

NATIONAL INSTITUTE OF TECHNOLOGY, HAMIRPUR (HP) – 177 005

B.Tech. Mechanical Engineering, Third Year [5th Semester]

| Sr. No. | Course No. | Subject | L | T | P | Hours | Credits |
|----------------|-------------------|-------------------------------------|----------|----------|----------|--------------|----------------|
| 1. | [MSS-301] | Principles of Management | 4 | 0 | 0 | 4 | 4 |
| 2. | [ME-351] | Mechanical Measurements & Metrology | 4 | 0 | 0 | 4 | 4 |
| 3. | [ME-352] | Heat Transfer | 3 | 1 | 0 | 4 | 4 |
| 4. | [ME-353] | Machining Science | 4 | 0 | 0 | 4 | 4 |
| 5. | [ME-354] | Kinematics & Dynamics of Machines | 4 | 0 | 0 | 4 | 4 |
| 6. | [ME-350] | Open Elective | 3 | 0 | 0 | 3 | 3 |
| 7. | [ME-351 (P)] | Mechanical Measurement Lab | 0 | 0 | 2 | 2 | 2 |
| 8. | [ME-352 (P)] | Heat Transfer Lab. | 0 | 0 | 2 | 2 | 2 |
| 9. | [ME-353 (P)] | Machining Science Lab. | 0 | 0 | 2 | 2 | 2 |
| 10. | [ME-354 (P)] | TOM/DOM Lab. | 0 | 0 | 2 | 2 | 2 |
| Total = | | | | | | 31 | 31 |

Open Electives:

Open Elective – I [ME-350]

- (a) Industrial Robotics
- (b) Finite Element Method
- (c) Finite Volume Method
- (d) Total Quality Management
- (e) Entrepreneurship
- (f) Computer Aided Design
- (g) Conditioning Monitoring

PRINCIPLES OF MANAGEMENT

MSS-301

| L | T | P/D | Cr |
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| 4 | 0 | 0 | 4 |

- 1. BASIS OF MANAGEMENT:** Classification, Characteristics, and Objectives of management, Management and Society, Social Responsibility and Ethics, Development of Management Thought, Nature and Functions of Management, Management by Objectives, Role of Managers, Principles of Scientific Management, Essence of Management.
- 2. ORGANIZATION:** The Nature and Purpose, Basic Departmentation, Line/Staff Authority and Decentralization, Organization Culture.
- 3. MANAGING AND THE HUMAN FACTOR:** Human Resource Management and Selection, Training and Development, Performance Appraisal and Career Strategy, Identifying the ability, Team work, Team Building for Enhanced Efficiency and Productivity, Leadership Processes and Framework, Behavior of Employees, Theory and Importance of Motivation, Motivation and Reward System.
- 4. MANAGERIAL CONTROL:** The System and Process of Controlling, Control Techniques and Information Technology, Productivity and Operations Management, Overall and Preventive Control.
- 5. PROJECT MANAGEMENT:** Policies and Procedures of Management Plans, Production Planning and Control, Techniques for Operations Planning, Gantt Charts, Program Evaluation and Review Technique, Critical Path Method, Difference between PERT and CPM.
- 6. PLANNING, FORECASTING, AND DECISION MAKING:** The Nature and Purpose of Planning, Objectives, Strategies, Policies, and Planning premises, Importance of Planning, Concept and Techniques of Forecasting, Strategic and Tactical Decisions, Decision Making Process, Rationality and Creativity in Decision Making.
- 7. SOCIAL RESPONSIBILITIES:** Ethics in Business, Guidelines for Managing Ethics in Work Place, Benefits of Ethics in Business, Concept and concern for Environment, Impact of Industries on Environment.
- 8. INTERNATIONAL MANAGEMENT AND THE FUTURE:** International management: Toward a Unified, Global Management Theory.

