3rd Semester:

UPE03XXX: Engineering Thermodynamics.

Introduction, Survey of units and dimensions, Zeroth Law, forms of energy and energy interaction, heat and work, phase rule, ideal and real gases, equations of state, First law of thermodynamics for closed loop system, internal energy and enthalpy, first law for control volumes, steady flow and unsteady flow applications.

Second law of thermodynamics, statements and corollaries, entropy, concept, of reversibility and irreversibility. Second law analysis for control volumes, concept of entropy generation, reversible work, Availability and Irreversibility. Tds relations, Maxwell equations, clapeyron equation, clausiusclapeyron equation, Joule Thompson coefficient, compressibility and expansion coefficient. Air standard Engine cycle – Otto, Diesel, Dual combustion, Brayton and stirling cycles. Steam power cycle – Rankine cycle, P-V & T-S plots, Rankine efficiency. Vapour compression Refrigeration cycle. Third law of thermodynamics.

Text Books:

1. Nag. P.K, "Engineering Thermodynamics", Tata McGraw Hills Co.Ltd.

References:

1. Mayhew, A and Rogers, B, "Engineering Thermodynamics", Longman Green & Co. Ltd, London, E.L.B.S. Edition,1990.
2. Van Wylen, G.J. and Sonntag, R.E., "Fundamentals of classical Thermodynamics (S.J. Version)", Second Edition,1986.
3. Bacon, D.H., "Thermodynamics", Butter worth & Co., London,1989.
4. Saad, M.A, "Thermodynamics for Engineers", Prentice-Hall of India Pvt. Ltd.1989.
5. Reynolds, "Thermodynamics", Int. student Edn., McGraw Hill book co. Ltd.,1990.
6. Wark Kenneth,"Thermodynamics".
7. Onkarsingh, "Applied Thermodynamics", New Age InternationalPublishers.
8. Arora C.P., "Refrigeration and Air conditioning", Tata McGeawHill.

UPE03B02: Solid Mechanics

1. **Introduction:** Internal forces – stresses and strains Elasticity – Hooke's law – Poisson's ratio – Elastic constants and their relationship – stress-strain diagram for ductile materials- Definition of Creep, fatigue and stress relaxation-statically determinate and indeterminateproblems.
2. **Bending of Beams:** Beams- Loads-shear force and bending moment diagrams for simply supported and cantilever beams-Pure bending- Bending stresses in straight beams-shear stresses in bending of rectangular and I-section beams – Beams of uniformstrength.
3. **Torsion and Columns:** Torsion of circular shafts stresses and twist in solid and hollow shafts – Definition of columns – Types of columns – Equivalent length – slenderness ratio – Rankin's formula.
4. **Biaxial Stresses:** Analysis of biaxial stresses – Mohr's circle – Principle stresses and maximum shear stress – Deductions from Mohr's circle – stresses in thin walled pressure vessels – combined bending andtorsion.
5. **Deflection of Beams:** Differential equation of the elastic axis – Double integration and area moment methods – strain energy in tension, compression, shear, bending and torsion- Castigliano'stheorems.

References

1. Timoshenko; S and Young D.H., " Elements of strength of materials,", Vol. I and Vol. II, T. van Nostrand Co., Inc., Princeton, N.J.,1988.
2. Malhotra, D.R. and Gupta, H.C, "The strength of Materials", Satya Prakasan Tech. India Publications, New Delhi,1987.
3. Kazimi S.M.A., " Solid Mechanics", Tata McGraw Hill,1976.
4. Dym. C.L. and shames I.H., "Solid Mechanics", McGraw Hill Kogakusha, Tokyo, 1973.
5. Khurmi R.S., "Strength of materials", S.C. Chand and Co.,1998.

UPE03XXX: Fluid Mechanics

Introduction: Definition of fluid, Concept of Continuum, Fluid Properties Fluid Static's: Body and surface forces, stress at a point, state of stress in fluid at rest and in motion, pressure distribution in hydrostatics, manometers, forces on plane and curved surfaces, Buoyancy and the concept of stability of floating and submergedbodies.

Fluids Kinematics: Scaler and vector fields, Eulerian and Lagrangian approaches, Material derivation, velocity and acceleration, streamline, streak line and path line, Deformation, rotation and velocity, Deformation rate and strain rate tensor, circulation.

Fluid Flow: System and control volume approaches, Transport theorems, Continuity equation, Euler's equation, Bernoulli's equation, Momentum equations for stationary, moving and rotating control volumes, Application of Bernoulli's equation, static and dynamic pressure.

Fluid measurements: Pitot tube, Siphon, Venturimeter, Orificemeter, Mouth piece, Sudden expansion in a pipe, weirs and notches.

Viscous Incompressible flow: Introduction to Navier stokes equation, Boundary layer flow, Drag and lift, Laminar and turbulent flow, Couette flow, Plane Poisuille and Hagen Poisuille flow.

Internal Viscous flow: Reynold's experiment, critical Reynold's number, Darcy-Weisbach and fanning friction factor, Moody's diagram, Minor losses and flow through simple network of pipes. Classification of Notches and Weirs; Discharge over a Rectangular Notches or Weir; Discharge over Triangular Notches or Weir; Advantages of Triangular Notches or Weirs over Rectangular Notches or Weirs; Discharge over a Trapezoidal Notches or Weir andproblems.

Principle of Similarity: Physical similarity, Dimensional Analysis, Buckingham pi theorem, Model studies and dimension less parameters, Froude number, Euler number, Mach number, Weber number.

Flow through Pipes: Loss of Energy in pipes, Loss of energy due to friction; Minor energy losses; Hydraulic gradient and total energy line and problems.

References

1. Shames, I.H., "Mechanics of fluids", Kogakusha, Tokyo,1998.
2. Ratha Krishna, E., "Introduction to fluid mechanics", Prentice-Hall, India,1987.
3. Yuan S.W., "Foundation of Fluid Mechanics", Prentice-Hall,1987.
4. Milne Thomson, L.M., "Theoretical Hydro-dynamics", McMillan,1985.
5. Kumar, K.l., "Fluid mechanics", Eurasia Publishing House,1990.
6. Introduction to Fluid Mechanics and Fluid machines by S.K. Som and G.Biswas.
7. Fluid Mechanics by Victor L. Streeter.
8. Fluid Mechanics by Frank M.White.
9. Introduction to Fluid Mechanics by James A.Fay.
10. Fluid Mechanics and Hydraulics by J.Lal.
11. Fluid Mechanics by A.K.Jain.

UPE03B04: Manufacturing Processes I

Types of Production and production processes, Product configuration and manufacturing requirements. Pattern making, allowances and core making.

Casting processes of ferrous and non-ferrous metals including die casting, investing casting, centrifugal casting, loan moulding, transfer moulding. Solidification Principles, design of moulds, risering, sprues and gating system, casting defects.

Metal joining processes: Soldering, brazing, fusion and non-fusion welding processes, various modern welding processes like TIG, MIG, Submerged Arc welding, friction welding. Weldingdefects.

Fundamentals of hot and cold working processes- Forging, extrusion and rolling.

1. Basic Joining Process

Types of welding –gas welding –are welding –shielded Metal arc welding, GTAW, GMAW, SAW, ESW-Résistance welding (sport, seam , projection , percussion , flash type) –Atomic hydrogen arc welding –thermit welding –shouldering , brazing and braze welding ,

2. Design of Weldments

Welding symbol – position of welding –joint and groove design –weld stress –calculation – design of weld size-estimation of weld dilution, heat input and preheat and post heat temperature – computer application in weld design .

3. Special weldingprocess

Electron Beam and Laser beam welding –plasma arc welding – stud welding- friction welding- explosive welding- ultra sonic welding h-under water welding -roll bonding – diffusion bonding – cold welding –welding of plastic, dissimilar metal.

