

Short Syllabi of the Courses for B. Tech. Degree in
Production Engineering
(2004 Admission onwards)

FIRST & SECOND SEMESTERS : Common for all branches

THIRD SEMESTER

MA201T: Mathematics III

3-1-0-0-3

Probability distributions, Random variables, mean and variance of probability distributions, Chebyshev's theorem, joint distributions, Sampling distributions and inference concerning means, sampling distribution of the variance, tests of hypothesis, Inference concerning variance, test for goodness of fit, regression analysis, analysis of variance, completely randomized designs.

Text Book:

1. Johnson R.A, Miller & Freund's Probability and Statistics for Engineers, 5thEdn., Prentice Hall Ltd., 1995

ME210T: Fluid Mechanics and Machinery

3-1-0-0-3

Fluid statics, pressure measurement, forces on bodies, Fluid dynamics, one dimensional equations for fluid flow, Bernoulli equation and its applications, introduction to multi dimensional flow, Pumping Machinery, centrifugal pumps and reciprocating pumps, Turbines, Generation of power from fluid flow, Francis, Kaplan and Pelton Turbines.

References:

1. Shames, I.H., Fluid Mechanics, McGraw Hill Book Co.
2. Vijay Gupta and Santosh Gupta, 'Fluid Mechanics and its Applications', Wiley Eastern Ltd.

ME212T: Elements of Mechanics of Solids

3-0-0-0-3

Definition of stress and strain, stress in axially loaded members, generalized Hooke's laws, Bending stresses in beams, shear force and bending moment diagrams, torsion of circular elastic bars, Transformation of stress and strains for the plane problems, compound stresses, theory of columns.

Text Book:

1. E.P. Popov: Engineering mechanics of Solids, Prentice Hall of India Ltd., New Delhi

References:

1. S.P. Timoshenko & D.H. Young: Elements of Strength of Materials-McGraw Hill-International student Edition.
2. Irving. H. Shames, Introduction to Solid Mechanics.
3. S.H. Crandall, N.C. Dhal & T.J. Lardner: Introduction to Mechanics of Solids-McGraw Hill.

PE213T: Metallurgy and Materials Science**3-0-0-0-3**

Introduction and overview of engineering materials, Atomic Structure and Bonding, Structure of Crystalline Solids, Imperfections/Defects in Solids, Diffusion in Solids, Mechanical Responses of Metals, Dislocations and Strengthening Mechanisms, Plastic deformation, Failure Mechanisms of Materials, Phases and Phase Diagrams, Phase Transformations, Metallic alloys, Structure and Properties of Ceramics, Structure and Properties of Polymers and Composites, Materials Selection and Design Principles.

Text Book:

1. Smith, Science of Engineering materials, Prentice-Hall
2. Callister W.D. , Materials Science and Engineering, John Wiley

References:

1. Avner S.H., Introduction to Physical Metallurgy, McGraw Hill
2. Van Vlack L.H., 'Elements of Material Science and Engineering', John Wiley
3. Shackelford J.F., Material Science for Engineers
4. Reed Hill, Physical metallurgy Principles, Affiliated East West Press

EE216T: Electrical Measurements and Machines**3-0-0-0-3**

Measurement of power, Basics of rotating machinery, principle of operation, e.m.f and torque equation, d.c. Machines, principles of operation, generators and motors, Transformers, Alternators, synchronous machines, single phase and special machines. Working of AC and DC Servomotors and Principles of Position, Velocity and Force servo control Systems- Applications in CNC Machine Tool drives and Robots.

Text Book:

1. Hughes, K., Electrical Technology, E.L.B.S., 1996
2. Nagrath, I.J., and Kothari, D.P., Electrical Machines, Tata McGraw Hill Ltd., New Delhi, 1997.

ME214D: Machine Drawing**0-0-0-3-2**

Principles of orthographic view applied to machine drawing, sectional views, threaded fastenings, welded joints, riveted joints, pipe joints, shaft couplings, keyed joints, pulleys, gear teeth and gears, bearings, assembly drawings, engine parts, jigs and fixtures, valves and boiler mountings, Designation of surface texture, limits fits and tolerances, working drawing of simple machine elements, introduction to CAD, Use of Commercially available software packages in Solid Modeling and Simulation.

Text Book:

1. Bhatt N.D. & Panchal V.M., Machine Drawing, Charotar Publishers, New Delhi

References:

1. Narayanan .K.L., Kannaiah P& Reddy K.V., Machine Drawing
2. Pippenger J.& Hicks T., Industrial Hydraulics, McGraw Hill

ME216L: Production Engineering Laboratory**0-0-3-0-1**

Classification of Machine tools and processes, Machining on centre lathes, study of parts and function, cutting tools, types and materials, Grinding, selection of speeds, feeds and depth of cut, Cutting fluids, methods of work holding, Lathe operations like turning, taper turning and eccentric turning, thread cutting, knurling, drilling boring and profile turning, tolerance and surface finish.

ME256L: Fluid Mechanics and Machinery Laboratory**0-0-3-0-1**

Study of Plumbing Tools and pipe fittings, Measurement of Metacentric height and radius of gyration of floating bodies, Measurement of viscosity of fluids, study of

viscosity measuring instruments, study and experimentation on discharge measuring instruments like venturimeter, orificemeter, notches, weirs, nozzle meters and rotameters, Measurement of pressure and velocity, Pipe friction, minor losses in pipes, verification of Bernoulli's theorem, demonstration of laminar and turbulent flow in pipes, critical velocity, forces on curved and plane surfaces, Evaluation of the performance of turbines, main and operating characteristics, Muschel curves, performance of pumping and other machinery, centrifugal pump, reciprocating pump, gear pump, hydraulic ram and torque converter.

FOURTH SEMESTER

MA202T: Mathematics IV

3-1-0-0-3

Power series solution of differential equations, Legendre equation, Bessels equation, Sturm-Liouville problem, Eigen functions, Partial differential equations – Methods of solving PDE, Elliptic, Parabolic and hyperbolic equations, typical examples and their solution, complex analysis, analytic functions and their applications, conformal mapping, Evaluation of real integrals, residue theorem, Laurents series, Taylor series and Maclaurians-series.