RECOMMENDED BOOKS:

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| 1. Fundamentals of Management | S. P. Robbins & D. A. Decenzo |
| 2. Principles of Management | Koontz & Donnel |
| 3. Handbook of Management Skills | Jaico Publishing House |
| 4. Principles of Management | K. C. Sahu |
| 5. Principles of Management | Tripathy & Reddy |
| 6. Essentials of Management | J. L. Massie |
| 7. Principles of Management | George & Frankline |
| 8. Business Ethics | W. H. Shaw |

MECHANICAL MEASUREMENT & METROLOGY

ME – 351

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| L | T | P/D | Cr |
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- 1. INTRODUCTION:** Requirement and Importance of Measurement, Static and Dynamic Characteristics, Generalized Measurements System and its Components, Classification of Instruments, Indicating & Recording Devices, Direct and Indirect Measurements. Classification of Errors, Selection of an Instrument, Sensor and Transducer.
- 2. MEASUREMENT OF PRESSURE:** Measuring Instruments – Micro Manometer – Piezo Meter, U Tube Double Column, U Tube Differential, U Tube Double Reservoir Manometer, Manometric Liquids, Advantages and Limitations, Elastic Pressure Transducers – Bourdon, Diaphragm and Bellows Gauges, Low Pressure Gauges – McLeod, Measurement of very high pressure, Thermal Conductivity and Ionization Gauges, CRO – Varying Pressure Measurement, Calibration and Installation of Pressure Gauges.
- 3. MEASUREMENT OF TEMPERATURE:** Classification of Temperature Measuring Instruments, Liquid in Glass Thermometer, Bimetallic Thermometer; Filled System Thermometer, Thermocouples – Laws of Thermocouples, Types of Thermocouples; Resistance Thermometer and Thermistors; Total Radiation and Optical Pyrometers; Errors and Precautions in Temperature Measurement, Calibration of Temperature Sensors.
- 4. STRAIN GAUGES & STRAIN MEASUREMENT:** Strain Measuring Techniques; Requirement of A Strain Gauge; Resistance Strain Gauge; Strain Gauge Alloys & Materials; Metal Resistance Strain Gauges – Unbonded & Bonded Strain Gauges, Strain Gauge Calibration, Temperature Compensation in Strain Gauges.
- 5. FORCE, TORQUE AND POWER MEASUREMENT:** Force Measurement Scales and Balances, Elastic Force Meters, Load Cells; Torque Measurement – Mechanical Torsion Meter, Electrical Torsion Meter & Strain Gauge Torsion Meter; Shaft Power Measurement – Mechanical Brakes, Hydraulic Dynamometer, Eddy Current Dynamometer, Strain Gauge Transmission Dynamometer.
- 6. HYDRAULIC AND PNEUMATIC CONTROL SYSTEMS:** Hydraulic Control Systems – Hydraulic Pumps; Hydraulic Control Valves, Desirable Characteristics of Hydraulic Fluids; Advantages & Limitations, Pneumatic Control Systems – Pneumatic Nozzle Flapper; Advantages & Limitations.
- 7. METROLOGY:** Basics, Interchangeability, Comparators, Gauges, Sine Bars, Surface Finish Measurement, Limit Gauges, Autocollimator, Angle dekkor, Alignment telescope, Laser Metrology, Tool Makers Microscope, Profile Projector, Coordinate Measuring Machine.

RECOMMENDED BOOKS

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| 1. Experimental Methods for Engineers | Hollman |
| 2. Instrumentation Measurement & Analysis | Nakra & Chaudhry |
| 3. Mechanical Measurement & Instrumentation | A.K.Sahney |
| 4. Mechanical Measurements | Beckwith & Buck |
| 5. Measurement Systems Applications and Design | Doebelin |
| 6. Engineering Metrology | R. K. Jain |