Text:

1. Khanna O.P., " A Welding Technology", KhannaPublishers.

References

1. Parmer R.S., "Welding process and technology," khanna publisher s,1994.
2. Little, "welding technology," Tata McGrawHill,1992.
3.Lancaster J.F., "metallurgy of welding", George Allen and Unwin,1991.
4. Metals hand book, vol-6,8/e,ASM,1971.
5. AWS welding and book, Vol 1to4,AWS,

References

1. Manufacturing Technology: Foundry, Forming and Welding by P.N. Rao,TMH.
2. Principles of manufacturing Materials and processes, by James S. Campbell,TMH.
3. Welding Metallurgy by G.E. Linnert,AWS.
4. Production Engineering Sciences by P.C. Pandey and C.K. Singh, Standard Publishers Ltd.
5. Manufacturing Science by A. Ghosh and A.K. Mallick, WileyEastern.

UPE03B05: Electrical machines

D.C Generator and Motors: Principle, Construction and function of various parts, methods of excitation, armature reaction, characteristics of compound machines, motor torque equation, characteristics, starting and speed control application. Transformers: Principle, construction, emf equation, regulation andefficiency.
Induction Motor: Single phase I.M construction, principles of operation of different kinds of single phase I.M., construction, principle and speed control of 3- phase I.M.
Alternator: Principle and construction, excitation and voltage regulation. Synchronous motor: Principle, starting and speed control. Miscellaneous: Stepper Motor, Servo motor.

References

1. Electrical Machines by Nagrath I.J. and Kothari D.P.,TMH
2. Electrical Machines by Fitzgerald, Kingsley, Kusko, Dumas, MGH, 4thEdition.
3. Electrical Machinery and Transformers by J.L. Kosow, PHI, 4thEdition.
4. Advanced Electrical by Cotton H., Wheeler & Co.,1995.

UPE03P11: Solid Mechanics Laboratory

Tension Test: Stress-strain diagram, determination of yield strength, ultimate strength, modulus of elasticity, percentage elongation and percentage reduction in areas; Compression Test; Hardness Test; Brinel and Rockwell tests; Impact test: Charpy and Izod tests; Bending test: determination of bending stresses; Fatigue test.

UPE03P 12: Fluid Mechanics Laboratory

Fluid flow measurements: Coefficient of discharge for venturimeter, Orifice meter, nozzle meter, weirs. Flow through pipes: Determination of pipes friction in laminar and turbulent flow remedies, Pitot tube experiments on viscous flows and boundary layer theory.

UPE03XXX: Workshop Process

Pattern making, pattern material, pattern allowances and types of patterns.
Mould making practice: uses of moulding tools: green sand moulding, gating system, risering system, core making, study of cupola, basic Forging processes like upsetting, drawing down.
Gas welding, TIG, MIG, SAW

UPE03P14: Electrical Machines Laboratory

Constructional features of DC machines, open circuit and load test of DC shunt generators, speed control and characteristics of DC shunt motor, OC and SC test, load test, regulation and efficiency of transformers, study of different parts of a 3 phase induction motor, speed control and load test on 3 phase I.M. Alternator performance determination, single phase induction motor starting and speed control.

4th Semester

UPE04B06: Thermal Power Engineering

Water tube and Fire tube boilers, Circulating principles, Forced circulation, Critical Pressure, Super heaters, Reheaters, Attemperators, Induced draught, Forced draught and secondary air fans, Boiler Performance analysis and heat balance. Combustion systems, Environmental Protection-ESP, Cyclone Separator, Dust collector etc.

Rotary Thermodynamic Devices- Steam turbines and their classification-Impulse and Reaction type turbines, Thermodynamics of compressible fluid flow, equation and continuity-Isentropic flow through nozzle, velocity diagram. Blade efficiency, Optimum velocity ratio, multistaging, velocity and pressure compounding, losses in turbines, erosion of turbine blades, turbine governing, performance analysis of turbine, condensing system, I C Engines-classification.-Regeneration- Reheating- Reheating, Isentrophic efficiency. Combustion efficiency.

Introduction to Heat Transfer, Models of heat transfer, steady and un steady state heat Transfer, Fourier Law of Conduction, conduction of Heat through slab, Hollow Cylinder and sphere, convection and heat transfer co-efficient, Natural and Forced convection, Introduction to Radiation, concept of Black body, Monochromatic and Total emissive power, concept of gray body, Kirchhoff's law of radiation, Heat transfer by radiation, Heat exchangers, overall heat Transfer coefficient.

References:-

1. Domkundwar, Kothandarman, Domkundwar, "A course in Thermal Engineering"(SI Units),Dhanpat Rai&co.
2. V.P. Vasandani, D.S. Kumar,"Treastise on heat Engineering", Metropolitan Book co.Pvt.Ltd.
3. J. Selwinrajadurai,"Thermodynamics and Thermal engineering", New Age International Publishers.
4. P.L. Ballaney,"Thermal Engineering" (in S I units) Khanna PublishersDelhi.
5. Shyam K.Agarwal, "International combustion Engines" New age International Publishers.
6. V.Ganeshan, " Internal combustion engines ",3rded; Tata Mc GrawHill.
7. V.L. Maleev, "Internal combustion Engines", International Studentedition.
8. Sharma &Mathur
9. R.Yadav, "Steam and Gas Turbines "(S.I. Units), Central Publishing House,Allahabad.
10. Gas TurbineV.Ganeshan
11. M. NecatiOzisik, "Heat Transfer –A Basic approach", Mc Graw Hill International Editions.
12. J. P. Holman, "Heat Transfer"- 8thed , Mc GrawHill
13. Steam TurbineKearton
14. Fundamentals of Heat and Mass Transfer by F.P. Incropera and D.P. Dewitt, 4th ed; John Wiley &Sons.
15. Elements Of Heat Transfer by Vijay Gupta, 2nd; New Age internationalPublishers

UPE04XXX: Numerical methods for computing

1. Solution of Equation and Eigen valueproblems

Interactive methods , Newtons Raphson method for single variables and for simultaneous equations with two variables , solutes of a linear system by Gaussian, Gauss-Jordan , Jacobi and Gauss –Seidel methods . Inverse of matrix by Gauss –Jordan methods .Eigen value of a matrix by power and Jacobi methods.

2. Interpolation

Newton's divided difference formulae, Lagrange's and Hermites polynomials. Newton forward and back difference formulae. Stirlings and Bessel's central difference formulae.

3. Numerical Differentiation and Integration

Numerical Differentiation with interpolation polynomial, Numerical integration by Trapezoidial and Simpson's (both $1/3^{rd}$ and $3/8^{th}$ ") rules. Two and three point Gaussian quadrature formulae. Double integral using Trapezoidial and Simpon's rule.

4.Initial value problem for ordinary Differentialequation

Single step methods –Taylor series , Euler and modified Eular , Runga –kutta method of order four first and second order differential equation. Multistep methods –Milne and Adam's Bash forth predictor and correctormethods.

5. Boundary value problems for ordinary and Partial DifferentialEquation

Finite difference solution for the 2^{nd} order ordinary differential equation . Finite difference solution for one dimensional heat equation (both implicit and explicit) one dimensional wave equation and two dimensional Laplace and Poisson's equation.

Text Books

1. Sastry S.s; "Introductory Methods of Numericals Analysis" 3/e, Prentice Hall of India New Delhi1998

References

1. Kanda samy ; P. Thilakavthy , K. and Gunavathy . K, "Numerical Methods ", S.Chand& co. new Delhi1999.

2. Grewal B.S , Grewal J.S , "Numerical methods in Engineering and science ". Khanna publisher , NewDelhi

3. Jain M.K. Iyenger S.R K and Jain R. K. , "Numerical methods for Engineering and Scientific computation ," 3/e , New Age International (P) Ltd; New Delhi ,1995.

4. General C.F; Wheatley P.O.,"Applied Numerical Analysis "5/e ,Adittion –Wesley , Singapore ,1998.

5. Narayanan S, Manickavachakam Pillai K. and Ramananiah G. "Advanced Mathematics for Engineering Students Vol2 ," S. Viswanathanan Pvt. Ltd. Chennai,1993.