Text Book:

1. Kreyzig. E , Advanced Engineering Mathematics, 8th Ed., John Wiley & Sons, 2000.

References:

1. Wylie, C.R. & Barret L.C, Advanced Engineering Mathematics, 6th Ed., McGraw Hill, New York, 1995.

ME258T: Thermodynamics and Heat Transfer

3-1-0-0-3

Thermodynamic system, properties of state, thermodynamic equilibrium, zeroth law, first law, and second law, reversible and irreversible processes and cycles, entropy, Helmholtz and Gibbs functions, Joule Thomson effects, Heat transfer through solids, the conduction equation, Energy transport by natural and forced convection, application to heat exchangers, evaluation of radiation effects

References:

1. Nag P.K, Engineering Thermodynamics
2. Holman J.P, Heat Transfer, McGraw Hill International Student Edition

ME252T: Mechanics of Machinery

3-0-0-0-3

Mechanisms, Kinematics, displacement, velocity and acceleration, the Euler Savary equation, Cam design, involute spur gears, cycloidal gears, theory and details of bevel gears, helical gears and worm gears, analysis of gear trains, kinematic synthesis, graphical synthesis of motion, function generator, analytical synthesis, techniques.

Text book:

1. Arthur G.Erdman and George N. Sandor; Mechanism Design: Analysis and Synthesis Vol. 1&Vol. 2 Prentice Hall of India, 1988
2. Hamilton H. Mabie and Charles F. Reinholtz: Mechanisms and Dynamics of Machinery 4th edn.1987,John wiley&Sons.

References:

1. Amitabha Ghosh and Ashok Kumar Mallik; Theory of Mechanisms and Machines, Affiliated East-west Press
2. J.E. Shigley & J.J Vicker: Theory of Machines and mechanisms, McGraw Hill

PE253T: Theory of Elasticity and Plasticity**3-0-0-0-3**

Analysis of Stress and Strain, equilibrium equations, Compatibility Conditions, Stress-Strain Relations, Two dimensional problems, Torsion, Bending of beams, Yield criteria, Stress space representation of von-Mises and Tresca criteria, Plastic stress-strain relations, Experimental verification, Analysis of Elastic-Plastic problems (like Spherical shell and Cylindrical shell under internal pressure, rotating Discs).

References:

1. Srinath L.S., 'Advanced Mechanics of Solids', Tata McGraw Hill Book Co, New Delhi.
2. Johnson W. and Meller P.B., Engineering Plasticity, McGraw Hill Book Co., New York, 1987.

PE255T: Metrology and Computer Aided Inspection**3-0-0-0-3**

Inspection principles and practices: Inspection fundamentals, inspection procedure, inspection accuracy, Type I and Type II inspection errors, error sources, sampling theory, uncertainty analysis, automated inspection, offline and online/in-process inspection, quantitative analysis of inspection, measurement standards and systems, Advanced metrology: Abbe's principle, standards for length measurement, shop floor standards and their calibration, light interference, slip gauge calibration, measurement errors, angular measurements, gear and thread measurements, form measurements, flatness, roundness, cylindricity, etc., various tolerances and their specifications, gauging principles, selective assembly. Machine Tool metrology, Co-ordinate Measuring Machine (CMM) : Co-ordinate Metrology, CMM Basics, CMM Construction, CMM operation and programming, accessory elements, probing systems, probe and stylus, non contact sensors, probe calibration, CMM Software, scanning, reverse engineering applications.

References:

1. Figliola R.H., Beasley D.E., Theory and Design for Mechanical Measurements, Third Edition, John Wiley and Sons.
2. Collet C.V. and Hope A.D., Engineering Measurements, Second Edition, ELBS Longman.

PE215T: Metal Casting and Joining**3-0-0-0-3**

Fundamentals of Casting and Expendable Mold processes, Pattern making, shrinkage and contraction, Use of cores. Properties of molding sands, bonding materials, testing of sands. Molding Processes, Sand and Permanent. Melting furnaces. Homogeneous and heterogeneous nucleation, types of growth. Flow effects of metal in mold, gating and riser design. Cleaning of castings. Metal gas interaction, casting defects, inspection and QA. New casting methods. Solidification modeling and simulation Use of Computer codes in casting design. Metallurgy of welding, Residual stresses in welds, Hot and cold cracking of welds, Soldering and brazing. Gas welding, arc welding and resistance welding, Evaluation of welds (NDT methods), Diffusion bonding, Adhesive bonding.

References:

1. Ghosh A., and Mallik A.K., Manufacturing Science, Affiliated East West Press,.
2. Heine R. and Rosenthal, P., Principles of Metal Casting, Tata McGraw Hill.
3. Richard A. Little, Welding and Welding Technology, Tata McGraw Hill.

CE294L: Strength of Materials Laboratory**0-0-3-0-1**

Study of extensometer and strain gauges, Simple tension test, double shear test, Rockwell, Brinell and Vickers hardness tests, Izod and Charpy impact tests, Strength of open coiled and closed coil springs, bending, torsion, compression and fatigue tests.

ME294L: Metrology and Instrumentation Laboratory **0-0-3-0-1**
Study of and Measurements using, Universal Measuring Microscope, Tool Makers Microscope, Profile Projector, Surface Roughness tester and CMM, Calibration of Strain gauge load cells, pressure gauges, LVDT, thermocouple, and Tachometers, Limits and fits, Psychrometers and preparation of Psychrometric charts, analysis of measurement systems, Study and measurement with other instruments like, thread pitch gauge, thread micrometer, disc micrometer, height gauge, slip gauges, optical flats, three pin micrometer, pyrometer etc.

FIFTH SEMESTER

ME301T: Principles of Management **3-0-0-0-3**
Introduction to management – characteristics – systems approach – task responsibilities and skill required – mission – models in decision making – process of management – planning – organizing – directing – controlling – overview of operations management – human resources management – marketing management – financial management.

