VIII SEMESTER

OPERATION MANAGEMENT

Subject Code	: 10ME81	IA Marks	: 25
Hours/Week	: 04	Exam Hours	: 03
Total Hours	: 52	Exam Marks	: 100

PART – A

UNIT - 1
Production and Operations Management: Introduction, Functions within business organizations, the operation management function, Classification of production systems, Productivity, factors affecting productivity, contemporary issues and development

06 Hours

UNIT - 2
Decision Making: The decision process, characteristics of operations decisions, use of models, decision making environments, graphical linear programming, analysis and trade-offs.

06 Hours

UNIT - 3
Forecasting: Steps in forecasting process, approaches to forecasting, forecasts based on judgment and opinion, analysis of time series data, accuracy and control of forecasts, choosing a forecasting technique, elements of a good forecast,

07 Hours

UNIT - 4
Capacity & Location Planning: Importance of capacity decisions, defining and measuring capacity, determinants of effective capacity, determining capacity requirement, developing capacity alternatives, evaluating alternatives, Need for location decisions, nature of locations decisions, general procedure for making locations decisions, evaluating locations decisions, facilities layout – need for layout decisions, types of processing.

07 Hours

146

UNIT - 5

Aggregate Planning & Master Scheduling: Aggregate planning – Nature and scope of aggregate planning, strategies of aggregate planning, techniques for aggregate planning – graphical and charting techniques, mathematical techniques. The master production schedule, Master scheduling process, Master scheduling methods.

08 hours

UNIT - 6

Inventory Management: Types of Inventories, independent and dependent demand, reasons for holding inventory, objectives of inventory control, requirements for effective inventory management – information, cost, priority system. Inventory control and economic-order-quantity models.

06 Hours

UNIT - 7

Material Requirement Planning (MRP): Dependent versus independent demand, an overview of MRP – MRP inputs and outputs, MRP processing, An overview of MRP-II and ERP capacity requirement planning, benefits and limitations of MRP.

07 Hours

UNIT - 8

Purchasing and Supply Chain Management (SCM): Introduction, Importance of purchasing and SCM, The procurement process, Concept of tenders, Approaches to SCM, Vendor development, Measures of purchasing and SCM, Make or buy decision, Types of buying, E-procurement.

06 Hours

TEXT BOOKS:
1. **Production and Operations Management**, William J Stevenson, 9th Ed., Tata McGraw Hill.
2. **Operations Management-Theory and Practice**, B Mahadevan, Pearson Education, 2007.

REFERENCE BOOKS:
1. **Production and Operations Management,** Norman Gaither & Greg Frazier,
2. **Operations Management for Competitive Advantage**, R.B.Chase, N.J.Aquilino, F. Roberts Jacob; McGraw Hill Companies Inc., Ninth Edition.
3. **Production & Operations Management**, Everett E.Adams, Ronald J.Ebert, Prentice Hall of India Publications, Fourth Edition.
4. **Production / Operations Management**, Joseph G Monks, McGraw Hill Books

CONTROL ENGINEERING

Subject Code	: 10ME82	**IA Marks**	: 25
Hours/Week	: 04	**Exam Hours**	: 03
Total Hours	: 52	**Exam Marks**	: 100

PART – A

UNIT - 1
Introduction: Concept of automatic controls, Open loop and closed loop systems, Concepts of feedback, requirements of an ideal control system, Types of controllers- Proportional, Integral Proportional Integral, Proportional Integral Differential controllers.

07 Hours

UNIT- 2
Mathematical Models: Transfer function models, models of mechanical systems, models of electrical circuits, DC and AC motors in control systems, models of thermal systems, models of hydraulic systems, pneumatic system, Analogous systems: Force voltage, Force current.

06 Hours

UNIT - 3
Block Diagrams and Signal Flow Graphs: Transfer Functions definition, function, block representation of systems elements, reduction of block diagrams, Signal flow graphs: Mason's gain formula.

07 Hours

UNIT- 4
Transient and Steady State Response Analysis: Introduction, first order and second order system response to step, ramp and impulse inputs, concepts of time constant and its importance in speed of response. System stability: Routh's-Hurwitz Criterion.

06 Hours

PART - B

UNIT - 5
Frequency Response Analysis: Polar plots, Nyquist stability criterion, Stability analysis, Relative stability concepts, Gain margin and phase margin, M&N circles.

06 Hours

UNIT - 6
Frequency Response Analysis Using Bode Plots: Bode attenuation diagrams, Stability analysis using Bode plots, Simplified Bode Diagrams.

07 Hours

UNIT - 7
Root Locus Plots: Definition of root loci, General rules for constructing root loci, Analysis using root locus plots.

06 Hours

UNIT 8
System Compensation and State Variable Characteristics of Linear Systems: Series and feedback compensation, Introduction to state concepts, state equation of linear continuous data system. Matrix representation of state equations, controllability and observability, Kalman and Gilberts test.

07 Hours

TEXT BOOKS :
1. **Modern Control Engineering,** Katsuhiko Ogatta, Pearson Education,2004.
2. **Control Systems Principles and Design,** M.Gopal, 3rd Ed., TMH,2000.

REFERENCE BOOKS :
1. **Modern Control Systems**, Richard.C.Dorf and Robert.H.Bishop, Addison Wesley,1999
2. **System dynamics & control**, Eronini-Umez, Thomson Asia pte Ltd. singapore, 2002.
3. **Feedback Control System**, Schaum's series. 2001.

ELECTIVE-IV (GROUP - D)

TRIBOLOGY

Subject Code	: 10ME831	**IA Marks**	: 25
Hours/Week	: 04	**Exam Hours**	: 03
Total Hours	: 52	**Exam Marks**	: 100

PART – A

UNIT - 1
Introduction To Tribology: Properties of oils and equation of flow: Viscosity, Newton's Law of viscosity, Hagen-Poiseuille Law, Flow between parallel stationary planes, viscosity measuring apparatus. Lubrication principles, classification of lubricants.

06 Hours

UNIT - 2
Hydrodynamic Lubrication: Friction forces and power loss in lightly loaded bearing, Petroff's law, Tower's experiments, mechanism of pressure development in an oil film, Reynold's investigation and Reynold's equation in 2D.

06 Hours

UNIT - 3
Idealized Journal Bearing: Introduction to idealized journal bearing, load carrying capacity, condition for equilibrium, Sommerfeld's numbers and significance of it; Partial bearings, end leakages in journal bearing, numerical problems.

07 Hours

UNIT - 4
Slider / Pad Bearing With A Fixed And Pivoted Shoe: Pressure distribution, Load carrying capacity, coefficient of friction, frictional resistance in a pivoted shoe bearing, numerical examples.