UPE04B08: Plant Layout & Material Handling

Introduction: Objectives and criteria for facilities planning and industrial plant design. Site selection Factors of plant layout, Types of production activities, job shop, batch and mass production. Similar products special products, Fixed, process, and product type layout and their combinations.
Layout planning: Factors influencing plant layout, design considerations steps in planning. safety requirements.
Quantitative evaluation plant layout: Application of assignment models, queuing theory, transportation problems, engineering economy, cross-chart technique to plant layout problems.
Material Handling: Organization for material handling relation to plant layout, factors affecting material handling. Material handling analysis: Selection and replacement of material handling equipments, analysis of handling problems, application of quantitative tools.
Handling systems: Transportation elevating conveying transferring, self loading and bulk handling equipments, their selection and characteristics, auxiliary equipments, safety in operation.

References:

1. Plant layout and material handling by AppleRonald.
2. Practical plant layout by Muther MC GrawHill.

UPE04B09: Measurement and Instrumentation

Basic Concepts: Definition of terms, calibration, standards, generalized measurement systems, static and dynamic performance characteristics ; analysis of experimentaldata ;Instrumentation for measurement of position and displacement, force, pressure ,velocity , temperature, proximity and range. Concept of feedback; Open and Closed loop control system, Transducers and devices and devices for engineering application and processing.

Metrology: standards, slip gauges, Measurement of angles, tapers, threads, coordinates, inspection of straightness, flatness, alignment and surface finish, Gear measurements, measurements of various product feature using Mechanical, Pneumatic, Optical and Electronic instruments, interferometry and use of opticalflats.

References:

1. Experimental Methods for engineers by J. Holman, 6th Ed, Mc GrawHill.
2. Mechanical Measurement by T.G.Backwith, N.L. Buck and R.d.Maragoni, 3rd.ed, Narosa publishinghouse.
3. Measurement systems- application and design by E.O. Doeblin,4th.ed; MCGrawhill
4. Instrumentation, measurement & analysis by B.C. Nakra& K.K. Chaudhury,TMH.
5. Metrology for Engineers by J.W.F., Gallies and C.R. Shotbolt,Cassel.
6. Metrology by R.K.Jain

UPE04B10: Mechanics of Machines

1. Machinestructure

Kinematic links, pairs and chain-constrain motion- Slider cranks and cranks rocker mechanisms –inversion –application –Kinematics analysis and synthesis of simple mechanisms-Determination of velocity and acceleration in Degree of freedom –Grueblers criteria.

2. Friction

Friction in screw and nut –Pivot and collar –Thrust bearing –plate and disc clutches-Bell (Flat and V) and rope drives –Ratio of tension –Effect of centrifugal and initial Tension –condition for Maximum power transmission- open and Cross bell Drive –Jockey pulley- creep in Belts

3. Gearing andCAMS

Gear profile and geometry-Nomenclature of spur and helical gears –Low of Gearing –Interference –Requirement of minimum Number of teeth in gear -Gears trains –Simple and compound gears trains- Determination of Speed and torque in Epicyclical gear trains – cam profile- Different type of followers

4. Balancing

Static and Dynamic balancing –single and several masses in different planes – Primary and secondary balancing of reciprocation masses- single and multi cylinder engine-Inline V and W arrangements ofengine.

5. Governor:

Introduction, Types of Governors, Centrifugal Governors, Terms used in Governors, Watt Governor, Porter Governor, Proell Governor, Hartnell Governor, Hartung Governor, Wilson-Hartnell Governor, Pickering Governor, Sensitiveness of Governors, Stability of Governors, Isochronous Governor, Hunting, Effort & power of Governors, Controlling force diagram, Coefficient of insensitiveness.

6. Vibration

Free, forced and damped vibration of single degree of freedom systems-Force transmitted to support – vibration isolation – vibration absorption-Torsional Vibration of shaft-Single and multi rotor system- Geared shafts- Critical speed of shafts.

Text Book

1.Ballancy.P.L., “Theory of machine” Khana publisher New Delhi 1998.
2.Sings,V.P, “Theory of machine”, Khana publisher New Delhi 1998.

References

1. Rao , J.S., and Dukkipati ;R.V., ‘’Mechanism of Machine Theory’’, Second Edition , Wiley Eastern Ltd.,1992.
2. Malhotra, D.R. and Gupta, H.C,” The Theory of Machine Satya Prakashan, Tech India publication,1988.
3. Ghosh, A. and Mallick, A.K,” Theory of Machines and Mechanism,” Affiliated East West Press,1989.
4. Shingley, J.E and Uicker (K),J.J., “Theory of Machines and Mechanisms,” McGraw Hill, 1980.
5. Burton Paul, “Kinematic and Dynamic of Planer Machinery,’’ PrenticeHall.1979

UPE04B11: Engineering Materials

Nature and properties of materials : crystal structures and lattices, crystal imperfection , slip and dislocations , plastic deformation , phase diagrams, solidification and structure of materials and alloys , Iron- carbon diagram, various types of bonds, mechanical, magnetic and electronic properties, binary phase equilibrium characteristics of alloy, ternary phase diagram.

Metallography : study of microstructures. Powder metallurgy. Heat treatment processes – general classifications, various heat treatment of steels, properties and applications of alloy steels, tool steels, stainless steels, 7 cast iron, different heat treatment furnaces.

Hot and cold working of metals, recovery, recrystallization and grain growth. Fracture, fatigue and creep phenomenon in metallic materials Non ferrous materials—copper and aluminium basedalloys.

Mechanical, magnetic, electrical and electronics properties of metals, alloys, ceramics, semiconductors and composites.

References:

1. Marerial science and engineering by V. Raghavan, prenticeHall.
2. Introduction to Engineering Metarialsby B.K. Agarwal,TMH.
3. Mechanical Metallurgy by G.E. Dieter, Mc GrawHill.
4. Physical Metallurgy principles by R.E. Reedhill, East- Westpublishers.
5. Principles of metarials science by W.F. Smith, 3rd ed. , Mc GrawHill.
6. Steel and its Heat Treatement by K.E. Theling, Butterworth.
7. Material science by J.C. Anderson, K.D. Leaver, R.D. Rawlings and J.M. Alexander , Chapman Hall, 4th Ed., 1992.

UPE04P15: Thermal power Engineering Laboratory

1.a. Study of cut off models – Lancashire boiler, Babcock and Wilcox boiler, Vertical Tube boiler, Cochran Boiler, Locomotive Boiler.
b. study of cut off models – four stroke diesel engines, four stroke petrol engines, two stroke petrol engine.
2. load test on four stroke petrol and diesel engine by electric loadbox.
3. Load test on four stroke diesel engine by rope brakedynamometer.
4. Heat balance on four stroke diesel engine by rope brake dynamometer and electric load box.
5. Valve timing diagram on four stroke diesel engine model and four stroke petrol engine model.
6. Measurement of the quality of steam, enthalpy, and drynessfraction.
7. To find out the boiler performance, boiler efficiency and steam evaporationrate.
8. To visit a thermal power station and study thefollowing:
    1. Boiler, 2. Steampipe, 3. SteamTurbine, 4. Economizer, 5.Preheater, 6. Alternator, 7. Water treatmentplant, 8. ESP

UPE04P16: Mechanics of Machines Laboratory

List of Experiments

1. Single degree of freedom vibratorysystem.
2. Static & Dynamic balancing of rotatingmasses.
3. Governors.
4. Gyroscope.
5. Cam Design andAnalysis.

UPE04P17: Measurements and Instrumentation Laboratory

Lab experiments involving :

Measurements of position, displacement, velocity, force, temperature, proximity/range.

Measurements of various product features using mechanical, pneumatic, optical and electronic instruments, interferometer, surface roughness measurements, measurements of threads and gears. Laboratory experiments and exercises involving hardware and software modular based off-line and on-line product gauging and inspection, information recording and processingetc.

1. Estimation of accuracy of instruments -vernier andmicrometer.
2. Calibration of dial gauge, micrometer andvernier.
3. Measurement of angels using sine bar, bevel protractors, spiritlevel.
4. Measurement of gear tooth thickness by various methods including profileprojector.
5. Measurement of effective diameter, pitch and helix angle of screwthreads.
6. Surface roughness measurement .
7. Measurement of run out andconcentricity.
8. Measurement of internal and external angles, bores, concavity, convexity using standard balls, rollers, height gauge and depthmicrometer.
9. Measurement using visionsystem.
10. Study of co-ordinate measuringmachine.
11. study of digital measuringinstruments.
12. Measurement of Straightness andFlatness.