Text Book:

1. Koontz and Weihrich, 'Management', Ninth Edition, McGraw Hill, 1999.

References:

1. Stoner, et.al., 'Management', 6th edition, Prentice Hall, 1999
2. Mazda, 'Engineering Management', Addison Wesley, 1999
3. Certo, S., "Modern Management", 8th edition, Prentice Hall, 2003

ZZ301Z: Environmental Studies **3-0-0-0-3**
Unit 1: The Multidisciplinary nature of environmental studies. Unit 2: Natural Resources, Renewable and non-renewable resources: Natural resources and associated problems, Unit3: Eco Systems, Unit 4: Bio diversity and its conservation, Unit5: Environmental Pollution, Unit 6: Social Issues and the Environment, Unit 7: human population and the environment, Unit 8. Field Work.

PE312T: CAD/CAM **3-0-0-0-3**
Design process and CAD/CAM; review of basics of interactive computer graphics; Design of 3D curves; Hermitian interpolation, Bezier curves, B-spline curves, Design of surfaces; Coons patches; Bezier surfaces; B-spline surfaces, general surface design processes, Representation of solid models; b-rep models; csg models; CNC machine tools, constructional features, drives and controls, CNC manual part programming and computer assisted programming, computer integrated manufacturing systems, computer aided inspection, group technology, flexible manufacturing systems, industrial robotics and machine vision, rapid prototyping, design for manufacturability, process planning and concurrent engineering, lean production and agile manufacturing, Reconfigurable Manufacturing Systems.

Current Developments in CAD/CAM – Student Presentation and/or Poster (2-3 students per team)

References:

1. David F. Rogers & J H Adams; Mathematical Elements of Computer Graphics ; McGraw Hill International
2. Ibrahim Zeid; CAD/CAM Theory and Practice, Tata McGraw Hill publishing company.
3. Yoram Koren; Computer Control of Manufacturing Systems, McGraw Hill Book Company.

4. Mikell P. Groover; Automation, Production Systems, and Computer Integrated Manufacturing, Pearson Education
5. HMT Limited; Mechatronics, Tata McGraw Hill Publishing Company Limited

ME354T: Thermal Engineering

3-0-0-0-3

Internal combustion engines, 2 stroke and 4 stroke SI and CI engines, theoretical and actual cycles, different systems of IC engines, combustion process in CI and SI engines, performance and governing of IC engines, Nozzles, throat pressures and areas for maximum discharge, supersaturated flow, Steam turbines, compounding, reheat factor, Gas turbine cycles, Joule-Brayton cycle, regeneration, inter-cooling and reheating, Reciprocating Compressors and Rotary compressors, Refrigeration, vapour compression and vapour absorption refrigeration, Air conditioning, effective temperature, summer and winter air conditioning system, cooling load and simple air conditioning calculations

References:

1. Maleev, M.L., Internal Combustion Engines, McGraw Hill
2. Kearton, W.J., Steam Turbines Theory and Practice, ELBS
3. Cohen and Rogers, Gas Turbine Theory

PE316L: Production Engineering Laboratory II

0-0-3-0-1

Study and practice of metal cutting operation by shaper, milling machine, slotting machine, drilling machine, grinding machine

Introduction: Limits and Fits, Horizontal and Vertical milling machine – Spindle drives and feed motion - Milling cutters – indexing head – Simple, compound and differential indexing, shaping machine - cutting motion, slotting machine, Grinding machine – Surface, cylindrical and centreless grinding – Tool and cutter grinder, unconventional machining, NC/CNC machine.

ME312L: Thermal Engineering Laboratory

0-0-3-0-1

Study of IC Engines, Automotive Parts, Experimentation for the determination of the Performance of petrol engines, diesel engines and compressors, Flash point, fire point, calorific value and viscosity of oils, analysis of exhaust gas, Measurement of thermal conductivity of materials, Performance of heat exchangers.

Electives :

ME322T: Unconventional Energy Systems

3-0-0-0-3

Energy outlook, Solar Energy Systems, Biomass Utilization, Wind Energy calculations and Usage, Mini and Micro-Hydel plants, Scope and Economics of Unconventional Energy Systems, Introduction to Integrated Energy Systems.

References:

1. S. P. Sukhatme, Solar Energy-Principles of Thermal Collection and Storage, Tata McGraw Hill, 1996
2. A.N. Mathur and N.S. Rathore, Bio-gas Production, Management and Utilisation, Himansu Publications, 1992
3. L.L. Ferris, Wind Energy Conversion Systems, Prentice hall 1990

ME324T: Introduction to Finite Element Methods

3-0-0-0-3

Linear Vector Spaces, Variational Methods of approximation – FEM analysis of one-dimensional and two-dimensional problems. Applications to heat transfer, Elasticity and fluid mechanics problems. FEM analysis of Eigen value and non-linear problems.

Text Book:

1. Reddy, J.N., An Introduction to the Finite Element Method, McGraw Hill International Edition

References:

1. Heubner, K.H., Finite Element Method for Engineers, John Wiley

ME326T: Marketing Concepts**3-0-0-0-3**

Marketing defined – scope and concepts – analysing opportunities and market planning – consumer and business markets – segmentation – product life cycle – advertising – sales promotion-marketing communication – changing practices.

Text Book:

1. Kotler, P., Marketing Management, McMillan India Ltd., New Delhi

ME327T: Management Information Systems**3-0-0-0-3**

Concept of data and information - economies of information – building blocks of information systems – General system design – System analysis – charting tools – coding considerations – Forms design – File storage consideration – Sorting and searching techniques – verification, audit – Security features.

References:

1. Burch and Gruditski, Information systems-Theory and Practice, John Wiley and Sons, New York 1989
2. O'Brien, J.A., Management Information Systems, Tata McGraw Hill, 1999.

ME328T: Experimental Stress Analysis**3-0-0-0-3**

Basic equations and formulation of problems in elasticity – Strain measurement methods and related instrumentation – Basic optics – Theory of photo-elasticity – Brittle coating methods.

Text Book:

1. James W. Dally & William E. Riley – Experimental Stress Analysis; McGraw-Hill.

References:

1. Budynas: Advanced Strength and Applied Stress Analysis – McGraw Hill.
2. L. Sreenath, M. R. Raghavan, K. Lingaiah, G. Garghesha, B. Pant, K. Ramachandra: Experimental Stress analysis; Tata McGraw Hill
3. Timoshenko & Goodier: Theory of elasticity – McGraw Hill, New York.