HEAT TRANSFER

ME – 352

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| L | T | P/D | Cr |
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- 1. INTRODUCTION:** Basic Concepts and Modes of heat transfer; Relationship to thermodynamics.
- 2. CONDUCTION:** Mechanism; Fourier's general conduction equation in 3-D; 1-D steady state conduction with heat generation: composite plane wall and cylinders, thermal resistance network, critical thickness of insulation; extended surface heat transfer. 2-D steady state conduction: solution for simple boundary conditions, Unsteady heat conduction: lumped parameter system, semi-infinite wall with convection boundary condition, Use of Heisler charts.
- 3. CONVECTION:** Mechanism, forced convection, basic concepts of hydrodynamic and thermal boundary layers, similarity conditions of heat transfer processes, equations of motion and energy, application of dimensional analysis, Laminar boundary layer analysis on flat plate, Fully-developed heat transfer through smooth pipes, Relation between fluid friction and heat transfer, forced convection empirical correlations, Free convection: laminar free convection on a vertical flat plate; empirical correlations, Boiling and condensation: mechanism, laminar film condensation on a vertical plate, empirical correlation.
- 4. RADIATION:** Thermal radiation, monochromatic and total emissive power absorptivity, reflectivity and transmissivity, black, grey and real surfaces, Planck's distribution- law, Wien's displacement law, Stefan -Boltzmann's law, Kirchhoff's law, heat transfer by radiation between black surface and grey surfaces, heat transfer in the presence of re-radiating surface, electrical network method of solving radiation problems, radiation shields, shape factors.
- 5. HEAT EXCHANGERS:** Basic type of heat exchangers, fouling factor, overall heat transfer coefficient, logarithmic mean temperature difference, effectiveness –NTU, Methods of design of single and multiple pass heat exchangers.

RECOMMENDED BOOKS

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| 1. Principal of Heat Transfer | Kreith & Bohn |
| 2. Heat Transfer – A practical Approach | Yunus A. Cengel |
| 3. Fundamental of Heat and Mass Transfer | Incropera & Dewitt |
| 4. Heat Transfer | J.P.Holman |
| 5. Heat and Mass Transfer | Eckert & Drake |

MACHINING SCIENCE

ME – 353

| L | T | P/D | Cr |
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| 3 | 0 | 4 | 4 |

- 1. MACHINING PROCESSES AND MACHINE TOOLS:** Introduction to machine tools and machining operations, Importance of material removal, elements of metal machining, fundamental mechanism of metal deformation in cutting. Different types of tool materials and their properties.
- 2. CHIP FORMATION:** Typical lathe tools; orthogonal cutting; oblique cutting; Mechanism of chip formation, Types of chips; Mechanism of built-up-edge formation.
- 3. MECHANICS OF METAL CUTTING:** Merchant's circle diagram- determination of cutting and thrust forces; Coefficient of friction; shear plane angle, Velocity and force relationship, shear stress and strain and strain rate in orthogonal cutting, stress distribution along rake face, theories of Lee and Shaffer's, Oxley's, etc. Cutting force measuring techniques i.e dynamometer.
- 4. TOOL GEOMETRY:** Reference planes; Tools specification in ASA, ORS and NRS; conversation from ASA to ORS; Selection of tools angles; Multi-point cutting tools-geometry of peripheral milling cutters and twist drills. Effect of tool geometry on cutting parameters.
- 5. THERMAL ASPECTS IN MACHINING AND CUTTING FLUID:** Regions of heat generation; Heat In the Primary Shear Zone, Heat at the Tool/work Interface, Heat Flow at the Tool Clearance Face, Average shear plane temperature; Average chip-tool interface temperature; method of tool temperature measurement, temperature distribution in tool, Cutting Fluid: Types and composition of cutting fluids, selection of cutting fluid.
- 6. TOOL WEAR, TOOL LIFE AND MACHINABILITY:** Tool wear mechanisms, Tool wear equations, tool failure criteria, Tool life equations, Effect of Process parameters on Tool life, Mach inability, Economics of machining Processes, optimization of metal machining process.
- 7. JIGS & FIXTURES AND DESIGN FEATURES OF MACHINE TOOLS,** Defination of Jigs and fixtures, Purpose of using Jigs and Fixtures, Design consideration for Jigs and fixtures, Principles And Methods Of Locating, Supporting And Clamping Blanks And Tool Guidance In Jigs And Fixtures Essential steps in design of machine tools, design of machine tool drives, tool structures, slide ways, Guide ways and automatic lubrications etc.