5th Semester:

UPE05B13: Machining principles and Technology

1. ToolNomenclature

Single Point tool- Signification of the various angle provided and nose radius- American, German CIRP and orthogonal system of tool nomenclature, conversion of rage angle from American to German and Vice- Versa, Nomenclature of drills, Milling cutters and broaches, Need for chip barker.

2. Machine of MetalCutting

Mechanism of Formation of chips-types of chips and the condition conducive for the formation of each type-built-up edge, its effects, orthogonal Vs oblique cutting, Merchant's circle diagram-Force and velocity relationship, shear plane angle, Energy consideration in matching-Ernst Merchants theory of shear angle relationship-Original assumption and modification made.

3. Forces in Machining

Forces in turning, drilling, milling and grinding, Conventional Vs climb milling- mean and maximum cross sectional areas of chips in milling- Specific cutting pressure- specification horse power- requirement of tools dynamometer- construction and principle of operation of tools dynamometer for turning, drilling and milling,

4. Thermal Aspect inMachining

Sources of heat generation in machining- temperature in measurement technique in machining, Function of cutting fluid- Characteristic of cutting of fluid.

5. Tool Materials , Tools Wear and toollife

Requirement of tool materials- advances in tool materials-HSS,PM, HSS, coated HSS, carbides and coated carbides, ceramic, cold pressed, hot pressed, ceramic composites,

CBN, Diamond properties, advantages and limitation- ISO specification for inserts and tools holders, Tool Wear, type, mechanism, tool life, machinability, and economics of machining, charter in machining.

6. MachiningPrincipal

Setting and machining operation on metal cutting machine- Lathe, Milling, shaping, slotting, planning, Drilling, Boring, Broaching, Grinding (cylindrical, surface, center less), Thread rolling and gear cutting machining.

7. Tooling: Jigs and Fixtures, Principals of location andclamping,

8. BatchProduction

Machining on capstans and Turret lathe.

9. Massproduction

Machining on single/ multi spindle automats.

10. Finishing

Micro finishing operations like honing lapping, super finishing.

UPE05B14: Design of Machine Elements

1. Product Development Concepts

Fundamentals of Machine Design - - Selection of materials --- Factor of safety--- Code and standards--- economic of Design --- Reliability--- safety and product liability – Product Development – Stages --- Sequential and concurrent engineering.

2. Static and Variable Stress Analysis

Static Strength --- Failure theories --- Stress Concentration – Fatigue strength—S-N Diagram – Lowcycle—High cycle fatigue--- Endurance limit—modifying factors--- Fluctuating stresses – Stresses due to combined loading.

3. Design of MechanicalElements

Shafts—Design for static loads – Bending, torsion and axial loads—Reversed bending and steady torsion—Soderberg and Goodman approach—Design of couplings --- Muff flange, bushed pin types – Design of closely coiled helical springs.

4. Design of Transmission Elements

Design of Gears – Spur, helical, bevel and worm gears—Belt drives – Flat belts and V belts selection and specification – design of journal bearings – Selection and specification --- Design of journal bearings—Selection and specification of rolling contact Bearings.

5. Recent Advances

Synthesis design of multistage speed reducers—Design of typical special purposes machine – Design of Geneva Mechanism-- ratchet and pawl mechanism--- Soft ware Implementation in design--- CAD—product Modeling Concept.

Text Book

1. Joseph Edward Shigley, “Mechanical Engineering design,” McGrawHill.

References

2. Spotts M.F. “Design of Machine Elements”, 7/e, 1997, PrenticeHall.
3. Robert L. Norton, “Machine Design” – an integrated approach”, 1997, PrenticeHall.
4. Wilson, “Computer Integrated Machine Design”, 1996, PrenticeHall.
5. Joseph. E. Shigley, “Standard Hand Book of Machine Design,” McGraw Hill, 1996.

“Burr A.H and Cheathak. J.B.”Mechanical Analysis and Design,” 2/e, PrenticeHall.

UPE05B15: Ergonomics and Work System Design

Defining Human Factors in a Production system; Characteristics feature of man-machine system; human performance and reliability; Human sensory-motor system; Stimulus dimension, Human information processing; Noise and theory of signal detection (TDS); Quantitative and qualitative visual display; Human factors associated with speech communication; Introduction to biomechanics and bioengineering aspects of human motor activity; Performance of body members in making different types of movements; Energy expenditure in physical activities; Spatial movements and conceptual relationships of stimuli and responses; Continuous control systems; Types of control function, tools and related control devices.

Design of work place and work components; Applied anthropometry, activity analysis; Design of work place; Human Performance under heat, cold, Illumination, Vibration, Noise, Pollution, Static and dynamicconditions.

Application of results from human factors data and analysis in work study; work design; Method study and work measurement Techniques.

Reference:

1. Sanders M.S and McCormick, “Human Factors Engineering”, Tata McGrawHill.
2. Salvendy G, “Hand book of Human Factors and Ergonomics”, John Wiley &Sons.
3. Kroemer KHE, “Ergonomics – How to Design for case and efficiency”, Prentice Hall EnglewoodCliffs.
4. Indian Adaptation – introduction to work study. ILO, Geneva, Oxford &IBH Pub. Co. Pvt.Ltd.
5. Murrell, “Ergonomics atwork”.

UPE05XXX: Production Planning and Control

1. Introduction: introduction to material management and productivity, functions of material management, organization structures in material management, role ofmaterial management techniques in improved materialproductivity.

2. Material planning: objectives, material requirement planning, manufacturing resource planning, JIT production planning, strategic material planning, material control: acceptance, sampling, inspection, make or buy decision, simple cost analysis, economic analysis, break even analysis, breakeven point theory, whether to add or drop a product line store management and warehousing, productexplosion.

3. Purchasing: importance of good purchasing system, organization of purchasing functions, purchase policy and procedures, responsibility and limitations, purchasing decisions, purchasing role in new product development, role of purchasing in cost reduction, negotiations and purchase, purchasing research: identification of right sources of supply, vendor rating, standardization, vendor certification plans, vendor and supply reliability, developing new source ofsupply.

4. Cost reduction: cost control v/s cost reduction, price analysis, material costreduction techniques, andanalysis.

5. Inventory management: inventory v/s stores, types of inventory, inventory control, inventory build –up, EOQ, various inventory models, inventory models with quantity discount, exchange curve concept, coverage analysis, optimal stocking and issuing policies, inventory management of perishable commodities, ABC – VED analysis, design of inventory distribution systems, surplus management, information system for inventory management, casestudies.

6. Demand forecasting: Long and short term demand forecasting methods, Regression analysis and Smoothing methods. Estimation of trend, cycle, seasonality components. Analysis of forecast error and computer control of forecasting systems. Plant location, capacity scheduling, Warehouse location and capacity scheduling; Multiple Plant Production Facility Design. Aggregate Planning and Master ProductionPlanning and Scheduling; Operations scheduling and Control: Basic Sequencing and scheduling techniques, Despatching rules; Chasing and updating of Production Schedules. Design of Production Planning and Control Systems: System Design for continuous and intermittent Production Systems; Integration of Master Production, Material Requirement and Shop Scheduling Systems. Diagonistic Analysis of Production Planning and Control Systems: Techniques of analysis and evaluation of systemperformance.