ME423T: Automobile Engineering**3-0-0-0-3**

Constructional details of engines – various components – cooling systems – lubricating systems – fuel system – ignition system – transmission systems – braking systems – steering mechanism – chassis and suspension – starting mechanism – electrical equipments – trouble shooting – modern trends in automobiles – pollution and control.

References:

1. Heitner, J., Automotive Mechanics
2. Judge, Motor Manual, vol. 1, 2, 3 and 4.

SIXTH SEMESTER

ME312T: Dynamics of Machinery

3-0-0-0-3

Kinematics and Kinetics of rigid body – Euler equations of motion – Euler angles, Gyroscope - Introduction to Lagrangian dynamics – work and energy principle of virtual work – D’Alembert’s principle – generalised coordinates – Lagrange’s equation of motion – Introduction to calculus of variations – Hamilton’s principle – force analysis – balancing – introduction to vibration.

Text Book:

1. Shames, I.H., Engineering Mechanics, Prentice Hall India
2. Meirovich, L., Elements of Vibration Analysis, McGraw Hill.
3. Holowenko, Dynamics of Machinery, McGraw Hill.

PE352T: Industrial Engineering

3-0-0-0-3

Productivity, Method study, Process and Operation analysis, Motion analysis, Principles of motion economy, Introduction to Ergonomics, Time study, Standard time determination, Incentive plans, Work sampling, Pre-determined Motion Time Systems, Job analysis, Job evaluation, Merit rating, Principles of costing, Methods of costing, Depreciation and replacement analysis.

Text Book:

1. L.O, Introduction to Work Study.
2. Barnes, R.M.: Motion and Time Study: Design and Measurement of Work, John Wiley & Sons
3. Khan and Jain, Costin and Management Accounting
4. P. Chandra, Financial Management

PE351T: Operations Research

3-0-0-0-3

Methodology of operations research, Linear programming, model formulation Graphical solution, Theory of simplex method, Two-phase method, Charne’s Method, Duality Primal-dual relationships, Formulation and solution of transportation problem and assignment problem, Games theory, Two-person zero-sum games, Graphical method and linear programming method, Dynamic programming problems with a finite number of consecutive decisions, Queuing theory, Steady state solution of single server model (Poisson input and exponential service times).

Text Book:

1. Hadley, G., Linear Programming, Addison Wesley/Narosa Publishing House, 1987.
2. Taha, H. A., Operations Research-an Introduction, Prentice Hall India, New Delhi, 1997.

PE354T: Machine Tools

3-0-0-0-3

Metal cutting machine tools: Basic concepts – Tool – work motion – cutting variables. Machining Time – Drive mechanisms – Layout of speeds – Ray diagram for machine Tool gear boxes – stepped and stepless speed drive. Machine tool dynamics – Chatter. Design of modern CNC machines and mechatronic elements – Positioning accuracy and repeatability of CNC Machine tools – Acceptance testing of machine tools – Industrial design, aesthetics and ergonomics.

Metal forming machine tools, Machines for rolling, forging, extrusion and drawing operations, allowances and tolerances for forming operations, High energy rate forming processes, Design considerations for Machine tools. Non traditional machining processes:

Principles, process characteristics and application of ECM, EDM, AJM, USM, EBM & LBM - Capability analysis.

References:

1. Yusuf Altintas, Manufacturing Automation, Cambridge University Press, 2000.
2. George Tlusty, Manufacturing Process and Equipment, Prentice Hall, 1999.
3. Sen & Bhattacharya, Principles of Machine Tools, Central Book Agency, Calcutta
4. Koenigsberger, Design principles of metal cutting machine tools
5. Manfred Weck, Handbook of machine tools, Vol. 1 – 4, John Wiley & Sons
6. Acherkan, Principles of Machine Tools, Vol. 1, 2, 3 & 4, MIR Publishers.
7. HMT Limited; Mechatronics: Tata McGraw Hill Publishing Company Limited, 1998.

ME355T: Design of Machine Elements

3-1-0-0-4

Steps in design process, design factors, standardization, selection of materials, strength of machine elements, design for different types of stresses, Design of threaded fasteners, welded joints, springs, clutches and brakes, belt and chain drives, shafts for power transmission, keys, gears and geared joints, journal bearings and roller bearings.

Text Book:

Shigley, J.E., Mechanical Engineering Design, McGraw Hill Book Co.

PE361L: CAD/CAM Laboratory

0-0-3-0-1

Exercises on Solid Modeling: using commercial packages like IDEAS, Pro Engineer

Exercises on Finite Element Analysis: Introduction to FEM- 1D, 2D and 3D elements- Exercises on Heat Conduction, fluid flow and Elasticity may be given using commercial FEM packages like ANSYS, NASTRAN.

Assembly and Mechanism Design: Assembling of various parts and Tolerance analysis Synthesis and Design of Mechanisms-Animations Exercises on various mechanisms like four bar linkages and its variations, cam and follower, Two and Four Stroke engines. Design for manufacturability-use of commercial software packages.

Computer Aided Manufacturing: Process Control using PLC-PID control strategy Part Programming fundamentals- Manual Part Programming and Computer Aided Part Programming. Exercises on CNC Lathe and Machining Center/Milling Machines,

Programming of Industrial Robots: Computer Aided Inspection and Quality Control, Demonstration of the capability of Coordinate Measuring Machine using a sample component e.g.: Engine Block – Concepts of Reverse Engineering and Rapid Prototyping Technology.

Electives :

ME371T: Fluid Power Control

3-0-0-0-3

Introduction to oil hydraulics and pneumatics, ISO Symbols and standards, ideal pump and motor analysis. Practical pump and motor analysis. Performance curves and parameters. Direction, pressure and flow control valves, flow forces and lateral forces on spool valves, Flapper valve Analysis and Design, Electro hydraulic servo valves, Bypass Regulated and Stroke Regulated Hydraulic Power Supplies, Direction, flow and pressure control valves in pneumatic systems, Examples of typical circuits using Displacement – Time and Travel-Step diagrams. Will-dependent control, Travel-dependent control and Time-dependent control, Combined Control, Program Control, Sequence Control, Electro-pneumatic control and air-hydraulic control.

