, Developing DSS: Putting the System Together, DSS Research Directions and the DSS of the Future.

7 Hours

TEXT BOOK:

1. **Decision Support Systems and Artificial Intelligence** - Efraim Turban, Jay E Aronson - Pearson Education - 6th Edn - ISBN – 81-7808-367-1.

Subject Code	: 10IM845	IA Marks	: 25
No. of Lecture Hrs./ Week	: 04	Exam Hours	: 03
Total No. of Lecture Hrs.	: 52	Exam Marks	: 100

PART - A

UNIT - 1

INTRODUCTION: Concepts, terms, and definitions of reliability and related performance measure, Terminology in reliability, Failure rate, MTBF, Life test, importance of reliability, definition, meaning of adequate performance, reliability-engineering Programme and its scope, Typical applications. **6 Hours**

UNIT - 2

RELIABILITY MANAGEMENT: Reliability goals & policies, economics of reliability, reliability data Collection.

COMPONENT LIFE: Failure distribution function, reliability function and hazard rate function, interrelationships, MTTF, MTBF, bath tub curve (Mortality curve), conditional reliability function, constant and time dependant failure models.

PRACTICAL FAILURE PATTERNS: Failure behaviour of mechanical, electrical, electronic parts, common failure distribution.

7 Hours

UNIT - 3

COMBINATORIAL RELIABILITY (RELIABILITY OF SYSTEMS): Reliability analysis of systems: (Success-Failure models only) Analysis of Series, parallel, series parallel and parallel series configurations. R out of n configurations, redundancy improvement factor, stand by systems.

7 Hours

UNIT - 4

TECHNIQUES FOR COMPLEX SYSTEMS RELIABILITY EVALUATION: Inspection methods, event space methods, path tracing methods, decomposition methods, cut set methods, tie set methods.

6 Hours

PART - B

UNIT - 5

DESIGN FOR RELIABILITY: System effectiveness measures and life cycle cost analysis, reliability allocation, methods for reliability in design, failure analysis, systems safety and fault tree analysis, multistate model. Failure mode effect and criticality analysis. **6 Hours**

UNIT - 6

MARKOV MODELS FOR SYSTEM RELIABILITY: Reliability analysis of state dependent systems, Markov analysis, stand by system analysis, Load sharing systems.

6 Hours

UNIT - 7

MAINTENABILITY AND AVAILABILITY: Analysis of Down time, Repair Time distributions, maintainability, Maintenance increment, Design for maintainability. Availability analysis, Different forms of availability, system availability analysis, mission availability, Availability of stand by system.

6 Hours

UNIT - 8

ANALYSIS FAILURE DATA: Types of life testing, data collection, Empirical methods, Estimation of Static life, types of life testing: Development of confidence intervals, acceptance test procedures for life estimation using exponential, weibull and Gamma distribution models. Sequential life tests and acceptance criteria.

APPLICATION AND CASE STUDIES: Case example involving redundancy, burning tests, preventive maintenance analysis. Repairable system analysis, Software reliability.

8 Hours

TEXT BOOKS:

1. **Concepts of Reliability Engineering** -L. S. Srinath - Affiliated East West Press Pvt. Ltd -2nd edn
2. **Reliability Engineering** -Dr. Balaguru Swamy –Tata McGraw Hill – Fourth Edition –2003
3. **An introduction to Reliability and Maintainability** -Charles E Ebeling – TMH – Edition 2000, .ISBN 0-07-042138-2

REFERENCES BOOKS:

1. **Reliability Hand Book** – Ireson and Grant -1995
2. **Mathematical Theory of Reliability and Mathematics** – Barlow and Proschan - 1st edition.
3. **Probability Reliability & Engineering approach**-Shooman-1976.
4. **Practical Reliability Engineering** – Patrick D.T.O – John Wiley and Sons – 2002.
5. **Introduction to Reliability Engineering** – E E Lewis – John Wiley & Sons - 2nd edition.
6. **Reliability Technology** -J S Gurjar- I K International Publishing house Pvt. Ltd -1991.

DATA WAREHOUSING AND MINING

Subject Code	: 10IM 846	IA Marks	: 25
No. of Lecture Hrs./ Week	: 04	Exam Hours	: 03
Total No. of Lecture Hrs.	: 52	Exam Marks	: 100

PART - A

UNIT - 1

OVERVIEW AND CONCEPTS: Need for Data Warehousing, Basic Elements of Data Warehousing, Trends in Data Warehousing.

PLANNING AND REQUIREMENTS:

Project planning and management, collecting the requirements.

7 Hours

UNIT - 2

ARCHITECTURE AND INFRASTRUCTURE: Architectural components, Infrastructure and metadata.

6 Hours

UNIT - 3

DATA DESIGN AND DATA REPRESENTATION: Principles of dimensional modeling. Dimensional modelling advanced topics, data extraction, transformation and loading, data quality.

8 Hours

UNIT - 4

INFORMATION ACCESS AND DELIVERY: Matching information to classes of users, OLAP in data warehouse, Data warehousing and web.

IMPLEMENTATION AND MAINTENANCE

Physical design process, data warehouse deployment, growth and maintenance.

7 Hours

DATA MINING

PART - B

UNIT - 5

INTRODUCTION: Basics of data mining, related concepts, Data mining techniques.

6 Hours

UNIT - 6

DATA MINING ALGORITHMS: Classification, Clustering.

6 Hours

UNIT - 7

DATA MINING ALGORITHMS: Association rules.

6 Hours

UNIT - 8

KNOWLEDGE DISCOVERY: KDD process.

WEB MINING

Web content mining, Web structure mining and Web usage mining.

6 Hours

TEXT BOOKS:

1. **Data Warehousing Fundamentals** - Paulraj Ponnian, John Wiley.- 1st edition
2. **Data Mining Introductory and advanced Topics** - M.H. Dunham - Pearson education – 2002.
3. **Data mining concepts and techniques** - Han, Kamber - 2nd edition

REFERENCES BOOKS:

1. **The Data Warehouse Lifecycle Toolkit** - Ralph Kimball, John Wiley - 2nd edition.
2. **Mastering Data Mining** - M Barry and G. Linoff - John Wiley - 1st edition.
3. **Building the Data warehouses** - W. H. Inmon, Wiley Dreamtech - 1st edition.
4. **The Data Warehouse Toolkit** - R. Kimball - John Wiley - 2nd edition.
5. **Decision Support and Data warehouse systems** - E.G. Mallach - TMH.- 2000.