Reference books:

1. Material management :- W. R. Stelzer Jr.(PHI)
2. Material management :- D. S. Ammer& Richard ErwinInc.
3. Menon, K.S., "*Purchasing and Inventory Control*", Wheeler Publication, NewDelhi
4. Dobler and Lee, "*Purchasing and Material Management*", Tata McGraw Hill, New Delhi
5. Stevenson, J. William, Operations Management 7th Edition, McGraw-Hill Irwin,2002.
6. Plossl, G.W. Production and Inventory Control: Principles and Techniques, Englewood Cliffs, NJ, Prentice-Hall, Inc.,1985.
7. Monks, Joseph G., Operations Management, Theory and Problems, New York, NY, McGraw-Hill,1987.
8. Production Systems Planning Analysis & Control by James L. Riggs, John Wiley &Sons
9. Modern Production / Operations Management by Elwood S. Buffa, Rakesh K. Sarin, John Wiley &Sons
10. Production / Operations Management : Concept, Structure & Analysis by Tersine R.J., NorthHolland
11. Operations Management, by Jay Heizer and Barry Render. Prentice Hall, 9th Edition.

UPE05B17: Computer Aided Design and Manufacturing

Fundamentals of Design, Computers and controllers, Fundamentals of CAD, computer systems, use of computers in CAD/CAM system, CAD system Hardware, CAD system software, principles of interactive computer graphics, Transformation systems, wire frame modeling, surface modeling, Solid modeling, Finite Element Modeling and analysis.

Numerical control in production systems, computer control of NC machines, NC part programming and computer aided part programming, Group technology, computer aided process planning, computer aided inspection and Quality control, Machine vision, computer integrated production planning systems, Industrial Robots and automated Guided Vehicle systems, Flexible Manufacturing systems, Computer Integrated Manufacturing, Artificial Intelligence and Expert system, communication system in Manufacturing.

Text Book

1. Lalit Narayan. K. MallikarjunaRao.K, Sarcar M.M.M, "Computer Aided Design and Manufacturing", Prentice Hall of India (P) Ltd, 2008.

References

1. Radhakrishnan.P and Subramanyam, S, " CAD, CAM, CIM" , New Age International Publishers.
2. G. Rankey, Paul, " Computer Integrated Manufacturing" , PrenticeHall.
3. J.Jr. Harrington, " Computer Integrated Manufacturing " Industrial Press Inc, NewYork.
4. Rathmill. K and Macconal. P, " Computer Integrated Manufacturing". IFSpublications.
5. Deb, S.R, " Robotics Technology and Flexible Automation" , Tata McGrawHill.

UPE05P19: Machining Principles and Technology Laboratory

List of Experiment in Metal Cutting

1. Study of influence of cutting parameters on surface roughness inturning
2. Tool life study on a single point turningtool.
3. Measurement of cutting forces in turning using lathe tooldynamometer.
4. Measurement of shear plane angle using chip- thickness ratiocriteria.
5. Acceptance test on RAM type milling machine as per ISI testchart.
6. Measurement of single point to angle.

UPE05P20: CAD/CAM Laboratory

1. Two Dimensional Geometry creation and modification using standard draftingpackage.
2. Detailing and documentation of a typical productiondrawing.
3. Attributes and Data extraction from a drawing.
4. Creation of simple solid models using CSG and B-Repapproach.
5. Surface ModelingTypes.
6. Interfering a programming language with a typical draftingpackage.
7. Interfering database package with typical draftingpackage.
8. Object Modeling and Mesh generation using simpleelements.
9. Analysis of typical machineelements.
10. Kinematic analysis of simplemechanisms.
11. Software project consisting of development of algorithms and programs in the field of manufacturingapplications.

UPE05P21: Ergonomic and Works system Design laboratory

List of Experiment

1. Work study
2. Workmeasurement
3. Anthropometry
4. Kinesiology
5. ComfortAnalysis
6. Fatigue Bio Engineering

UPE05P22: Design Practice

Exercises on 2-D and 3- D Modelling of Mechanical components and assembly system using software packages like AUTOCAD, CATIA etc.

Design Project
1. Jigs and Fixturedesign
2. Diedesign
3. Automation using hydraulic, Pneumatic, electrical, Electronic and Mechanicaldevices.

Text Book: Junija B.L and Sekhon, G.S. "Fundamentals of Metal cutting and Machine tools," New Age International (P) Ltd.1995.

References:

1. Shaw M.C., "Metal Cutting Principles", Oxford Clare dons Press,1984.
2. Bhattacharya a. "Metal Cutting theory and practice", New Central Book Agency (P) Ltd. Calcutta, 1984.

6th Semester

UPE06B18: Manufacturing Process II

1. Theory of Metal Forming

Metallurgical aspect of metal forming- Slip –twining-Mechanics of plastic deformation-Effect of temperature, strain rate –microstructure and friction in metal forming-yield criteria and their significance-classification of metal forming processes.

2. Forging and Rollingprocess

Principal-Classification-equipment, tooling-processes, parameters and calculation of force during forging and rolling process-Ring compression tests-Post forming heat treatment-Defect (cause and remedy)-application

3. Extrusion and Drawing Process

Classification of extrusion process –tool, equipment principal of this process –influence of friction –Extrusion forces calculation –Defects and analysis –Rod /Wire drawing –tools, Equipment and principal of process –defects –Tube drawing and sinking processes –Mannesmann processes of seamless pipe manufacturing ,

4. Sheet Metal Forming Processes

Classification –Conventional and HERF processes –Presses –Type and selection of presses –formability of sheet metal –principal, Process, parameters, equipments and application of the following process –

Deep Drawing, spinning, stretch forming, plate banding, press brake forming –Explosive forming, electro hydraulic forming, magnetic pulse forming

5. ReccentAdvances

Super plastic forming –electroforming –fine balancing, P/M forging –Isothermal forging –High Speed, hot forging –high velocity extrusion

Text books

1. Narayanasamy, R., "Metal working Technology", Prentice Hall (1997).

References

1. Dieter, "Mechanical Metallurgy", Revised Edition, 1992.
3. George E,"Dieter –Engineering Design (A Materials and processing Approach)" McGraw Hill-Edition II- University ofMaryland-1991
4. SEROPE KALPAKJJAN, "Manufacturing Engineering and Technology," Edition –III – addision—Wesley Publishingco.1985,
5. William F.Hosford and Robert M, Caddlel , "Metal forming ," (Mechanics andMetallurgy), Prentice Hall Publishing co, 1990.
6. Sinha and Prasad, "Theory of metal forming and metal cutting ," Dhanpat Rai Pub,(P)Ltd,.1999
7. Rao P.N," Manufacturing Technology," TMH Ltd 1998(ReviseEdition).

UPE06B19: Machine Tool System

Principles of generations of various surfaces in machine tools; Conformable Kinematic Synthesis for tracing , Forming, Enveloping and Generation; Kinematic Structure of Gear and step less Drive for machines ; Designing Discrete step Drives for Machine Tools speed and feed ; Step less Drive ; Design Principles of Machines Tool Gear Boxes ; hydraulic and Electric drives and control; Machine tool structures; Principles of design of Machine tool elements like bearings spindles and slides; Automation and control features of Machine tools; special tools and attachment. Elements of unit build machines and Transfer lines; Selection and acceptance testing of Machine tools.

References:-

1. Principles of Machine tools by A. Bhattacharya and G.C. Sen., Central Book Agency, Kolkata.
2. Machine Tools vol.-I, II, III, IV BY Acharkan, Mirpublishers.

UPE06B20: Operations Research

1. LinearModels

The phases of Operations research study- linear programming – Graphical methods – Simplex algorithm—Duality – Transportation Problems – Assignment problems---Applications to problems with discretevariables.

2. NetworkModels

NetworkModels---shortestroute---Minimalspanningtree---Maximumflowmodels----
Project network---- CPM and PERT networks--- Critical path scheduling ------Sequencing models.

3. InventoryModels

Inventory models----Economic order quality models---- Quantity discountmodels---
Stochastic Inventorymodels----- Inventory control models inpractice.

Queuing Theory

Queuing models--- Queuing system and structures ---Notation---Parameter------ SingleServer and multi--- Notation --- Parameter --- Single Server and multiserver models --- Poisson input --- Exponential service --- Component rate service ---Infinitepopulation------Simulation.