References:

1. Blackburn et.al., Fluid Power Control, Technology Press of M.I.T and Wiley, New York, 1960.
A. Esposito, Fluid Power with Applications, Pearson Education, 2000.
2. Lewis and Stern, Design of Hydraulic Control Systems, McGraw Hill, New York 1962.
3. Ernst, W., Oil Hydraulic Power and its Industrial Applications, McGraw Hill, New York, 1960.

ME375T: Human Factors in Engineering and Design**3-0-0-0-3**

Nature of man-machine systems and characteristics; Information input and processing – Sources and pathways of stimuli - Human information processing; Visual displays – Quantitative and qualitative displays, General guidelines in design of visual displays; Auditory and tactual displays; Speech communication; Bases of human motor activity, Human control of systems, Compatibility, Influence of display factors and control factors on system control – Anthropometry.

Text Book:

1. Sanders, M.S., and McCormick, E.J., Human Factors in Engineering and design, Tata McGraw Hill, 1976.

References:

1. Murrell K.F.H. and Schnauber, H.:Ergonomics. Econ, Munich, 1986.
2. Gavriel Salvendy: Handbook of Human Factors & Ergonomics, Inter-science, 1997.

ME376T: Technology Management**3-0-0-0-3**

Introduction to technology management – concepts – technological changes – approaches – technology cycle – technology acquisition – technology transfer, absorption, diffusion intellectual property rights.

Text Book:

Hawthorne E.P., The Management of Technology, McGraw Hill, 2000.

ME377T: Theory of Metal Forming**3-0-0-0-3**

Review of the theory of stress and strain - yield criteria - stress space representation - plasticity - true stress strain curves - empirical relations for work hardening materials - behavior of anisotropic materials - plastic stress strain relations - the elastic-plastic problem of bending - torsion - and other simple problems - theory of metal forming operations like drawing extrusion - rolling and forging - slip line field theory - bound theorems.

References:

1. Hoffman and Sachs, Introduction to the Theory of Plasticity for Engineers, McGraw Hill Book Co, New York,1987.
2. Chakravarty J., Theory of Plasticity, van Nostrand Reinhold Co., London, 1975.

ME433T: Consumer Behavior**3-0-0-0-3**

Consumer – diversity in market place – market segmentation – ethics in marketing – consumer as individuals – consumer as decision makers – consumers in the social and cultural settings.

Text Book:

Schiffman and Kanuk, Consumer Behavior, Seventh Edition, Pearson Education, 2000.

SEVENTH SEMESTER

PE401T: Mechatronics

3-0-0-0-3

Introduction to Mechatronics; Sensors and Transducers; Signal Conditioning; Pneumatic and Hydraulic Systems; Mechanical and Electrical Systems, System modeling, Mathematical Models; Mechanical, Electrical, Fluid and Thermal System building blocks, System models, Dynamic response of systems- First and second order systems; Modeling dynamic systems; System Transfer functions; Frequency response; stability, Closed Loop controllers- continuous and discrete processes, Proportional, Derivative and Integral controls; PID controller, Digital controllers, Controller tuning, adaptive control, Microcontrollers and Micro Processors- Digital Logic circuits, Microcontroller architecture and programming, Programmable Logic Controllers.

References:

1. Bolton, W., Mechatronics, Electronic Control Systems in Mechanical and Electrical Engineering, Addison Wesley Longman Ltd.
2. Dorf, R.C., and Bishop, R.H., Modern Control Systems, Addison Wesley

PE402T: Theory of Metal Cutting

3-0-0-0-3

Kinematic elements in metal cutting – Tool in hand nomenclature – Mechanics of chip formation – orthogonal and oblique cutting – shear angle – velocity relationship. Merchant's analysis of cutting forces – cutting power estimation. Tool Dynamometers: Turning, Milling, Drilling and Grinding Dynamometers. Thermal aspects of machining: Failure of cutting tools: Tool wear - Flank and crater wear - mechanisms of wear Taylor's tool life equation – Tool life testing – Economics of machining: Selection of optimal machining conditions and productivity - Machinability: Criteria and factors affecting machinability – Advances in cutting tool materials – Abrasive machining processes – mechanics of grinding – power requirements – Mechanics of wheel wear – Creep feed grinding – Thermal aspects of grinding process – Surface integrity – Methods of improving surface integrity.

References:

1. Trent E.M and P.K. Wright, Metal Cutting, 4th Edn., Butterworth-Heinemann, 2000.
2. David A. Stephansons, Metal Cutting Theory and Practice, Marcel Dekker, 1996.
3. Ghosh, A., and Mallik, A.K., Manufacturing Science, Affiliated East West Press.
4. Shaw, M.C., Metal Cutting Principles, Oxford University Press, 2nd Edn., 2004.
5. Kronenberg: Machining Science and Applications

PE441L: Management Science Laboratory

0-0-3-0-1

Statistical Process Control 1, Statistical Process Control 2, Facility Layout Planning 1, Facility Layout Planning 2, Construction of Process Flow Charts, Learning Curve, Determination of Standard Time, Performance Rating Analysis, Determination of Production System Parameter Through Simulation, Simulation of Single Server Queuing System, Simulation of Inventory system, Monte Carlo Simulation, Design of manufacturing cell, Mathematical Model formulation and solution of decision problems in operations management using softwares.

PE416L: Metal Cutting Laboratory

1-0-0-0-1

NC and CNC machines, Measurement of cutting force in various machine tools; study of the variation of cutting force with parameters like cutting velocity, feed, depth & tool

geometry, study of influence of cutting fluids on machining, study of tool and cutter grinder, surface integrity studies on parts machined in traditional machine tools

Electives :

ME421T: Mechanical Behavior and Testing of Materials 3-0-0-0-3

Crystal imperfection – Plastic deformation by slip and twinning – Shear strength of materials – Dislocation theory – Yield point phenomena – Strain hardening – Annealing of cold worked metal – Theory of brittle fracture – Ductile fracture, fatigue – Crup – Fracture at elevated temperatures – The tension test – Instability – Measurement of ductility – Effect of strain rate – Hardness tests – Flow of metal –Torsion test – Torsion stress for large plastic strains – Torsion failure.