07 Hours

PART – B

UNIT - 5
Oil Flow And Thermal Equilibrium Of Journal Bearing: Oil flow through bearings, self-contained journal bearings, bearings lubricated under pressure, thermal equilibrium of journal bearings.

06 Hours

UNIT - 6
Hydrostatic Lubrication: Introduction to hydrostatic lubrication, hydrostatic step bearings, load carrying capacity and oil flow through the hydrostatic step bearing.

06 Hours

UNIT - 7
Bearing Materials: Commonly used bearings materials, properties of typical bearing materials. Advantages and disadvantages of bearing materials.

07 Hours

UNIT - 8
Behavior Of Tribological Components: Selection, friction, Wear of ceramic materials, wear measurements, effects of speed, temperature and pressure. Tribological measures, Material selection, improved design, surface engineering

07 Hours

TEXT BOOKS:
1. **Fundamentals of Tribology** , Basu S K., Sengupta A N., Ahuja B. B., , PHI 2006
2. **Introduction to Tribology Bearings,** Mujumdar B. C., S. Chand company pvt. Ltd 2008.

REFERENEC BOOKS:
1. **Theory and Practice of Lubrication for Engineers,** Fuller, D., New York company 1998
2. **Principles and Applications of Tribology,** Moore, Pergamaon press 1998
3. **Tribology in Industries,** Srivastava S., S Chand and Company limited, Delhi 2002
4. **Lubrication of bearings – Theoretical Principles and Design,** Redzimovskay E I., Oxford press company 2000

FRACTURE MECHANICS

Subject Code	: 10ME832	**IA Marks**	: 25
Hours/Week	: 04	**Exam Hours**	: 03
Total Hours	: 52	**Exam Marks**	: 100

PART – A

UNIT - 1
Fracture Mechanics Principles: Introduction, Mechanisms of Fracture, a crack in structure, the Griffith's criterion, modern design – strengths, stiffness and toughness. Stress intensity approach

06 Hours

UNIT - 2
Stress Analysis For Members With Cracks: Linear elastic fracture mechanics, Crack tip stress and deformations, Relation between stress intensity factor and fracture toughness, Stress intensity based solutions. Crack tip plastic zone estimation, Plane stress and plane strain concepts. The Dugdale approach, the thickness effect.

07 Hours

UNIT - 3
Elastic – Plastic Fracture Mechanics: Introduction, Elasto–plastic factor criteria, crack resistance curve, J-integral, Crack opening displacement, crack tip opening displacement. Importance of R-curve in fracture mechanics, experimental determination of J-integral, COD and CTOD.

07 Hours

UNIT - 4

Dynamic And Crack Arrest: Introduction, the dynamic stress intensity and elastic energy release rate, crack branching, the principles of crack arrest, the dynamic fracture toughness.

06 Hours

PART – B

UNIT - 5

Fatigue And Fatigue Crack Growth Rate: Fatigue loading, various stages of crack propagation, the load spectrum, approximation of the stress spectrum, the crack growth integration, fatigue crack growth laws.

07 Hours

UNIT - 6

Fracture Resistance Of Materials: Fracture criteria, fatigue cracking criteria, effect of alloying and second phase particles, effect of processing and anisotropy, effect of temperature, closure.

06 Hours

UNIT - 7

Computational Fracture Mechanics: Overview of numerical methods, traditional methods in computational fracture mechanics – stress and displacement marching, elemental crack advance, virtual crack extension, the energy domain integral, finite element implementation. Limitations of numerical fracture analysis.

07 Hours

UNIT - 8

Fracture Toughness Testing Of Metals: Specimen size requirements, various test procedures, effects of temperature, loading rate and plate thickness on fracture toughness. Fracture testing in shear modes, fatigue testing, NDT methods.

06 Hours

TEXT BOOKS:
1. **Introduction to Fracture Mechanics**, Karen Hellan McGraw Hill Pub.2000
2. **Fracture of Engineering Brittle Materials,** Jayatilake, Applied Science, London. 2001.

REFERENCE BOOKS:
1. **Fracture Mechanics – Fundamentals and Application,** T.L. Anderson, CRC press 1998
2. **Elementary Engineering Fracture Mechanics**, David Broek, Artinus Nijhoff, London 1999.
3. **Fracture and Fatigue Control in Structures**, Rolfe and Barsom, Printice Hall 2000.
4. **Fundamentals of Fracture Mechanics**, Knott, Bureworth 2000.

POWER PLANT ENGINEERING

Subject Code	: 10ME833	IA Marks	: 25
Hours/Week	: 04	Exam Hours	: 03
Total Hours	: 52	Exam Marks	: 100

PART – A

UNIT - 1
Steam Power Plant:
Different types of fuels used for steam generation, Equipment for burning coal in lump form, strokers, different types, Oil burners, Advantages and Disadvantages of using pulverised fuel, Equipment for preparation and burning of pulverised coal, unit system and bin system. Pulverised fuel furnaces, cyclone furnace.

7 Hours

UNIT - 2
Coal, Ash Handling and Different Types of Boilers :
Coal and Ash handling, Generation of steam using forced circulation, high and supercritical pressures, A brief account of LaMount, Benson, Velox, Schmidt, Loeffer and Ramson steam generators.

6 Hours

UNIT - 3
Chimneys, Accessories for the Steam Generator Cooling Towers And Ponds:
Natural, forced, induced and balanced draft, Calculations involving height of chimney to produce a given draft. Accessories For The Steam Generator such

as super-heaters, desuperheater, control of super heaters, Economisers, Air Pre-heaters Study of different types of cooling towers and ponds.

6 Hours

UNIT - 4
Diesel Engine and Gas Turbine Power Plant:
Method of starting diesel engines, Cooling and lubrication system for the diesel engine. Filters, centrifuges, Oil heaters, Intake and exhaust system, Layout of a diesel power plant.Advantages and disadvantages of the gas turbine plant, Open and closed cycle turbine plants with the accessories.

7 Hours

PART – B

UNIT - 5
Hydro-Electric Plants: Storage and pondage, flow duration and mass curves, hydrographs, Low, medium and high head plants, pumped storage plants, Penstock, water hammer, surge tanks, gates and valves, power house, general layout. A brief description of some of the important Hydel Installations in India.

7 Hours

UNIT - 6
Nuclear Power Plant: Principles of release of nuclear energy Fusion and fission reactions. Nuclear fuels used in the reactors. Multiplication and thermal utilization factors. Elements of the Nuclear reactor, Moderator, control rod, fuel rods, coolants. Brief description of reactors of the following types - Pressurized water reactor, Boiling water reactor, Sodium graphite reactor, Homogeneous graphite reactor and gas cooled reactor, Radiation hazards, Radio active waste disposal.