RECOMMENDED BOOKS

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| 1. Metal Cutting | Trent |
| 2. Machining Hand Book | A.S.M. |
| 3. Production Engineering Science | Pandey & Singh |
| 4. Metal Cutting Principles | M.C.Shaw |
| 5. Manufacturing Engineering & Technology | Kapakkajian |
| 6. Fundamental of Metal cutting and machine tools | B.L.Juneja & Nitin Seth |
| 7. Engineering Metrology | R. K. Jain |

KINEMATICS AND DYNAMICS OF MACHINES

ME – 354

| L | T | P/D | Cr |
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| 4 | 0 | 0 | 4 |

- 1. INTRODUCTION:** Plain motion, kinematic concepts of links; basic terminology and definitions; inversion of kinematic chain, Absolute and relative motion, kinematic and dynamic qualities and their relationship, vector diagram, instantaneous centres, velocity and acceleration polygons, special graphical methods for slider crank mechanism, concept of free body and its equilibrium, static force analysis, dynamic force analysis.
- 2. KINEMATIC SYNTHESIS OF MECHANISMS:** Introduction, Movability of four bar linkage, Freudenstein's Equation, Function Generation, Errors in synthesis problems, Chebyshev spacing of precision points.
- 3. POWER TRANSMISSION and FRICTION DEVICES:** Flat belts and the kinematic design of pulleys, V-belts, length of belts, transmission of power by belts, condition for maximum power transmissions initial tension, Coulomb friction, pivots and collars, power screws, plate and cone clutches, band and block brakes, Types of brakes- band, block, band and block, internal expanding shoe brake, pressure and torque on internal expanding shoe brakes, dynamometers- types- absorption and transmission, prony brake dynamometer, rope brake dynamometer, belt transmission dynamometer, torsion dynamometer.
- 4. GEARS:** Fundamental law of gearing, classification and basic terminology, involute tooth profile and its kinematic considerations, type of gears, standards in tooth forms, gear trains, simple, compound, reverted and epicyclic gear train.
- 5. CAMS:** Classification of Followers and Cams, Terms used in Radial Cams, Cam Mechanism and its Uses, Displacement, Velocity and Acceleration Diagrams When the Follower Moves With Uniform Velocity, Simple Harmonic Motion, Acceleration and Retardation and Cycloid Motion, Construction of Cam Profile for a Radial Cam Operating a Knife Edge, Roller and Flat Faced Follower.
- 6. GOVERNORS:** Functions, Difference between Governor and Flywheel, Various Terms Used, Types of Governor- Watt, Porter, Proell & Hartnell; Inertia Governor, Sensitiveness and Stability of Governor; Isochronous Governor, Hunting, Effort and Power of a Porter Governor, Controlling Force Diagrams For Porter and Spring Controlled Governor, Coefficient of Insensitiveness.
- 7. TURNING MOMENT AND FLYWHEEL:** Turning Moment Diagram for a Four Stroke Cycle I.C. Engine and Multi Cylinder Engine, Fluctuation of Energy and Production of Energy and Co-Efficient of Fluctuation of Energy, Co-Efficient of Fluctuation of Speed, Energy Stored in a Flywheel, Dimensions of the Flywheel Rim, Fly Wheel in Punching Press.
- 8. BALANCING OF MACHINERY:** Necessity of Balancing, Static and Dynamic Balancing, Balancing of Rotating Masses in one Plane, In Different Planes - Analytical and Graphical Methods, Partial Unbalanced Primary Force in an Engine, Balancing of Reciprocating Masses, Condition of Balance in Multi Cylinder in Line Engines. Balancing of Engine.