Text Book:

Dieter, G.M; Mechanical Metallurgy, McGraw Hill Inc; 2001

References:

1. Hertzberg R.W., Deformation and fraction Mechanics, John Wiley and Sons.
2. Mc Clinock and Ali Argon S, Mechanical behavior of materials.
3. Reed Hill and Robert E, Physical Metallurgy Principles, East West Press.

ME422T: Computational Methods in Fluid Flow and Heat Transfer 3-0-0-0-3

Classifications of Partial Differential Equations (PDE) Discretization methods of Partial Differential Equations and Physical domain. Finite Difference formulations of Partial differential equations and boundary conditions. Grid generation methods – Adaptive grids. Marching techniques – Explicit-implicit – crank-Nicholson – ADI – ADE Methods. Consistency, stability and convergence for marching problems – stability analysis. Finite difference schemes used for model equations: Heat equation, Laplace’s equation, First order wave equation and Berger’s equation. Finite volume methods for diffusion and convection – diffusion problems. Calculation of the flow field using stream function – vorticity approach, staggered grid. Pressure – velocity coupling – SIMPLE, SIMPLER, QUICK algorithms.

References:

1. Anderson, Tannehill and Fletcher, Computational Fluid Mechanics and Heat Transfer, Hemisphere Publishing, 1984
2. Muraleedhar, K., and Sunderarajan, T., Computational Fluid Flow and Heat transfer, Narosa Publishers, 2003.

ME424T: Industrial Tribology 3-0-0-0-3

Navier-Stroke’s equation; Reynolds equations; Idealized hydrodynamic bearings; finite bearings; Hydrodynamic instability; Externally pressurized and gas lubricated bearings; surface topography; theories of friction; Wear of materials; Measurement of friction and wear.

References:

1. Majumdar, B.C., Introduction to Tribology, A.H. Wheeler, Bangalore
2. Pinkus and Sternlincht, Theory of Hydrodynamic Lubrication, John Wiley and Sons, New York.
3. Moore, D.F., Principle and Application of Tribology, Pergamon Press.

ME425T: Supply Chain Management 3-0-0-0-3

Evolution of Supply Chain Management (SCM) from logistics management - Decision phases in a supply chain - Achieving strategic fit - Supply chain drivers and obstacles -

Information technology and SCM - Enterprise resource planning systems and SCM - Role of purchasing in SCM - Sources of supply - Outsourcing and Make or Buy decisions - General procurement procedures - Managing inventories in a supply chain - Inventory models with constraints - Managing uncertainty in a supply chain using safety inventory - Determining appropriate level of safety inventory - Transportation in a supply chain - Design options for a transportation network - Routing and scheduling in transportation - Facility decisions - Models for facility location and capacity allocation.

Text Book:

1. Chopra, S., and Meindl, P., Supply Chain Management, Pearson Education 2001.
2. Doebler, D.W. and Burt, D.N., Purchasing and Supply Management: Text and Cases, Tata McGraw Hill New Delhi, 1996.
3. Tersine, R.J., Principles of Inventory and Materials Management, Prentice Hall Inc., New Jersey, 1994.

ME426T: Cost Analysis and Control

3-0-0-0-3

Cost analysis – need – classification – elements of cost overheads – depreciation – cvp analysis – costing systems – absorption costing, variable costing – standard costing and variance analysis.

Text Book:

1. Khan, M.Y and Jain,P.K., Management Accounting, third edition, Tata McGraw Hill, 2002.
2. D. Williamson, Cost and Management Accounting, Prentice Hall of India, 1999.

ME427T: Aerodynamics

3-0-0-0-3

Potential theory, conformal transformation, Blassius theorem, Kutta theorem, Jowkowski transformation, Aerofoil, thin aerofoil theory, finite wing theory.

References:

1. Kuethe and Chow, Foundations of Aerodynamics, John Wiley and Sons, 1976
2. Anderson (Jr.),J.D., Fundamentals of Aerodynamics, McGraw Hill,

ME430T: Computer Graphics

3-0-0-0-3

Aim: To Give an introduction and an overall idea about computer graphics.

Procedural elements of computer graphics- overview of graphics devices, Line and circle drawing algorithms, hidden line removal algorithms, etc. Mathematical elements of Computer Graphics – Viewing transformations, Mathematical modeling of curves and surfaces.

References:

1. Rogers, D.F. and Adams, J.H., Mathematical Elements of Computer Graphics, McGraw Hill International edition, 1990.
2. Rogers, D.F., Procedural Elements for Computer Graphics, McGraw Hill International Edition, 1995.

ME432T: Organizational Behavior

3-0-0-0-3

Organisation behavior – development – individual behavior values – attitudes – emotions – perceptions – abilities group process – team – communications – conflict – work design and technology – organization culture – change – stress management.

Text Book:

Robbins, Organizational Behavior, Ninth Edition, Pearson Education 2002.

References:

1. Greenberg and Baron, "Behavior in Organizations", 7/e, Pearson Education, (2002).
2. Machane and Vonglinow, "Organizational Behavior", 2/e, TMH, (2003).
3. Hersey, Balaschard and Johnson, " Management of organizational Behavior", 8/e, Pearson Education, (2002).

PE434T: Product Design for Manufacturability**3-0-0-0-3**

DFMA concepts, Why DFMA? Concurrent engineering -Product/process design, Design-manufacturing integration, Product life-cycle analysis, Product life-cycle design and manufacture, Sustainable products, Product sustainability- Definition, Measurement, Quantification. Integrated product sustainability rating (PSI), Product specification, standardization and tolerance analysis, Functional requirements and datum features Materials selection, Selection of manufacturing processes-Manufacturability, Break-even analysis, Process planning considerations in design for manufacturing-Basics of group technology, Design methodologies, Design for machining, Machinability and machining performance evaluation, Basic elements of machining system Cutting tool selection, Jigs and fixtures , Machining optimization , Product design for assembly, Methodology, Assembly efficiency, Classification systems, Robotic assembly -Selected case studies. Design for sheet metalworking, Design for injection molding, Design for die-casting, Design for hot forging.

References:

1. Chitale, A.K. and Gupta, R.C., Product Design and Manufacturing, Prentice hall India Ltd.
2. Dieter, D.E., Engineering Design: a Material and Processing Approach, McGraw Hill International.
3. R. Bakerjian, (Editor), Design for Manufacturability, 1992, Tool and Manufacturing Engineers Hand Book, Society of Manufacturing Engineers, Michigan.