7 Hours

UNIT - 7
Choice of site for power station, load estimation, load duration curve, load factor, capacity factor, use factor, diversity factor, demand factor, Effect of variable load on power plant, selection of the number and size of units.

6 Hours

UNIT - 8

Economic Analysis of power plant: Cost of energy production, selection of plant and generating equipment, performance and operating characteristics of power plants, tariffs for electrical energy.

6 Hours

TEXT BOOKS:
1. **Power Plant Engineering**, P.K Nag, 3rd Ed. Tata McGraw Hill2nd ed 2001,
2. **Power Plant Engineering.** Morse F.T., Van Nstrand.1998

REFERENCE BOOKS:
1. **Water Power Engg.**, Edition 3, Barrows, TMH, New Delhi. 1998
2. **Plant Engg. Hand Book**, Stanier, McGraw Hill. 1998
3. **Hydraulic Machines**, Jagadish Lal, Metropollitan Co 1996.
4. **Principles of Energy Conversion**, A.W. Culp Jr., McGraw Hill. 1996
5. **Power Plant Technology**, M.M. EL-Wakil, McGraw Hill, International. 1994
6. **Power Station Engg. Economics**, Skrotizke and V opat. 1994
7. **Power Plant Engineering,** Domakundawar, Dhanpath Rai sons.2003

NANOTECHNOLOGY

Subject Code	: 10ME834	**IA Marks**	: 25
Hours/Week	: 04	**Exam Hours**	: 03
Total Hours	: 52	**Exam Marks**	: 100

PART – A

UNIT - 1

An Overview Of Nano-Science & Nanotechnology – historical background – nature, scope and content of the subject – multidisciplinary aspects – industrial, economic and societal implications.

05 Hours

UNIT - 2

Experimental Techniques And Methods for investigating and manipulating materials in the nano scale – electron microscope – scanning probe

microscope – optical and other microscopes – light scattering – x-ray diffraction.

07 Hours

UNIT - 3
Fullerenes – discovery, synthesis and purification – chemistry of fullerenes in the condensed phase – orientational ordering – pressure effects – conductivity and superconductivity – ferromagnetism – optical properties.

Carbon Nanotubes – synthesis and purification – filling of nanotubes – mechanism of growth – electronic structure – transport properties – mechanical and physical properties – applications.

07 Hours

UNIT - 4
Self-Assembled Monolayers – monolayers on gold – growth process – phase transitions – patterning monolayers – mixed monolayers – applications.

GAS PHASE CLUSTERS – history of cluster science – formation and growth – detection and analysis – type and properties of clusters – bonding in clusters.

07 Hours

PART – B

UNIT - 5
Semiconductor Quantum Dots – synthesis – electronic structure of nanocrystals – how quantum dots are studied – correlation of properties with size – uses.

05 Hours

UNIT - 6
Monolayer-Protected Metal Nanoparticles – method of preparation– characterization – functionalized metal nanoparticles – applications – superlattices.

Core-Shell Nanoparticles – types – characterization – properties – applications.

Nanoshells – types – characterization – properties – applications.

08 Hours

UNIT - 7

Nanobiology – interaction between biomolecules and nanoparticle surfaces – materials used for synthesis of hybrid nano-bio assemblies – biological applications – nanoprobes for analytical applications – nanobiotechnology – future perspectives.

Nanosensors – what make them possible – nanoscale organization for sensors – characterization – nanosensors based on optical properties – nanosensors based on quantum size effects – electrochemical sensors – sensors based on physical properties – nanobiosensors – sensors of the future.

Nanomedicines – approach to development – nanotechnology in diagnostic and therapeutic applications.

08 Hours

UNIT - 8

Molecular Nanomachines – covalent and non-covalent approaches – molecular motors and machines – other molecular devices – single molecular devices – practical problems involved.

Nanotribology – studying tribology on the nanoscale – applications.

05 Hours

TEXT BOOKS:
1. **NANO: The Essentials – Understanding Nanoscience and Nanotechnology;** T Pradeep (Professor, IIT Madras); Tata McGraw-Hill India (2007)
2. **Nanotechnology:** Richard Booker & Earl Boysen; Wiley (2005).

REFERENCE BOOKS:
1. **Introduction to Nanoscale Science and Technology [Series: Nanostructure Science and Technology],** Di Ventra, et al (Ed); Springer (2004)
2. **Nanotechnology Demystified,** Linda Williams & Wade Adams; McGraw-Hill (2007)
3. **Introduction to Nanotechnology,** Charles P Poole Jr, Frank J Owens, Wiley India Pvt. Ltd., New Delhi, 2007.

ORGANIZATIONAL BEHAVIOUR & PROFESSIONAL COMMUNICATION

Subject Code	: 10ME835	IA Marks	: 25
Hours/Week	: 04	Exam Hours	: 03
Total Hours	: 52	Exam Marks	: 100

PART – A

UNIT - 1
Introduction: Definition of Organization Behaviour and Historical development, Environmental context (Information Technology and Globalization, Diversity and Ethics, Design and Cultural, Reward Systems).

06 Hours

UNIT - 2
The Individual: Foundations of individual behaviour, individual differences. Ability. Attitude, Aptitude, interests. Values.

07 Hours

UNIT - 3
Learning: Definition, Theories of Learning, Individual Decision Making, classical conditioning, operant conditioning, social learning theory, continuous and intermittent reinforcement.

07 Hours

UNIT - 4
Perception: Definition, Factors influencing perception, attribution theory, selective perception, projection, stereotyping, Halo effect**.**

06 Hours

PART – B

UNIT - 5
Motivation: Maslow's Hierarchy of Needs theory, Mc-Gregor's theory X and Y, Hertzberg's motivation Hygiene theory, David Mc-Clelland's three needs theory, Victor Vroom's expectancy theory of motivation**.**

06 Hours

UNIT - 6
The Groups: Definition and classification of groups, Factors affecting group formation, stages of group development, Norms, Hawthorne studies, group processes, group tasks, group decision making**.**

06 Hours

UNIT - 7
Conflict & Stress Management: Definition of conflict, functional and dysfunctional conflict, stages of conflict process**.** Sources of stress, fatigue and its impact on productivity. Job satisfaction, job rotation, enrichment, job enlargement and reengineering work process**.**

08 Hours

UNIT - 8
Principles Of Communication: Useful definitions, communication principles, communication system, role of communication in management, barriers in communication, how to overcome the barriers, rule of effective communication**.**

06 Hours

TEXT BOOKS:
1. **Organizational Behaviour,** Stephen P Robbins, 9th Edition, Pearson Education Publications, ISBN-81-7808-561-5 2002
2. **Organizational Behaviour,** Fred Luthans, 11th Edition, Mc Graw Hill International Edition, ISBN-0-07-120412-12002