RECOMMENDED BOOKS

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| 1. Machines and Mechanisms | David H. Myszka |
| 2. Theory of Machines | Sarkar |
| 3. Theory of Machines | P.L.Ballaney |
| 4. Theory of Machines | V.P.Singh |
| 5. Theory of Machines | S. S. Rattan |
| 6. Mechanism & Machine Theory | Rao & Duggipati |
| 7. Theory of Machines | Mallib |
| 8. Theory of Machines | Abdulla Sharif |

INDUSTRIAL ROBOTICS

ME – 350 (a)

| L | T | P/D | Cr |
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| 3 | 0 | 0 | 3 |

- 1. FUNDAMENTAL OF ROBOTICS:** Introduction, automation and robotics, history of robotics, Advantages and disadvantages, investment on robot, economic analysis of robot, social impact, management and robotics, characteristics and application of the present robot, The characteristics and applications of robot of future industrial robot.
- 2. THE STRUCTURE OF ROBOTIC SYSTEM:** Anatomy of robot, classification of robot, robot configurations, robotic systems, robot specifications, performance parameters, robot drive systems, wrist and motions, Robot end effectors, force analysis of gripper mechanisms, Gripper design considerations, selection consideration of grippers, robot control system and components.
- 3. ROBOT MOTION ANALYSIS:** Introduction to manipulator kinematics, Homogeneous transformation and robot kinematics, Manipulator parameters, The D-H representation, Kinematics arm equations, inverse kinematics problems, Robot arm dynamics, dynamics equations, Trajectory planning.
- 4. ROBOT SENSORS AND VISION:** Introduction, classification of sensors and their functions, Position, velocity, acceleration sensors, proximity and range sensors, Touch and slip sensors, force and Torque sensors, Vision: Introduction to machine vision, Image processing and analysis, Robotic applications.
- 5. ROBOT PROGRAMMING:** Introduction, methods of programming, Motion interpolations, Robot programming languages, Language structure, Programming languages-features and applications, Introduction to artificial Intelligence and robotics.
- 6. ENGINEERING APPLICATIONS FOR MANUFACUTRING:** Robot cell design and control, Robot as peripheral device, Material transfer, machine loading and unloading, processing operations applications, Assembly and applications.
- 7. IMPLEMENTATION PRINCIPLES, SOCIAL ISSUES AND FUTURE OF ROBOTICS:** Plant survey to identify potential applications, planning and engineering. The installation, safety, training and maintenance issues, social and labor issues, robotic technology of the future and future applications.

RECOMMENDED BOOKS

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| 1. Robotic Engineering - An Integrated Approach | Richard D. Klafter Thomas A. Chemielewski & Michal Negin |
| 2. Industrial Robotics | Gordon M. Mair |
| 3. Introduction to Robotics | Craig |
| 4. Introduction to Robotics- Analysis, Systems Application | Nikku |
| 5. Robotics & Automated Manufacturing | Richard C.Dort |
| 6. Industrial Robotics | Mikell P.Groover, Nicholas G.Odery |
| 7. Fundamentals of Robotics | Robert J. Schilling |

FINITE ELEMENT METHODS

ME – 350 (b)

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| L | T | P | Cr |
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- 1. FUNDAMENTAL CONCEPTS:** Introduction, Historical background, stresses and equilibrium, boundary conditions, strain-displacement relations, stress-strain relations, temperature effects, Rayleigh-Ritz Method, Galerkin's Method, Saint Venant's Principle, Matrix algebra, Gaussian Elimination.
- 2. FINITE ELEMENT MESHES:** Choice of mesh, mesh data in numerical form, generation of mesh data, mesh modification.
- 3. ONE -DIMENSIONAL PROBLEMS:** Introduction, Finite element Modeling, Co-ordinates and Shape Functions, Potential energy approach, The Galerkin Approach, Assembly of Global stiffness matrix and load vector, Finite element equations; Treatment of boundary conditions, quadratic shape functions, Temperature effects.
- 4. TRUSSES:** Introduction, plane trusses, three dimensional trusses, assembly of global stiffness matrix for the banded and skyline solution.
- 5. TWO- DIMENSIONAL PROBLEMS:** Introduction, finite element modeling, constant strain triangle (CST), Problem modeling and boundary conditions.
- 6. AXISYMMETRIC SOLIDS SUBJECTED TO AXISYMMETRIC LOADING:** Introduction, Axisymmetric formulation, finite element modeling: Triangular elements, Problem modeling and boundary conditions.
- 7. TWO -DIMENSIONAL ISOPARAMETRIC ELEMENTS AND NUMERICAL INTEGRATION:** Introduction, The fournode quadrilateral, Numerical Integration, Higher order element, Problem related to beams.
- 8. BEAMS AND FRAMES:** Introduction, finite element formulation, load vector, boundary considerations, shear force and bending moment beams on elastic supports, plane frames, three dimensional frames.
- 9. FINITE ELEMENT METHODS IN FLUID FLOW &. HEAT TRANSFER:** 1-D Steady heat conduction, 1-D heat conduction in thin fins, 2-D Steady heat conduction, 2-D Fins. 1-D & 2-D heat diffusion, incompressible inviscid flow (potential flow), acoustic flow, and viscous incompressible fluid flow.