4. DecisionModels

DecisionModels---GameTheory---TwopersonZerosumGame---Graphicalsolution---Algebraicsolution---Linearprogrammingsolution–ReplacementModels ----------Modelsbased onservicelife---Economiclife---Singleormultivariablesearchtechniques ---------- Application orModels-----Casestudies

Text Books

1. H.A.Taha “Operation Research” Prentice Hall of India 1999 6thEdition
2. S.Bhaskar “Operation Research” Anuradha Publishers Tamil Nadu1999

References

1. Shennoy, Srivastava “Operation Research for Management” Willy Eastern-1994.
2. N.J.Bazara, Jarvis, H. Sherali“ A linear programming and Network Flows” , Joha Wiley 1990.
3. Philip and Ravindran “Operational Research “ ,Joha Wiley ,1992.
4. Hiller and Lieberman “Operation Research “ Holden Day1986.
5. Frank, S. Budnick, Dennis Mcleavy :Principals of Operation Research for Management” Richad D Irwin -1990.
6. Sharma J.K. “Operation Research’ ,Macmillan

UPE06XXX: Automation, CNC and Robotics

Basic principles of automation; Extending the capabilities of conventional machines through improved devices and manipulators; Basic principles and constructure of numerical control; CNC, DNC and machining centre; Methods of coding and programming; APT programming; Adaptive control; Economics of numerical control.

Introduction to Robotics: Synthesis of elements with movability constraints; Elements of robot anatomy; Hydraulic, pneumatic and electric manipulators; End-effectors and their design; controllers with microprocessors or fluidics; Robot sensors; Applications of industrial robotics.

Reference:

1.Craig J. J., "Introduction to Robotics", Addison – Wesley.
2.Koren Y. "Robotics for Engineers", McGraw Hill.
3.Del S. R.,"Robotics Technology and Flexible Automation", Tata McGraw Hill.
4.Tewari N K., Kundra and Rao P. N., "CNC Machine".

UPE06B22: ELECTIVE I

List of Electives

1. Optoelectronics and laser materials processing

Basic laser optics; Laser: electromagnetic radiation, reflection, refraction, laser beam characteristics, focusing with a single lens, optical components. Types of laser –CO2 laser, co laser, solid state, diode, excimer lasers, application of laser, laser cutting, laser welding, laser treatment. Theory of heat flow, laser automation and in-process sensing, laser safety.
Theory of heat flow, laser automation and in-process sensing, laser safety.

References

1.A text book on light by K.G Majumdar, Modern book agency private Ltd.
2.A text book on optics by Subramanyan and Brijlal.S.Chand&Company ltd.
3.Laser material processing by William M.Steen, Springer –Verlag.

2. Management Information System(MIS)

Data Information and knowledge concepts, concepts of information representation: storage, dissemination, discrimination and transmission

Data base management system, design and implementation of RDBMS for managerial applications, retrieval aspects, security and privacy aspects.

Specification and configurations of computer based systems, manufacturing management information systems-its subsystems and outputs; Costing and performance audit applications MIS

References

1. Management information systems, organization and technology by London and London 4th ED, PreticeHall
2. Management information systems by JamesObien

3. Total QualityManagement

1. **Introduction:** definastion of quality, dimensions of quality, quality planning, quality costs – analusis techniques for quality costs, basic concepts of total quality management, historiacl review, principles of TQM, leadership – concepts, role of senior management, quality council, quality statements, strategic planning, deming philosophy, barriers to TQM implementation.

2. **TQM Principles:** Customer satisfaction – customer perception of quality, customer complaints, service quality, customer retention, employee involvement – motivaiton, empowerment, teams, recognition and reward, performance appraisal, benefits, continuous process improvement – juran trilogy PDSA cycle, 5s, kaizen, supplier partnership – partnering, sourcing, supplier selection, supplier rating, relationship development, performance measures – basic concepts, strategy, performancemeasure.

3. **Statistical process control (SPC):** The seven tools of quality, statistical fundamentals – measures of central tendency and dispersion, population nad sample, normal curve, control charts for variables and attributes, process capability, concepts of six sigma, new seven managementtools.

4. **TQM Tools:-**Bench marking – reasons to benchmarking, benchmarking process, quality function deployment (QFD) – house of quality, QFD process, benefits, taguchi quality loss function, total productive maintenance (TPM) – concepts, improvement needs, FMEA – stages ofFMEA.

5. **Quality systems:-**Need for ISO 900 and other quality systems, ISO 9000: 2000 quality system – elements, implementation of quality system, documentation, quality auditing, QS 9000, ISO 14000 – concept, requirements andbenefits.

Text Book:

1. Dale H. Besterfield,et al., Total Quality Management, Pearson Education Asia, 1999.(Indian reprint 2002).

Reference:

1. James R.Evans& William M. Lidsay, The Management and Control of Quality (5th Edition), South-Western (Thomson Learning), 2002 (ISBNO-324-06680-5).
2. Feigenbaum. A.V. "Total Quality Management", McGraw Hill,1991.
3. Oakland .J.S. "Total Quality Management", Butterworth-Hcinemann Ltd.,Oxford,1989.
4. Narayana V. and Sreenivasan, N.S. "Quality Management – Concepts and Tasks", New Age International1996.
5. Zeiri, "Total Quality Management for Engineers" Wood head Publishers,1991.
6. Arora. K.C., "Total QualityManagement",
7. Paul James, "Total Quality Management – An Introductory Text", PrenticeHall.
8. Housen&Ghose, "Quality control andApplications".
9. Khanna, O.P., "Industrial engineeringManagement."

4. Fluid Machinery

1. Dynamics of FluidFlow

Introduction, Impulse Momentum Principle, Forces Exerted on Pressure Conduits, Force Exerted on a Stationary Vane or Blade. Absolute and Relative Velocity Relations, Force on a Moving Vane or Blade, Torque on Rotating Wheel, Forces Exerted by the Jet on a stationary vertical, Inclined Flat plate ,Curve plates, moving plates, hinged plates

2. HydraulicTurbines

Introduction, Hydraulic Power Plant, Classification of Turbines, Similitude and Model Testing, Model and Prototype, Unit Quantities, Turbine Efficiencies, Euler Turbine Equation, Components of Power Produced Pelton Turbine, Power Development, Torque and Power and Efficiency Variation with Speed Ratio, Reaction Turbines , Francis Turbines, Axial Flow Turbines, Cavitation in Hydraulic Machines, Governing of Hydraulic Turbines

3. Rotodynamic Pumps

Introduction, Centrifugal Pumps , Impeller, Classification, Pressure Developed by the Impeller , Manometric Head, Energy Transfer by Impeller, Slip and Slip Factor, Losses in Centrifugal Pumps, Effect of Outlet Blade Angle Pump Characteristics, Operation of Pumps in Series and Parallel, Specific Speed and Significance, Cavitation , Axial Flow Pump , Power Transmitting Systems , Fluid Coupling, TorqueConverter

4. ReciprocatingPumps

Introduction, Comparison, Description and Working, Flow Rate and Power ,Slip ,Indicator Diagram , Acceleration Head , Minimum Speed of Rotation of Crank, Friction Head , Air

Vessels, Flow into and out of Air Vessel, Rotary Positive Displacement Pumps , Gear Pump, Lobe Pump , Vane Pump.

Reference Books:

1. Fluid Machinery by TerryWright
2. Fluid Mechanics by Joseph H. Spurk and NuriAksel
3. Fluid Mechanics by Frank M.White
4. Jain, A.K., "Fluid Mechanics" KhannaPublishers.
5. Rajput, R.K., "Fluid mechanics & Hydraulicmachines

UPE06P23: MANUFACTURING PROCESS-II LAB

Pneumatic Hamer, hydraulic Hamer, Sheet Metal Forming, Compaction through powder metallurgy route.

UPE06P24: MACHINE TOOL SYSTEM LABORATORY

Study of speed structure (Ray Diagram) of lathes, determination of apron constant, measurement of cutting forces and tool wear experiments are also to be done tostudy principles of metal cutting; Alignment tests of drilling machines, quick return motion mechanism on shaper are to be undertaken; Laboratory exercises involving machining of complex product configurations, machining of spur and helical gears, copying and contouring, finishing processes and grinding of tools and cutters are to bedone.