REFERENCE BOOKS:
1. **Organizational Behaviour,** Hellriegel, Srocum and Woodman, Thompson Learning, 9th Edition, Prentice Hall India, 2001
2. **Organizational Behaviour,** Aswathappa - Himalaya Publishers. 2001
3. **Organizational Behaviour,** VSP Rao and others, Konark Publishers.2002
4. **Organizational Behaviour,** (Human behaviour at work) 9th Edition, John Newstron/ Keith Davis. 2002

COMPUTER GRAPHICS

Subject Code	: 10ME836	**IA Marks**	: 25
Hours/Week	: 04	**Exam Hours**	: 03
Total Hours	: 52	**Exam Marks**	: 100

PART – A

UNIT - 1

Scan Conversion and Clipping Representation of points, lines, Line Drawing Algorithms: DDA algorithm, Bresenham's integer line algorithm, Bresenham's circle algorithm, mid point line and circle, Polygon filling algorithms: scan conversion, seed filling, scan line algorithm. Viewing transformation, Clipping –points, lines, text, polygon, Cohen-Sutherland line clipping, Sutherland-Hodgmen algorithm.

07 Hours

UNIT - 2

Two Dimensional Transformations Representation of points, Transformations: Rotation, Reflection, Scaling, Combined Transformations, Translations and Homogeneous Coordinates, A geometric interpretation of homogeneous coordinates, Over all scaling, Points at infinity, rotation about an arbitrary point, Reflection through an arbitrary line.

06 Hours

UNIT - 3

Three Dimensional Transformations and Projections 3D Transformation matrix: general matrix, Translation, scaling, Shearing, Rotation, Reflection, Multiple transformations, Rotation about an axis parallel to coordinate axis, Rotation about an arbitrary axis in space, Reflection through an arbitrary plane, Orthographic, Parallel projection Transformations, one, Perspective projections- one point, two point and three point.

06 Hours

UNIT - 4

Plane and Space Curves Curve representation, Nonparametric curves, parametric curves, parametric representation and generation of line, circle, ellipse, parabola, hyperbola, generation of circle, ellipse, parabola, hyperbola, Cubic spline, normalized cubic splines, Bezier curves: blending function, properties, generation, B-spline curves- Cox-deBoor recursive formula,properties,open uniform basis functions, Non-uniform basis functions, periodic B-spline curve.

07 Hours

161

PART – B

UNIT - 5
Types and Mathematical Representation of Solids, Solid Models, Solid entities, Solid representation, Solid modeling- set theory, regularized set operations, set membership classification, Half spaces, Half spaces of plane, cylinder, sphere, conical half-space, Boundary representation, Constructive Solid Geometry- basic elements, Building operations.

07 Hours

UNIT - 6
VISUAL REALISM-I: Introduction, hidden line removal- visibility of object views, Visibility techniques: minimax test, containment test, surface test, Silhouttes, Homogeneity test, Sorting, Coherence, Hidden line priority algorithm, Hidden surface removal- Z-buffer algorithm, Warnock's algorithm, Hidden solid removal- ray tracing algorithm.

06 Hours

UNIT - 7
VISUAL REALISM-II: Shading, shading models- diffuse reflection, specular reflection, ambient light, Shading surfaces- constant shading, gourmand shading, Phong shading, Shading enhancements, Shading Solids- Ray tracing for CSG, z- buffer algorithm for B-rep and CSG, octree encoded objects, Colouring- RGB, CMY, HSV, HSL colour models.

07 Hours

UNIT - 8
COMPUTER ANIMATION: Introduction, Conventional animation-key frame, Inbetweening, Line testing, Painting, Filming, Computer animation-entertainment and engineering animation, Animation system hardware, software architecture, Animation types- frame buffer, colour table, zoom-pan-scroll, cross bar, real time play back, Animation techniques- key frame, skelton. Path of motion and p-curves.

06 Hours

TEXT BOOKS:
1. **CAD/CAM-Theory and Practice,** Ibraham Zeid, 2nd Ed., McGraw Hill, 2006
2. **Mathematical Elements for Computer Graphics**, Rogoer's Adams, McGraw Hill. 1990

REFERENCE BOOKS:
1. **Computer Graphics**, Xiang z, Plastock, R. A., Schaums outlines, McGraw Hill. 2007.
2. **Computer Graphics, principles and practice,** .Foley, Van- Damn, Finner and Hughes, Addison Wesley. 2000
3. **Computer Graphics,** Sinha A. N., Udai A. D., Tata McGraw Hill, 2008.
4. **Computer Graphics,** C Version- Doneld Heran, M. Pauline Baker, 2nd Edition, Pearson.

RAPID PROTOTYPING

Subject Code	: 10ME837	**IA Marks**	: 25
Hours/Week	: 04	**Exam Hours**	: 03
Total Hours	: 52	**Exam Marks**	: 100

PART – A

UNIT - 1
Introduction: Need for the compression in product development, history of RP systems, Survey of applications, Growth of RP industry, and classification of RP systems.
Stereo Lithography Systems: Principle, Process parameter, Process details, Data preparation, data files and machine details, Application.

07 Hours

UNIT - 2
Selective Laser Sintering: Type of machine, Principle of operation, process parameters, Data preparation for SLS, Applications.
Fusion Deposition Modelling: Principle, Process parameter, Path generation, Applications.

07 Hours

UNIT - 3
Solid Ground Curing: Principle of operation, Machine details, Applications. Laminated Object Manufacturing: Principle of operation, LOM materials. Process details, application.

06 Hours

UNIT - 4

Concepts Modelers: Principle, Thermal jet printer, Sander's model market, 3-D printer. Genisys Xs printer HP system 5, object Quadra systems.

06 Hours

PART – B

UNIT - 5

Rapid Tooling: Indirect Rapid tooling, Silicon rubber tooling, Aluminium filled epoxy tooling, Spray metal tooling, Cast kirksite, 3Q keltool, etc. Direct Rapid Tooling Direct. AIM.

06 Hours

UNIT - 6

Rapid Tooling: Quick cast process, Copper polyamide, Rapid Tool, DMILS, Prometal, Sand casting tooling, Laminate tooling soft Tooling vs. hard tooling.

06 Hours

UNIT - 7

Software For RP: STL files, Overview of Solid view, magics, imics, magic communicator, etc. Internet based software, Collaboration tools.

06 Hours

UNIT - 8

Rapid Manufacturing Process Optimization: factors influencing accuracy. Data preparation errors, Part building errors, Error in finishing, influence of build orientation.

08 Hours

TEXT BOOKS:
1. **Stereo Lithography and other RP & M Technologies,** Paul F. Jacobs: SME, NY 1996.
2. **Rapid Manufacturing,** Flham D.T & Dinjoy S.S Verlog London 2001.