RECOMMENDED BOOKS

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| 1. Introduction to Finite Elements in Engineering | Tirupathi, R. ,Chandrupatle Ashoka D. Belegundu |
| 2. An Introduction to Finite Element Method | J.N. Reddy |
| 3. Finite Element Analysis -Theory and Programming | C.S. Krishnamurthy |
| 4. The Finite Element Method in Engineering | S.S. Rao |
| 5. Finite Element Methods for Engineers | Roger T.Fennee |
| 6. Finite Element Analysis in Engg. Design | Rajoebaron |

Special assignments and projects/models are to be submitted for evaluation in consultation with the course coordinator

FINITE VOLUME METHOD

ME – 350 (c)

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1. **DISCRETIZATION METHODS:** Review of other methods, control volume formulations, four basic rules.
2. **HEAT CONDUCTION:** Steady one- dimensional conduction: grid spacing, interface conductivity, non-linearity, source term linearization, boundary conditions, unsteady state one dimensional conduction; explicit, implicit and crank Nicolson scheme, two and three-dimensional conduction, over and under relaxation.
3. **CONVECTION AND DIFFUSION:** Steady one- dimensional convection and diffusion, upwind scheme a generalized formulation, discretization equation for two dimensions.
4. **FLOW FIELD:** Continuity and momentum equation, pressure correction equations, 6 simple algorithms.
5. **APPLICATIONS:** Developing flow in curved pipe, two-dimensional heat conduction on a non-uniform mesh, heat conduction in cylindrical geometry, an symmetric steady conduction in spherical coordinators.

RECOMMENDED BOOKS

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| 1. Numerical Methods in Heat Transfer & Fluid Flow | S.V.Patankar |
| 2. Computational Fluid Flow and Heat Transfer | Muralidhar & G. Biswas |
| 3. Computational Fluid Dynamics Vol.1 & 2 | Fletcher |
| 4. Computational Fluid Dynamics | Date, A. N. |

TOTAL QUALITY MANAGEMENT

ME – 350 (d)

| L | T | P | Cr |
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| 3 | 0 | 0 | 3 |