UPE06XXX: Automation and Condition Monitoring Laboratory

List of Experiments

1.A study of different control system and I,S and FANUC codes,
2. CNC Miller-Programming Exercise involving linear polation, circular interpolation and repeatcycle.
3. CNC Miller -Programming Exercise involving mirror image, tools seating, job setting and editing oftools.
4. CNC Miller -Programming Exercise involving cannedcycles.
5. CNC –Lathe programming exercise for a simple component involving linear and circular – interpolation.
6. CNC- Lathe Programing Making use of subroutine and Do Loop.
7.CNC – Lathe Programming on hmt lathe in sinumeric system,
8.CNC programming on a retrofiltedlathe.
9. CAM Software in CNC tutor, MasterCAM,
10. Gegenerative machining in IDEAS,
11. Study of the geometry of the Robot Manipulations, grippers and exercises on Robot programming

12. Ferrography and condition monitoring by OilAnalysis.
13. Bearing Health Analysis to optimize its lifespan.
14. Alignment and Balancing Test Rigs to provide Exposure to latest Alignment and BalancingTechniques.
15. Wear Particle Analysis for Quantitative and Qualitativestudy.
16. Lubricant contamination Analysis for Quantitative and Qualitativestudy.

The following equipments can be monitored–

i) Compressor, ii) Engine, iii) Exhauster, iv) Fan, v) Gear Box, vi) Generator, vii) Hydraulic, viii) Motor, ix) Paper Machine, x) Pump, xi) Turbine.

17. Vibration conditionMonitoring.

UPE06P26: Seminar on Assigned Topics

Each student will be required to give a seminar take along with a report on any current topic with audio visual aids, graphs, charts, and models as assigned to them on individual basis.

7th Semester

UPE07B23: Reliability Engineering and Plant Maintenance.

Reliability: Definition and basic concepts; Failure data, failure moods, and Reliability in terms of hazard rate and failure density functions; Hazards models and bath tub curve; applicability weibul distribution. Reliability calculations for series, parallel and parallel series systems; Reliability calculations for maintained and stand bysystems.

Maintenance - - its rules and scope in total organizational context. Objectives and characteristics of maintenance; basic guidelines for design of organization structures for maintenance; Centralized Vs de centralized maintenance ; Types of maintenance – corrective planned, preventive and predictive maintenance; Factors affecting maintenance; opportunistic maintenance; measurement of maintenance work; rating and allowances. Maintenance cost budgets. Maintenance planning and scheduling;

Noise and Vibration technology, Infra – Thermography, Laser alignment and in situ balancing, Ultrasonics, Acoustic Emissions, High end Corrosion Mapping System, Lube and Wear Analysis, Residual Life Assessment, Oil Analysis and indigenization

References

1. Carter, ADS, “Mechanical Reliability Engineering”,Macmillan.
2. Belington Roy & Allen R.N, “Reliability Evaluations of Engineering Systems” Pitman.
3. Dhilan& Singh, “Introduction to ReliabilityEngineering’.
4. Doty, L.A, “Reliabilities for the Technologies”, Industrial PressInc.
5. Basu S.K &Bhadury B, “ Terrotechnology – Reliability Engineering and MaintenanceManagement”.

UPE07B24: Non-Traditional Manufacturing

Introduction to new methods of production; Need and capability analysis of various processes; Classification and selection of non-traditional machining technologies. Abrasive processes of machining including Abrasive Jet machining (AJM), Water Jet Mechining (WJM) and ultrasonic machining (USM). Chemical machining (CHM), Electrochemical machining (ECM): Electrochemical deburring and honing: Electrochemical Grinding (ECG); Electrochemical Arc Machining (ECAM). Electrical discharge machining (EDM); wire EDM, Electrochemical Discharge Machining (ECDM); Electron beam machining (EBM); Plasma arc machining (PAM); Laser beam machining (LBM); Ion beam machining (IBM), Netural particle etching. Cryogenic machining; Hot machining, stretched turning; Dynamic cutting; Magnetic cutting; Oscillating turning; Ballistic machining. Selecting the most suitable process for a product; Economic analysis of non-traditional machiningprocesses.

Text:

1. Misra P.K., " Non Traditional Machining Process", Narosa Publishing House.

Reference:

1. Gary F Benedict, Non traditionalmachining.
2. Kalpakjian, "Non Traditional Machining", PrenticeHall.
3. Jain V.K., "Advanced Machining Process", Allied Publishers(2005).
4. Pandey P.C., "Modern Machining Process", TataMcgrawHill.

UPE07B25: Production and Quality Management

Management functions, Evolution of Management Theory, Management approach to planning, Analysis and control function involved in a production system; Production cycles, planning functions; types of industry: Job, Batch, Continuous, Mass and flow production ; Organization and policies in respect of production planning and control; Product design and development; Fore-casting techniques; Scheduling, Sequencing and plant loading for optimal utilization; Queuing models and line balancing; Materials planning and control, Inventory Management; Value analysis; productivity Analysis, Mechanics of production control.

Quality Management: Introduction, Meaning, Quality Characteristics of Goods and Services, Juran‟s Quality Trilogy, Deming‟s 14 principles, Tools and Techniques for Quality Improvement, Statistical Process Control Chart, Quality Assurance, Total Quality Management (TQM) Model Concept of Six Sigma and itsApplication.

Acceptance Sampling – Meaning, Objectives, Single Sample, Double Sample and Multiple Sample Plans with sated risk, Control charts for variables – Averages and Ranges, Control Charts for Defectives – Fraction Defective and Numbers Defective.

References

1. Production and operational Management by S.N.Chary,TMH.
2. Essentials of Managementt by Koontz and Weihrich,TMH.
3. Modern Production/ Operational Management by E.S.Buffa and R.K.Sarin, John Wiley and sons.
4. Krajewski&Ritzman, Operations Management, 5th PearsonEducation
5. Buffa & Sarin, Modern Production/Operations Management, 8th JohnWiley
6. Chary, Production and Operations Management, TataMcGraw-Hill
7. Johnston R et al – Cases in Operations Management,Pitman
8. McGregor D – Operations Management,McGraw-Hill

UPE07B26: Financial Management and Costing

1. Finance function and financialaccounting

The finance function – Indian financial system – financial planning – cost of capital – operating and financial level rages – financial statements – income statement – balance sheet.

2. Capital budgeting and working capitalmanagement

Different techniques of capital budgeting and investmetn analysis – cocept of present value – sources of long term finance – cash management – recievables management – sources of short termfinance.

3. Inventorymanagement

Purpose of inventoreis – costs related to inventories – basic EOQ model – variation in EOQ model – Finite production – stockout – quantity discounts – lots size under constraints – MRP inventory accouting.

4. Cost estimation and costaccounting

Importance and aims of cost estimation and costing – determination of materials cost, labour cost, cost of a product – overhead expenses – depreciatoin – methods – profit planninng – anaysis – cost – volume relationship – breakeven analysis.

5. Recentadvances

Just in Time (JIT) system – MRP II – credit rating – leasing – Hire purchasing – venture capital – SEBI.

Text Book

1. Prasannachandra, " Financial management Theory and pactice", Tata Mc Graw Hill, 1998.

References

1. James C. Vanhorne, John M Wachowilz, "Fundamentals of FinancialManagement", Prentice Hale of India,1996.
2. T R Banga and S C Sharma , " Mechanical Estimating and costing ", Khanna Publishers, 1993.
3. Monks J G – "Operation management theory and practice", McGraw Hill,1992.
4. I M Pandey, "Financial Management",Vikas Publishing House,1995.

UPE07B27: Elective II

List of Electives

1. Enterprise Resource Planning

Enterprise Resource Planning: Basic issues, approach and database implementation, ERP modules; Production planning, Sales and distribution, materials management, Plant maintenance, Quality management, Project management, Financial and costing and human concept of supply chain and its major components.