REFERENCE BOOKS:
1. **Rapid Prototyping,** Terry Wohlers Wohler's Report 2000" Wohler's Association 2000.
2. **Rapid Prototyping Materials,** Gurumurthi, IISc Bangalore.
3. **Rapid Automated,** Lament wood. Indus press New York

FOUNDRY TECHNOLOGY

Subject Code	: 10ME838	IA Marks	: 25
Hours/Week	: 04	Exam Hours	: 03
Total Hours	: 52	Exam Marks	: 100

PART – A

UNIT - 1
Foundry Metallurgy: Oxidation of liquid metals, gas dissolution in liquid metals, methods of degassing, fluidity, factors affecting fluidity, fluidity tests, hot tearing, shrinkage of liquid metals.

06 Hours

UNIT - 2
Casting Design: Introduction to casting design, redesign considerations, design for minimum casting stresses, design for directional solidification, design for metal flow, safety factors, design for low pattern cost and model making as an aid in design.

06 Hours

UNIT - 3
Solidification Of Castings: Crystallization and development of cast structure - nucleation, growth and dendritic growth. Structure of castings - significance and practical control of cast structure, grain shape and orientation, grain size, refinement and modification of cast structure. Concept of progressive and directional solidification, solidification time and derivation of Chvorinov's equation, influence on mold characteristics and cast metal.

07 Hours

UNIT - 4
Risering And Gating: Need for risering, general considerations of risering, riser shapes, riser size, and location. Requirements of a riser. Sand, insulating, and exothermic materials used for risers. Riser feeding distance and theory of risering. Internal chills, external chills, use of mould materials of different chill capacities, padding for directional solidification. Open type and blind risers. Riser treatment using exothermic and insulating compounds. Gating system – theoretical consideration of gating, laws of fluid flow, turbulence in gating system, use of ceramic foam filters in gating, need for tapered sprue, gating ratio, simple problems.

07 Hours

PART – B

UNIT - 5
Special Moulding Techniques: Principles, materials used, process details and application of no-bake sand systems, vacuum moulding, flaskless moulding, and high pressure moulding.

CUPOLA MELTING: Developments in cupola melting – hot blast cupola, water cooled cupola, balanced blast cupola, cokeless cupola, cupola charge calculations.

07 Hours

UNIT - 6
Ferrous Foundry: Melting procedures, casting characteristics, production, specification, and properties of some typical steels, grey cast iron, malleable iron, and spheroidal graphite cast iron castings.

07 Hours

UNIT - 7
Non-Ferrous Foundry: Melting procedures, casting characteristics, production, specification, and properties of some typical aluminum, copper, and magnesium based alloy castings.

06 Hours

UNIT - 8
Modernization And Mechanization Of Foundry: Need for modernization, and mechanization, moulding and core making, melting, pouring, shake out equipment and fettling, dust and fume control, material handling equipments for sand moulds and cores, molten metal and castings, reclamation of sands. Pollution control – norms, and agencies.

06 Hours

TEXT BOOKS:
1. **Principles of metal casting,** Heine Loper & Rosenthal TMH - 2005
2. **Principle of Foundry Technology**, P. L. Jain, 5th Ed., TMH – 2006.

REFERENCE BOOKS:
1. **Castings,** John Campbell, Second edition, Elseivier
2. **Foundry Technology,** P. N. Rao
3. **Manufacturing Process,** I, Dr. K. Radha Krishna 5th Edn. Sapna Book House, Bangalore

ELECTIVE-V (GROUP - E)

MACHINE TOOL DESIGN

Subject Code	: 10ME841	**IA Marks**	: 25
Hours/Week	: 04	**Exam Hours**	: 03
Total Hours	: 52	**Exam Marks**	: 100

PART – A

UNIT - 1
Principles Of Machine Tool Design: General requirements of machine tool design - design process machine tool layout general requirements of machine tool design – design process machine tool layout

05 Hours

UNIT - 2
Machine Tool Drives And Mechanisms: Working and auxiliary motion. Drives- Electric drives, Hydraulic transmission, Kinmatic structure, Regulation of speed and feeds, stepped regulation, standardization of speed and feed, stepless regulation of speeds and feeds.

07 Hours

UNIT - 3
Cutting Force Analysis And Power Requirement: In Turning, Milling, Drilling, Shaping and Broaching operation with simple problems. General requirements of machine tools - Centre lathe, Milling machine.

07 Hours

UNIT - 4
Design Of Machine Tool Structures: Functions-Requirements-Design criteria Material used – static and dynamic stiffness – Profile and basic design procedure for machine tool structures. Design of beds, columns, housing, bases, tables, cross-rails, arms saddle, carriages.

07 Hours

PART - B

UNIT - 5
Design Of Guide Ways And Power Screws: Function and types of guide ways – Design and lubrication of slide ways - aerostatic slide ways -

antifriction guide ways, combination guide ways - protecting devices, design of power screws.

06 Hours

UNIT - 6
Design Of Spindle And Spindle Bearings: Functions-Requirements and materials for spindle compliance and machining accuracy. Design of spindles, antifriction bearing, Hydrodynamic and Hydrostatic bearing, Air lubricated bearing.

06 Hours

UNIT - 7
Dynamics Of Machine Tools: Concept of dynamic cutting process, Physical causes of chatter and vibrations, Types of Chatter. Stability chart, chatter vibration in Lathe, Drilling machine, Grinding machine and Milling machine. Different methods for avoiding machine tool chatter and vibration.

07 Hours

UNIT - 8
Control Systems In Machine Tools: Functions, requirements and classification. Control system for speed and feeds centralized control pre selective control, control system for forming and auxiliary motions – Mechanical control– Ergonomic consideration and compatibility – Automatic control system – Electric Hydraulic and pneumatic systems.

07 Hours

TEXT BOOKS:
1. **Machine Tool Design,** N.K. Mehta, 2nd Ed., Tata McGraw Hill 2001
2. **Principles of Machine Tools,** Sen and Bhattacharaya Oxford IBM Publishing 2000

REFERENCE BOOKS:
1. **Machine Tool Design Volume – II and III,** N. Acharkan MIR Publications 2000
2. **Design of Machine Tools**, S. K. Basu and D. K. Pal 2000
3. **Principles of Machine Tool Design**, Koensberger 1993

INDUSTRIAL ENGINEERING AND ERGONOMICS

Subject Code	: 10ME842	IA Marks	: 25
Hours/Week	: 04	Exam Hours	: 03
Total Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1
Productivity & Work Study: Definition of productivity, factors affecting productivity, definition, objective & scope of work study, human factors in work study, work study & management, work study & supervisor, work study &worker.