- 1. QUALITY MANAGEMENT:** Evolution of Philosophy of Quality, Quality Gurus-Crosby, Deming and Juran, Attributes of Quality, Quality Characteristics-Quality of Design, Quality of Performance and Quality of Conformance, Organization For Quality, Total Quality Management (TQM), TQM Models, 4 – C’S of TQM; Barriers to Implement TQM.
- 2. ORGANISING FOR QUALITY:** Developing an Organization AI Structure for Quality. Quality Management System. Role of top Management ,Quality Council, Quality Policies ,Quality Improvement Teams, Role of Middle and Lower Management ,Quality Circles, Organization Structure for Quality Circles. Problem Solving Techniques .Zero Defects.
- 3. QUALITY MEASUREMENT; TOOL AND TECHNIQUES:** Seven Basic (B7)Tools – Cause & Effect Diagram, Flow Diagrams, Trend Charts, Histogram, scatter Diagram, Control Chart, New Seven (S7)Tools – Affinity Diagram, Inter relationship Diagram, Tree Diagram, Matrix Diagram, Process decision Program chart (PDPC) and Matrix Data Analysis.
- 4. QUALITY ASSURANCE & CONTROL:** Causes of Quality Failure ,Quality Assurance-Need and Various Elements In Quality Assurance Programme. Quality Control- On Line and Off Line, Statistical Concepts in Quality, Chance and Assignable causes. Types of control charts. Control chart for variables (X and R charts).Interpreting patterns of variations on X and R charts. Control chart for attributes: Attribute chart for defectives, P- chart, NP- chart. Attribute chart for number of defects per unit ,C-Chart and U-Chart.
- 5. INNOVATIVE TECHNIQUES IN QM:** Quality Function Deployment (QFD)-Definition and Phases in QFD , Taguchi Approach to quality-system design, parameter design and Tolerance design, Six-Sigma -Definition & Implementation Steps, ISO-9000 and 14000, Role of Total Productive Management (TPM), Bench Making in quality management.
- 6. QUALITY SYSTEMS:** Seven QC tools of quality control, Histogram, Scatter diagram, Standardisation

RECOMMENDED BOOKS

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| 1. TQM Text with Cases | Amrik Sohal |
| 2. Managing Quality | B. G. Pale |
| 3. TQM Text with Cases | John S. Oaklend |
| 4. TQM and ISO –14000 | Arora |
| 5. TQM | Besterfield |

ENTREPRENEURSHIP

ME – 350 (e)

| L | T | P/D | Cr |
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- 1. THE ENTREPRENEURIAL DEVELOPMENT PERSPECTIVE:** Concept of Entrepreneurship Development Evolution of the concept of of Entrepreneur, Entrepreneur Vs. Intrapreneur, Entrepreneur Vs. Entrepreneurship, Attributes and characteristics of a successful Entrepreneur, Role of Entrepreneur in India economy and developing economics with refrence to self-Employment Development, Entrepreneurship Culture.
- 2. CREATING ENTREPRENEURIAL VENTURE:** Business Planning Process, Environmental Analysis – Search and Scanning, Identifying problems and opportunities, Defining Business Idea, Basic Government Procedures to be complied with.
- 3. PROJECT MANAGEMENT:** Technical, Financial, Marketing, Personnel and Management Feasibility, Estimating and Financing funds requirement – Schemes offered by various commercial banks and financial institutions like IDBI, ICICI, SIDBI, SFCs, and Venture Capital Funding.
- 4. ENTREPRENEURSHIP DEVELOPMENT AND GOVERNMENT:** Role of Central Government and State Government in promoting Entrepreneurship – Introduction to various incentives, subsidies and grants – Export Oriented Units – Fiscal and Tax concessions available.
- 5. ROLE OF FOLLOWING AGENCIES IN THE ENTREPRENEURSHIP DEVELOPMENT:** District Industries Centres (DIC), Small Industries Service Institute (SISI), Entrepreneurship Development Institute of India (EDII), National Institute of Entrepreneurship & Small Business Development (NIESBUD), National Entrepreneurship Development Board (NEDB).
- 6. WHY DO ENTREPRENEURS FAIL:** The FOUR Entrepreneurial Pitfalls (Peter Drucker)
- 7. WOMEN ENTREPRENEURS:** Reasons for Low/No Women Entrepreneurs, Role, Problems and Prospects.
- 8. CASE STUDIES:** Case studies of Successful Entrepreneurial Ventures, Failed Entrepreneurial Ventures and Turnaround Ventures.