PE435T: Quality Planning and Analysis**3-0-0-0-3**

Quality management, Quality control, Quality assurance, ISO9000, TQM, Comparison with ISO9000, Statistical process control, Principles of control charts, Control charts for variables and attributes, Process capability analysis, Introduction to six sigma concept, Quality improvement, Principles and methodologies, Reliability and acceptance sampling, Acceptance sampling for variables.

Text Book:

Juran & Gryna, Quality Planning and Analysis, Tata McGraw Hill

References:

1. Besterfield, D.H. et.al. Total Quality Management, Pearson Education, 2003.
2. Montgomery, D.C., Introduction to Statistical Quality Control, John Wile and Sons Inc., New Delhi, 2001.
3. Grant, E.L. and Leavenworth, R.L., Statistical Quality Control, McGraw Hill
4. Wadsworth, H.M., Stephens, K.S., and Godfrey, B.A., Modern Methods for Quality Control and Improvement, Second Edition, John Wiley and Sons, New Delhi, 2002.

PE436T: Advanced Materials Processing**3-0-0-0-3**

Processing of Advanced ceramics, Biomaterials, Composites (PMC, CMC, MMC), Electronic and magnetic materials, Laser processing, Light alloys manufacture (Mg, Al, Ti), Mechanical alloying and innovative milling processes, Micro forming, Nano-

structured materials, Powders and particles, Rapid prototyping, Semi-solid forming, Severe plastic deformation processing, Sheet metal forming, Smart materials, Strip casting, Super hard coatings and surface engineering, Thin film processing.

References:

1. R. Gregg Bruce, Modern Materials and Manufacturing Processes, Prentice Hall, 3rd Edn., 2003.
2. Donald R Uhlmann and Ulrich, Ultrastructure Processing of Advanced Materials, Wiley-Interscience, 1992.
3. Yoshio Waseda et al, Morphology Control of Materials and Nanoparticles – Advanced Materials Processing and Characterisation, Springer Verlag, 2004.
4. J. Binner & Jon G.P. Binner, Advanced Ceramic Processing and Technology, Noyes Publications, 1990.
5. Steen & Watkins, Laser Materials Processing, Springer Verlag, 3rd Edn., 2003.

EIGHTH SEMESTER

PE451T: Operations Management

3-1-0-0-3

Operation Strategy and competitiveness - Project Management – Organisational structure – Network construction – CPM and PERT networks – Product design and process selection – Value analysis – Break-even analysis – Strategic capacity planning – Procurement of capital equipment – Alternative evaluation method - Inventory control – Selective Inventory control – Independent demand systems: Deterministic models – Introduction to independent demand systems: probabilistic models-Manufacturing Planning and Controls (MPC) – Material Requirement planning (MRP) – Technical issues – Production activity control – Forecasting methods – Facility Design – Flow, space and activity relationship.

Text Book:

1. Chase, Aquilano and Jacobs, Production and Operations Management, Eighth Edition, Tata McGraw Hill.
2. Richard J. Tersine, Principles of Inventory and Materials Management, Fourth edition, Prentice Hall International.
3. Vollmann, Berry and Whybark, Manufacturing Planning and Control Systems, Fourth Edition, Irwin McGraw Hill.
4. Tomkins, White, Bozer, Frazelle, Tanchoco and Trevino, Facility Planning, Second Edition, John Wiley & Sons.
5. Francis R. L., McGinnis, L.F.Jr & White J.A., Facility Layout and Location: An Analytical Approach, Prentice-Hall India.

PE452T: Tool Engineering and Design

3-1-0-0-3

Design of chips forming tools – milling, drilling, boring, grinding tools – vibration damping of boring bars – press working tools – Punch and Die size and press tonnage calculations – Black development – die design for simple components – Fixture design – principles of location and clamping – Design of fixtures for milling of simple components – Design of jigs for drilling and reaming – Indexing jigs.

References:

1. Bhattacharya, A., Metal Cutting Theory and Practice, Central Book Publishers.
2. ASTME, fundamentals of Tool Design, Prentice Hall.
3. Wilson, F.W., Hand Book of Fixture Design, McGraw Hill.

SH301T: Industrial Economics**3-0-0-0-3**

Industrial efficiency: Concepts and Measurement, efficiency conditions in the theory of production, efficiency and decision making process. The organizational form and Alternative motives of the firm, Types of organizational form, Demand Analysis The elasticity concept, Demand forecasting, The cost theory and optimum size of the firm, the theory of cost and production, the efficiency and size of the firm Market Structure Some concepts – standard forms of Market structure – The concept of workable competition. Market structure and Innovation, Diffusion of New Technology, Finance and Accounting sources of finance in Indian situation, an evaluation of Indian Industrial policy, Labour productivity and its measurement

References:

1. Barthwal, R.R., Industrial Economics, John Wiley
2. Stewart, W., Industrial Economics and Applied approach, Mc Millan.
3. Clark, R., Industrial Economics, Blackwell Oxford.

Electives :**ME471T: Powder Metallurgy****3-0-0-0-3**

Powder Metallurgy Process, Secondary operations, Powder production techniques; Powder properties and their characteristics, Particle size distribution, Types of distribution function, sieve analysis, Microscopy, Sedimentation analysis; Specific surface and other technological properties; Powder conditioning; compaction, Pressing equipments and tooling; Powder Injection Moulding, extrusion and rolling, Hot compaction, Hot Iso-static Pressing (HIP), equipments, tooling and applications; Explosive compaction; slip casting: sintering, single component, Sintering diagrams and sintering anomalies, Multi-component sintering-solid phase and liquid phase, infiltration and reaction sintering; Sintering atmospheres and equipments; Production routes in practice; Products of PM.

Text Book:

F Thummler and R Oberacker, An introduction to Powder Metallurgy, The Institute of Materials, The University Press, Cambridge Great Britain. ISBN 0-901716-26-X.

References:

ASM Handbook: Powder Metal Technologies and Applications (ASM Handbook, Vol. 7) by ASM.