06 Hours

UNIT - 2
Method Study: Definition, objective & scope, charts to record movements in shop, process charts, flow process charts, Multiple activity charts, two handed process charts, SIMO chart, principles of motion economy.

08 Hours

UNIT - 3
Work Measurement: Definition, objectives, techniques of work measurement, work sampling, need of confidence levels, sample size determination, random observation with simple problems

06 Hours

UNIT - 4
Time Study: Definition, time study equipments, selection of jobs, steps in time study, breaking jobs into elements, recording information, rating, standard performance, scales of rating, factors affecting rate of working, allowances, standard time determination.

06 Hours

PART – B

UNIT - 5
Introduction To Industrial Design: elements of design structure for industrial design in engineering application in modern manufacturing systems.

Ergonomics and Industrial Design: Introduction, general approach to the man-machine relationship, workstation design-working position.

08 Hours

UNIT - 6
Visual Effects Of Line And Form: The mechanics of seeing-psychology of seeing general influences of line and form.

06 Hours

UNIT - 7
Color Models: RGB, CMY, HSV, Color and light, color and objects-color and the eye-color consistency-color terms reactions to color and color continuation-color on engineering equipments.

06 Hours

UNIT - 8
Aesthetic Concepts: Concept of unity-concept of order with variety-concept of purpose style and environment –Aesthetic expressions. Style –components of style house style, observation style in capital goods, case study.

06 Hours

TEXT BOOKS:
1. **Work study,** ILO, 3rd edition, 2006
2. **Human Factor Engineering**: Sanders & McCormick, 7th Ed., McGraw Hill Publications.

REFERENCE BOOKS:
1. **Applied Ergonomics Hand Book,** Brain Shakel, Butterworth Scientific, London 1988
2. **Introduction to Ergonomics,** R. C. Bridger, McGraw Hill Publications.
3. **Industrial Design for Engineers,** Mayall W. H. London Hiffee Books Ltd., 1988
4. **Work Study & Ergonomics,** Suresh Dalela & Saurabh, standard publishers & distributors,1999

BIOMASS ENERGY SYSTEMS

Subject Code	: 10ME843	**IA Marks**	: 25
Hours/Week	: 04	**Exam Hours**	: 03
Total Hours	: 52	**Exam Marks**	: 100

PART - A

UNIT - 1
Introduction: Biomass energy sources, energy content of various Bio – fuels, Energy plantation, origin of Biomass photo synthesis process, Biomass Characteristics, sustainability of Biomass.

06 Hours

UNIT - 2
Biomass Conversion Methods: Agrochemical, Thermochemical, Biochemical (flowchart) & Explanation.

06 Hours

UNIT - 3
Physical & Agrochemical Conversion: Briquetting, Pelletization, Agrochemical, fuel Extraction, Thermo chemical Conversion: Direct combustion for heat, Domestic cooking & heating.

07 Hours

UNIT - 4
Biomass Gasification: Chemical reaction in gasification, Producergas& the constituents, Types of gasifiers. Fixed bed gasifiers, Fluidized bed gasifiers.Liquefaction: Liquefaction through pyrolysis & Methanol synthesis, application of producer gas in I C Engines.

07 Hours

PART – B

UNIT - 5
Bio-Methanization: Anaerobic digestion, Basic principles, factors influencing Biogas yield, classification of Biogas digester, floating gasholder & fixed dome type.(Working Principle with diagram), Calculations for sizing the Biogas plant.

06 Hours

UNIT - 6
Biogas For Power Generation: Ethanol as an automobile fuel, Ethanol production & its use in engines.

06 Hours

UNIT - 7
Bio - Diesel: Bio Diesel from edible & non-edible oils, Production of Bio diesel from Honge & Jatropha seeds, use of bio diesel in I C engines, Engine power using Bio diesel, Blending of Bio diesel, Performance analysis of diesel engines using bio diesel. Effect of use of bio diesel in I C engines.

07 Hours

UNIT - 8
Bio Power Plants: Bio Power generation routes, Basic Thermodynamic cycles in Bio power generation; Brayton cycle, Sterling cycle, Rankine cycle, Co-generation cycle. Biomass based steam power plant.

07 Hours

TEXT BOOKS:
1. **Bio Gas Technology,** B.T. Nijaguna. New Age International- New Delhi.2001-02
2. **Energy Technology,** S. Rao & B. B. Parulekar – Khanna Publishers, Delhi-1999.
3. **Non Conventional Energy Sources,** G. D. Rai - Khanna Publishers. Delhi.

REFERENCE BOOKS:
1. **Greenhouse Technology for Controlled Environment,** G.N. Tiwari, Alpha Science International Ltd., Pangbourne.England.
2. **Renewable Energy Resources,** John.W.Twidell, Anthony. D. Weir, EC BG-2001.
3. **BioMass, Deglisc. X and P. Magne,** Millennium Enterprise, New Delhi.

AUTOMOTIVE ENGINEERING

Subject Code	: 10ME844	**IA Marks**	: 25
Hours/Week	: 04	**Exam Hours**	: 03
Total Hours	: 52	**Exam Marks**	: 100

PART – A

UNIT - 1
Engine Components And Cooling & Lubrication Systems: Spark Ignition (SI) & Compression Ignition (CI) engines, cylinder – arrangements and their relatives merits, Liners, Piston, connecting rod, crankshaft, valves, valve actuating mechanisms, valve and port timing diagrams, Types of combustion chambers for S.I.Engine and C.I.Engines, Compression ratio, methods of a Swirl generation, choice of materials for different engine components, engine positioning, cooling requirements, methods of cooling, thermostat valves, different lubrication arrangements.

07 Hours

UNIT - 2
Fuels, Fuel Supply Systems For Si And Ci Engines: Conventional fuels, alternative fuels, normal and abnormal combustion, cetane and octane numbers, Fuel mixture requirements for SI engines, types of carburetors, C.D.& C.C. carburetors, multi point and single point fuel injection systems, fuel transfer pumps, Fuel filters, fuel injection pumps and injectors.

07 Hours

UNIT - 3
Superchargers And Turbochargers: Naturally aspirated engines, Forced Induction, Types pf superchargers, Turbocharger construction and operation, Intercooler, Turbocharger lag.

06 Hours

UNIT - 4
Ignition Systems: Battery Ignition systems, magneto Ignition system, Transistor assist contacts. Electronic Ignition, Automatic Ignition advance systems.

06 Hours

PART – B

UNIT - 5
Power Trains: General arrangement of clutch, Principle of friction clutches, Torque transmitted, Constructional details, Fluid flywheel, Single plate, multi-plate and centrifugal clutches.