RECOMMENDED BOOKS

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| 1. Entrepreneurship : New Venture Creation | David H. Holt |
| 2. Entrepreneurship | Hisrich Peters |
| 3. The Culture of Entrepreneurship | Brigitte Berger |
| 4. Project management | K. Nagarajan |
| 5. Dynamics of Entrepreneurship Development | Vasant Desai |
| 6. Entrepreneurship Development | Dr. P.C. Shejwalker |
| 7. Thought Leaders | Shrinivas Pandit |
| 8. Entrepreneurship, 3 rd Edition | Steven Brandt |
| 9. Business Gurus Speak | S. N. Chary |
| 10. The Entrepreneurial Connection | Gurmit Narula |

COMPUTER AIDED DESIGN

ME -350 (f)

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1. **INTRODUCTION:** Design steps, role of computers in design and drafting, computer hardware, types of display - raster display, vector display, colour display, input devices, output devices.
2. **TRANSFORMATIONS:** World to device coordinate transformation, world coordinates, window and view port, and window to view port transformation, Normalized coordinates, zooming and panning.
3. **TWO DIMENSIONAL TRANSFORMATION:** Mathematical aspects of translation, scaling, shearing, rotation, Reflection, Composite (concatenation) transformation, concatenation properties of matrices, practical example - rotation about a pivot point, scaling relative to fixed point, scaling relative to arbitrary directions, shearing relative to a fixed point. Inverse Transformation: Inverse translation, scaling, rotation shearing matrix.
4. **THREE-DIMENSIONAL TRANSFORMATIONS:** Scaling, translation, rotation.
5. **THREE-DIMENSIONAL VIEWING OPERATIONS:** Projections- Multiview orthographic projections, Axonometric projections, Oblique projections, Perspective projections, Vanishing points, Special techniques for producing perspective views.
6. **CURVES:** Geometric curve description, Parametric and implicit formulations, Conics- Circles, Ellipses; Interpolation techniques for curve definition- Lagrange polynomial, Parametric cubic, Matrix approach, Cubic spline; Bezier curves.
7. **SOLID MODELLING SYSTEM:** Octree or Quadtree representations, boundary or perimeter modelling, primitive or constructive solid geometry or building block method.

RECOMMENDED BOOKS

1. Mathematical Elements for Computer Graphics D.F. Rogers & J. Alan Adam.
2. Microcomputer Graphics using Pascal Richard Halpern
3. Computer Graphics Hern & Baker
4. Introduction to CAD/CAM Oniver & Zimer
5. Computer graphics and Geometrical Modeling for Engineers Vera B.Anand

Special assignments and projects/models are to be submitted for evaluation in consultation with the course coordinator.

CONDITION MONITORING

ME – 350 (g)

| L | T | P/D | Cr |
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| 3 | 0 | 0 | 3 |

1. Importance of machine health monitoring and fault diagnosis of plant, Classification of Maintenance Activities: Breakdown, Preventive and Predictive Maintenance, Condition Monitoring maintenance strategies.
2. Fault identification/detection; visual inspection; crack detection techniques like magnetic crack detection, dye penetrant, radiography; oil analysis; wear particle analysis; Ferrography; strain gauge technology, ultra sonic crack detection, themography.
3. Condition monitoring methods; sensors required for various applications viz. electrical fluid, mechanical; wear debris analysis; vibration of mechanical components; on line and off line techniques.
4. Noise analysis; fluid borne, structural borne, air borne noise measurement and its analysis.
5. Signal processing; signature analysis and their significance; machine signatures; spectrum analysis; time series analysis.
6. Expert systems and real time process analysis; microcomputer interfacing; data acquisition, expert system skills, Classification of Maintenance Activities: Breakdown, Preventive and Predictive Maintenance, Condition Monitoring.

RECOMMENDED BOOKS

1. Mechanical Faults Diagnostics and Condition Monitoring R. A. Colacott John Wiley & Sons, 1997.
2. Handbook of Condition Monitoring B.K.N. Rao, Elsevier Science Publisher.
3. Engineering Condition Monitoring, Practice, Methods and Applications, by Barron, R., Addison Wesley Longman, 1996
4. Condition Monitoring for Engineering Services by Armstrong, J.H. & Taylor P.
5. Maintenance Engineering and Management by Mishra R.C. & Pathak K.