ME472T: Refrigeration and Air Conditioning**3-0-0-0-3**

Principles of refrigeration – vapour compression refrigeration system – components – air refrigeration – absorption refrigeration – psychrometry – psychrometric processes – air conditioning systems-human comfort-cooling load calculations-duct design-air distribution systems-heating systems-heat pump-air conditioning equipments and control systems.

Text Book:

1. Stoeckor, Refrigeration and Air Conditioning, Tata McGraw Hill
2. Norman Harris, Modern Air Conditioning Practice, McGraw Hill

References:

1. Dossar, Refrigeration and Air conditioning
2. Jordan and Priester, Refrigeration and Air conditioning, Prentice Hall
3. Arora, Refrigeration and Air Conditioning, Tata McGraw Hill

ME474T: Manufacturing Planning and Control**3-0-0-0-3**

Evolution of manufacturing planning and control system – Continuous improvement – Just-in-time principles – Forecasting – Time series analysis – error measurement – Aggregate planning – Quantitative methods – Master production scheduling (MPS) – MPS technique – Final assembly schedule – Material requirement planning (MRP) – Lot sizing – Buffering concept – Pull production systems – Mixed model production schedule – Shop-floor control – Capacity planning and control techniques – Concepts in scheduling.

Text Book:

1. Vollmann, Berry and Whybark, Manufacturing Planning and Control Systems, fourth Edition, Irwin McGraw Hill.
2. John M. Nicholas, Competitive Manufacturing Management: Continuous Improvement, Lean production and Customer – Focussed Quality, Tata McGraw Hill publishing Company Limited.

References:

1. Narasimhan, S. I., McLeavy, D. W., and Billington, P. J., Production planning and Inventory Control, Second Edition, 2000, Prentice-Hall of India.
2. Tersine, R. J., Production and Operations Management: Concepts, Structure, and Analysis, Second Edition, 1985, North-Holland.
3. Monks, J. G., Operations Management: Theory and Problems, Third Edition, 1987, McGraw Hill, International Edition.
4. Panneerselvam, R., Production and Operations Management, 2001, Prentice-Hall of India, New Delhi.

ME475T: Accounting and Finance for Engineers**3-0-0-0-3**

Finance – scope – objectives – time value of money – financial accounting – financial statement analysis – sources of finance – working capital – financial planning – capital budgeting.

Text Book:

1. Khan M.Y. and Jain P.K., “Financial Management”, 3rd edition, Tata McGraw Hill (2003)
2. Jawahar lal, “Financial Accounting”, 2nd edition, Wheeler publishing (2000).

References:

1. I.M. Pandey, “Financial Management”, 8th edition, Vikas publishing house (2003).
2. Prasanna Chandra, “Financial Management”, 4th edition, Tata McGraw Hill (2003).

ME478T: Robotics**3-0-0-0-3**

Aim : to give an insight into various topics in robotics

Workspace analysis, direct and inverse kinematics - jacobian and static force analysis - Trajectory generation – Sensors - vision and intelligence.

References:

1. K S Fu R C Gonzales, C S G Lee: Robotics Control, Sensing, Vision and intelligence, McGraw Hill 1987.
2. John J Craig, Introduction to Robotics, Mechanics and control, second edition Addison – Wesley, 1999.
3. Mark W Spong & M Vidyasagar, Robot Dynamics and Control, John Wiley & Sons, 1989.
4. R P Paul: Robot Manipulators Mathematics Programming, Control, The computer control of robotic manipulators, The MIT Press 1979.
5. Robert J Schilling: Fundamentals of Robotics, Analysis and Control. Prentice Hall of India 1996.

6. Gonzalez/Woods, Digital Image Processing, Addison Wesley, 1993.

ME479T: Discrete Events System Simulation

3-0-0-0-3

Introduction to system concept, modelling and simulation - Monte carlo simulation - Examples of single server queueing systems and inventory systems - Concepts in discrete event system simulation - Event scheduling/time advance algorithm - Random number generation - Random variate generation - Input modelling for simulation - Verification and validation of simulation models - Output analysis for a single model - Simulation modelling and analysis of manufacturing systems – Introduction to simulation software for manufacturing applications.

Text Book:

Banks J., Carson J.S. and Nelson B.L., Discrete-Event System Simulation, Second Edition, Prentice Hall of India Private Limited, 1996.

References:

1. Deo, N., System Simulation with Digital Computer, Prentice Hall of India Private Limited, 1996.
2. Gordon, G., System Simulation, Prentice Hall of India Private Limited, 1996.
3. Kelton, W.D., Sadowski, R.P and Sadowski, D.A., Simulation with ARENA, WCB/McGraw-Hill International Edition, 2000.
4. Law A.W. and Kelton W.D., Simulation Modeling and Analysis, Third Edition, McGraw-Hill International Edition, 2000.

ME481T: Human Resource Management

3-0-0-0-3

Personnel functions – Job analysis – Evaluation – Salary, wages and incentives administration, Dimensions of Human behaviour – measurement – Theories of motion – Group behaviour – labour laws – Industrial conflict resolution, work organization – Process of organizational change.

References:

1. Fred Luthans, “Organizational Behaviour”, McGraw Hill International Student Edition.
2. Dwivedi, R.S., “Manpower Management – An Integrated Approach to Personnel Management and Labour Relations”, PHI, 1984.
3. Yoder D., and Staodohar P. D., “Personnel Management and Industrial Relations”, PHI 1986.
4. Monappa A., and Saiyadain M. S., “Personnel Management”, TMH, 1988.
5. Kapoor N. D., “Introduction to Commercial and Industrial Law”, Sultan Chand & Sons, New Delhi, 1986.

ME482T: Design of Mechanical Systems

3-0-0-0-3

Product design process – Human factor in design – Optimization technique in design – Design of a wind generator – Design of automobile engine – Design of power transmission system – Design of automobile gear box and machine tool gear box – Design of power conversion systems – Design of motor vehicle – Design of materials handling systems.

References:

1. Dixen F.R., Design Engineering, Tata McGraw Hill
2. S.P. Patil, Mechanical System Design, Jaico student Edition.
3. Kolchin A., Design of Automotive Engines, Mir Publication.
4. Gillespie, Fundamentals of Vehicle Dynamics SAE.