Gear box: Necessity for gear ratios in transmission, synchromesh gear boxes, 3, 4 and 5 speed gear boxes. Free wheeling mechanism, planetary gears systems, over drives, fluid coupling and torque converters, Epicyclic gear box, principle of automatic transmission, calculation of gear ratios, Numerical calculations for torque transmission by clutches.

08 Hours

UNIT - 6
Drive To Wheels: Propeller shaft and universal joints, Hotchkiss and torque tube drives, differential, rear axle, different arrangements of fixing the wheels to rear axle, steering geometry, camber, king pin inclination, included angle, castor, toe in & toe out, condition for exact steering, steering gears, power steering, general arrangements of links and stub axle, over steer, under steer and neutral steer, numerical problems, types of chassis frames.

06 Hours

UNIT - 7
Suspension, Springs And Brakes: Requirements, Torsion bar suspension systems, leaf spring, coil spring, independent suspension for front wheel and rear wheel. Air suspension system.

Types of brakes, mechanical compressed air, vacuum and hydraulic braking systems, construction and working of master and wheel cylinder, brake shoe arrangements, Disk brakes, drum brakes, Antilock –Braking systems, purpose and operation of antilock-braking system, ABS Hydraulic Unit, Rear-wheel antilock & Numerical Problems

06 Hours

UNIT - 8
Automotive Emission Control Systems: Automotive emission controls, Controlling crankcase emissions, Controlling evaporative emissions, Cleaning the exhaust gas, Controlling the air-fuel mixture, Controlling the combustion process, Exhaust gas recirculation, Treating the exhaust gas, Air-injection system, Air-aspirator system, Catalytic converter, Emission standards- Euro I, II, III and IV norms, Bharat Stage II, III norms.

6 Hours

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TEXT BOOKS:
1. **Automotive mechanics,** William H Crouse & Donald L Anglin, 10th Edition Tata McGraw Hill Publishing Company Ltd., 2007
2. **Automotive Mechanics,** S. Srinivasan, 2nd Ed., Tata McGraw Hill 2003.

REFERENCE BOOKS:
1. **Automotive mechanics: Principles and Practices**, Joseph Heitner, D Van Nostrand Company, Inc
2. **Fundamentals of Automobile Engineering,** K.K.Ramalingam, Scitech Publications (India) Pvt. Ltd.
3. **Automobile Engineering**, R. B. Gupta, Satya Prakashan, 4th edn. 1984.
4. **Automobile engineering**, Kirpal Singh. Vol I and II 2002.

DATABASE MANAGEMETN SYSTEM

Subject Code	: 10ME845	**IA Marks**	: 25
Hours/Week	: 04	**Exam Hours**	: 03
Total Hours	: 52	**Exam Marks**	: 100

PART – A

UNIT - 1
Database And Database Users: Introduction, characteristics of database approach, intended uses of a DBMS, advantages and implementation of database approach.

06 Hours

UNIT - 2
Database Systems Concepts And Architecture: Data models, schemes and instances, DBMS architecture and data independence, database languages and interfaces, database system environment, classification of database management systems.

06 Hours

UNIT - 3
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 diagram and design issue.

08 Hours

UNIT - 4
Record Storage And Primary File Organizations: Secondary storage devices, buffering of the blocks, placing file records on the disk, operations on files, heap files and sorted files, hashing techniques.

06 Hours

PART – B

UNIT - 5
Relational Data Model And Relational Algebra: Brief discussion on code rules, relational model concepts, constraints and schemas. Update operation on relations, basic and additional relational algebra operations, queries in relational algebra.

07 Hours

UNIT - 6
Structural Query Language (Sql): Data definition etc., in SQL2. Basic and complex queries in SQL, Inser, Delete; Update statements, and views in SQKL, embedded SQL.

07 Hours

UNIT - 7
Database Design: Design guidelines for relational schemas, 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.

07 Hours

UNIT - 8
System Implementation: System catalogue for RDBMSs, transaction processing, and system concepts, properties of transaction, brief discussion on concurrency control and recovery techniques, database security and authorization.

05 Hours

TEXT BOOKS:
1. **Fundamentals of Database Systems,** Ramez Elmasri and Shanmkanth B. Navathe, 3rd Edition, Addison Pearson.
2. **Database Management System,** Raghu Ramakrishnan, Tata Mc Graw Hill, 3rd Edn. 2002.

REFERENCE BOOKS:
1. **Database Management and Design,** Gray W.hansen and James V. Hansen, 2nd Edn. Printice Hall India Pvt. Ltd., 2002.
2. **Database Management Systems,** Designing and Building business applications by Gerald V. Post, 3rd Edition, Tata Mc Graw Hill Publishing company Ltd.,- 2005
3. **Project Mangment with PERT and CPM,** Moder Joseph J and Phillips cerel, R., VAN Noserand, Reinhold, 2nd Edn., 1976.

ARTIFICIAL INTELLIGENCE

Subject Code	: 10ME846	**IA Marks**	: 25
Hours/Week	: 04	**Exam Hours**	: 03
Total Hours	: 52	**Exam Marks**	: 100

PART – A

UNIT - 1
Artificial Intelligence: Introduction, definition, underlying assumption, importance of AI & AI related fields.

06 Hours

UNIT - 2
Space Representation: Defining a problem. Production systems and its characteristics, Search and Control strategies – Generate and Test, Hill Climbing, Best – first Search, Problem reduction, Constraint Satisfaction, Means – Ends Analysis.

07 Hours

UNIT - 3
Knowledge Representation Issues: Representations and Mappings, Types of knowledge – Procedural Vs Declarative, Logic programming. Forward Vs Backward reasoning, Matching.

07 Hours

UNIT - 4

Use Of Predicate Logic: Representing simple facts, Instance and Isa relationships, Syntax and Semantics for Prepositional logic, FQPL and properties of Wffs, Conversion to Clausal form, Resolution, Natural deduction.

06 Hours

PART – B

UNIT - 5

Statistical And Probabilistic Reasoning: Symbolic reasoning under uncertainty, Probability and Bayes' theorem, Certainity factors and Rule based systems, Bayesian Networks, Shafer Theory, Fuzzy Logic.

07 Hours

UNIT - 6

Expert Systems: Structure and uses, Representing and using domain knowledge, Expert System Shells. Pattern recognition Learning classification patterns, recognizing and understanding speech. Introduction to knowledge Acquisition, Types of Learning.

07 Hours

UNIT - 7

Typical Expert Systems: MYCIN, Variants of MYCIN, PROSPECTOR, DENDRAL, PUFF, ETC.

06 Hours

UNIT - 8

Introduction To Machine Learning: Perceptrons, Checker Playing Examples, Learning Automata, Genetic Algorithms, Intelligent Editors.

06 Hours

TEXT BOOKS:
1. **Artificial Intelligence,** Elaine Rich & Kevin Knight, 3rd Ed., M/H 1983.
2. **Introduction to AI & ES,** Dan W. Patterson, Prentice Hall of India, 1999.

REFERENCE BOOKS:
1. **Principles of Artificial Intelligence**, Springer Verlag, Berlin, 1981.
2. **Artificial Intelligence in business, Science & Industry**, Wendy B. Ranch

3. **A guide to expert systems,** Waterman, D.A., Addison – Wesley inc. 1986
4. **Building expert systems,** Hayes, Roth, Waterman, D.A. Addison – Wesley, 1983

DESIGN OF EXPERIMENTS

Subject Code	: 10ME847	**IA Marks**	: 25
Hours/Week	: 04	**Exam Hours**	: 03
Total Hours	: 52	**Exam Marks**	: 100

PART – A

UNIT - 1
Introduction: Strategy of Experimentation, Typical applications of Experimental design, Basic Principles, Guidelines for Designing Experiments.

05 Hours

UNIT - 2
Basic Statistical Concepts: Concepts of random variable, probability, density function cumulative distribution function. Sample and population, Measure of Central tendency; Mean median and mode, Measures of Variability, Concept of confidence level. Statistical Distributions: Normal, Log Normal & Weibull distributions. Hypothesis testing, Probability plots, choice of sample size. Illustration through Numerical examples.

07 Hours

UNIT - 3
Experimental Design: Classical Experiments: Factorial Experiments: Terminology: factors, levels, interactions, treatment combination, randomization, Two-level experimental designs for two factors and three factors. Three-level experimental designs for two factors and three factors, Factor effects, Factor interactions, Fractional factorial design, Saturated Designs, Central composite designs. Illustration through Numerical examples.

07 Hours

UNIT - 4
Analysis And Interpretation Methods: Measures of variability, Ranking method, Column effect method & Plotting method, Analysis of variance (ANOVA) in Factorial Experiments: YATE's algorithm for ANOVA, Regression analysis, Mathematical models from experimental data. Illustration through Numerical examples.

07 Hours

PART – B

UNIT - 5
Quality By Experimental Design: Quality, Western and Taguchi's quality philosophy, elements of cost, Noise factors causes of variation. Quadratic loss function & variations of quadratic loss function. Robust Design: Steps in Robust Design: Parameter design and Tolerance Design. Reliability Improvement through experiments, Illustration through Numerical examples.

06 Hours

UNIT - 6
Experiment Design Using Taguchi's Orthogonal Arrays: Types of Orthogonal Arrays, selection of standard orthogonal arrays, Linear graphs and Interaction assignment, Dummy level Technique, Compound factor method, Modification of linear graphs. Illustration through Numerical examples.

08 Hours

UNIT - 7
Signal To Noise Ratio: Evaluation of sensitivity to noise. Signal to Noise ratios for static problems: Smaller-the-better type, Nominal-the –better-type, Larger-the-better type. Signal to Noise ratios for Dynamic problems. Illustration through Numerical examples.

06 Hours

UNIT - 8
Parameter And Tolerance Design: Parameter and tolerance design concepts, Taguchi's inner and outer arrays, parameter design strategy, tolerance design strategy. Illustration through Numerical examples.

06 Hours

TEXT BOOKS:
1. **Design and Analysis of Experiments,** Douglas C. Montgomery, 5th Edition Wiley India Pvt. Ltd. 2007
2. **Quality Engineering using Robust Design,** Madhav S. Phadke, Prentice Hall PTR, Englewood Cliffs, New Jersy 07632, 1989.

REFERENCE BOOK:
1. **Quality by Experimental Design,** Thomas B. Barker, Marcel Dekker, Inc ASQC Quality Press.1985.
2. **Experiments Planning, analysis, and parameter Design optimization,** C.F. Jeff Wu Michael Hamada, John Wiley Editions. 2002.
3. **Reliability Improvement by Experiments,** W.L. Condra, Marcel Dekker, Inc ASQC Quality Press.1985.
4. **Taguchi Techniques for Quality Engineering,** Phillip J. Ross, 2nd Edn. McGraw Hill International Editions, 1996.

DESIGN FOR MANUFACTURING AND ASSEMBLY

Subject Code	: 10ME848	**IA Marks**	: 25
Hours/Week	: 04	**Exam Hours**	: 03
Total Hours	: 52	**Exam Marks**	: 100

PART - A

UNIT-1
Tolerances, Limits & Fits: General Tolerances, Tolerance grades, Limits fundamental deviation, Fits, Tolerance Accumulation cumulative effect of tolerances in assembly. Relationship between attainable tolerance grades and different machining processes.

06 Hours

UNIT-2
Geometric Tolerances: Geometrical characteristics and symbols. Definition and Measurement of circularity, cylindricity, flatness and runout. True position tolerance.

Surface Roughness : Terminology, Terms used for surface roughness, measurement of surface roughness. Surface roughness values obtained from various machining processes.

08 Hours

UNIT-3
Cumulative Effect Of Tolerances: sure fit law and truncated normal law. Selective assembly and interchangeable part manufacture, Control of axial play by introducing secondary machining processes and by adding laminated shims.

06 Hours

UNIT-4
Statistical Quality Control: Frequency distribution, standard deviation concept of skewness & Kurtosh variance, Process capability, Indices C_p and C_{pk} control charts.

06 Hours

PART – B

UNIT-5
Component Design From Casting Considerations: Pattern, Mould, Parting line, cored holes and machined holes, Design for reducting/eliminating sand cores.

06 Hours

UNIT-6
Component Design From Machining Consideration: Design considerations for turning, drilling, tapping, milling and grinding operations, provisions for clamping, Reduction in machining area, simplification by separation and amalgamation, Use of productive machines.

06 Hours

UNIT-7
Design Considerations: Major Design Phases. Design for Manufacturability consideration. Influence of Fabrication properties (Machinability, Castability, Weldability, Polymer processing).

07 Hours

UNIT-8
Selection Of Materials In Design: Properties of Materials used in design. Material selection process – cost per unit property, weighted properties and limits on properties methods.

07 Hours

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TEXT BOOKS:
1. **Design for Manufacture,** Harry Peck,Pitman Publications,1983.
2. **Engineering Metrology,** R.K. Jain Khanna Publishers,2000.

REFERENCE BOOKS:
1. **ASM Handbook,vol.20.** Material selection & Design.
2. **Design for Manufacturability Handbook,** Jamesh G. Baralla, Editor, Mcgraw Hill 1998.
3. **Product Design for Manufacture and Assembly,** Geoffery Boothroyed et al 'Mercel Dekker Inc. New York.
4. **Engineering Design: A Materials and Processing Approach,** Geaorge. E. Dieter, Mcgraw Hill, 1991.

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