References

1. Enterprise Resource Planning by Ravisankar and S Jaiswal,Galgotia

2. Nanotechnology

1. General Introduction: Basics of Quantum Mechanics, Harmonic oscillator, magnetic Phenomena, band structure in solids, Mossbauer and Spectroscopy, optical phenomena bonding in solids,Anisotropy.
2. Silicon Carbide: Application of Silicon carbide, nano materials preparation, Sintering of SiC, X-ray Diffraction data, electron microscopy sintering of nano particles, Nano particles of Alumina and Zirconia: Nano materials preparation, Characterization, Wear materials and nanocomposites.
3. Mechanical properties: Strength of nano crystalline SiC, Preparation for strength measurements, Mechanical properties, Magneticproperties.
4. Electrical properties: Switching glasses with nanoparticles,Electronic conduction with nano particles; Optical properties: Optical properties, special properties and the colored glasses
5. Processofsynthesisofnanopowders,Electrodeposition,Importantnaonmaterials
6. Investigaing and manipulating materials in the nanoscale: Electron microscopics, scanning probemicroscopics, optical microscopics for nano science and technology, X-ray diffraction.
7. Nanobiology : Interaction between bimolecules and naoparticle surface, Different types of inorganic materials used for the synthesis of hybrid nano-bio assemblies, Application of nano in biology, naoprobes for Analytical Applications-A new Methodology in medical diagnostics and Biotechnology, Current status of nano Biotechnology, Future perspectives of Nanobiology,Nanosensors.
8. Nano Medicines : Developing of Nano medicines Nano systems in use, Protocols for nano drug Administration, Nanotechnology in Diagnostics applications, materials for used in Diagnostics and Therapeutic applications, Molecular Nanomechanics, Molecular devices, Nano tribology, studying tribology at nanoscale, Nano Tribology applications.
TEXTBOOKS:
1. Nano Materials- A.K.Bandyopadhyay/ New Age Publishers.
2. Nano Essentials- T.Pradeep/TMH

3. Non Conventional Energy

4. Rapid Prototyping

1. Introduction: Basic concept – Overview f existing technologies of prototyping andtooling –Need for speedy design to market operations.
2. Product Development: State of the Technology – conceptual design – development – Detail design – Prototype – Tooling –Engineering Pilot –Limitations.
3. Accelerated Product Development: Application of CAD-Techniques – Procedures – Product slicing – software –Applications.
4. Rapid Prototyping Systems: Selective laser sintering – Working Principles – Advantages and limitation – stereo lithography – working principle – Application advantages and limitations.
5. Other systems: Laminated object modeling – Waving principles application – Advantages

and Limitations- fused deposition and modeling – direct shell production casting- application.

Text:

1. Ghosh Amitabha, “Rapid Prototyping-A Brief Introduction”, East-WestPublishers

References:

1. PAUL F. JACOBS , “Rapid Prototyping and Manufacture , Fundamentals of stereo lithography“,1995
2. SOENEN,RandOILLING,“AdvancedCAD/CAMsystems“,NarosaPublishingHouse ,1995.
3. DURVENT , W.R, The lithographic Handbook, Narosa Publishinghouse,1995.
4. Rapid News, University of Warwick,U.K.1995.

UPE07P28: Non-Traditional Manufacturing Laboratory

One experiment on each machine

1. Abrasive Jet machining(AJM)
2. Ultrasonic machining(USM).
3. Electrochemical machining(ECM):
4. Electrical discharge machining(EDM);
5. WireEDM,
6. Electron beam machining(EBM)
7. Laser beam machining(LBM)

UPE07XXX: Mini Project

UPE07P30: Industrial Training

Students undergoing industrial training at the end of the semester will be given credit in semester. Students shall have to submit a project report to be signed by the industry training manager or lab-in-charge of R&D organization.

8th Semester

UPE08B30: Entrepreneurship Development

1. Entrepreneurship

Entrepreneur- Traits of Entrepreneurs- Types of Entrepreneurs- Intrepreneur Difference between Entrepreneurs and Intrapreneur- Entrepreneurial Growth.

2. Motivation

Major motives influencing Entrepreneur- Achievement Motivation Training, Self Rating, Business game, Thematic Apperception Test- Stress Management. Entrepreneurship Development programs-Need, Objectives.

3. Business

Small Enterprises-definition, classification-characteristics, ownership structure- Project Formulation-Steps involved in setting up a Business- Indentifying, Selecting a good business opportunitiy, Market survey and Research, Techno economic Feasibility Assessment- Preliminary Project Report- Project Appraisal- Sources of information- Classification of needs andAgencies.

4. Financing andAccounting

Need- Sources of Finance, Term Loans, Capital Structure, Financial Institutions, Management of working capital, Costing Break Even Analysis, Network Analysis techniques of PERT/CPM-Taxation-Income Tax, Excise Duty- SalesTax.

5. Support toEntrepreneurs

Industrial support to Entrepreneurs- Sickness in smallll business-concept, magnitude, causes and consequences, corrective measures- Government policy for small scale Enterprise- Growth strategies in small Industry- Expansion, Diversification, joint venture, Merger, Sub contracting.

TextBook:

1.Khanka S. S., "Entrepreneurial Development", S. Chand and Co. Ltd., 1997.

Reference:

1.EDII- "Faculty and external experts- A Hand Book for new Entrepreneurs: Publishers: Entrepreneurship Development", Institute of India, Ahmedabad, 1986.

UPE08XXX: Professional Ethics

1. EngineeringEthics

Senses of 'Engineering Ethics'- variety of moral issues- types of inquiry- moral dilemmas- moral autonomy- Kohlberg's theory-Giligan's theory- consensus and controversy- professions and professionalism- professional ideas and virtues- theories about right action- self interest customs and religion-uses of ethical theories.

2. Engineering as socialexperimentation

Engineering as experimentation- engineers as responsible experimenters- codes of ethics- a balanced outlook on law- the challenger case study.

3. Engineer's Responsibility forsafety

Safety and risk- assessment of safety and risk- risk benefit analysis- reducing risk- the Three Mile Island and Chernobyl case studies.

4. Responsibilities and Rights Collegiality and loyalty- respect for authority- collective bargaining- confidentiality- conflicts of interest- occupational crime- professional rights- employee rights- intellectual property rights (IPR) -discrimination.

5. GlobalIssues

Multinational Corporation- environmental ethics-Computer ethics-Weapons Development- engineer as managers –consulting engineer –engineer as expert witnesses and advisors – moral leadership –sample code of conduct.

Text Books:

1. Miki Martin and Roland Schinzinger, "Ethics in Engineering," Mc Graw Hill, New York 1996,

Reference:

1. Ethics in Engineering Profession by prof S.K. Chakraborty ,IITM-Joka,
2. Charles D. Fleddermann,"Engineering Ethics," PranticeHall , New Maxico1999.
3. Laura Schlesinger," How could you do that: The Abdication of character, courage and conscience,"
Harper Collins, New York, 1996,
4. Stephen Carter," Integrity." Basic Books, Newyorks,1996,
5. Tom Rush," The Power of Ethical persuasion: From Conflict to partnership at works and in Private
Life," Viking, New York 1993,

UPE08B32: Elective

List of Elective

1. Project Planning and Appraisal

Project Definition : Venture analysis, Project management Features; Project organisation design; Operation planning and resource allocation; Plant location analysis models; Project scheduling; Gantt charts; Analysis of project networks - PERT and CPM. Scheduling under Resources constraint, Cash scheduling to multi-projects situation Project monitoring and control aspects; Decision making theories in Management under certainty, risk, uncertainty and competitive situations; applications of the methodologies and formulations in such project decision making problem solutions; Project capital, cost estimation; Breakeven Analysis, Cost Benefit Analysis; Profitability Analysis, Commercial and notional profitability. Project Engineering, procurement, storage and construction functions and other related management problems; Project wind up and technological obsolescence; Computer aided ProjectManagement.

References :

1. Operations Research – An Introduction byTaha
2. Principles of Operations Research with Applications to Managerial Decision byWagner

2. Supply Chain Management

Building blocks of a supply chain network. Business processes in supply chains. Types of supply chains and examples. Strategic, tactical, and operational decisions in supply chains. Supply chain performance measures. Supply chain inventory management: Newsboy, Base-stock, and (Q,R) models, multi-echelon supply chains, bullwhip effect. Performance modeling of supply chains using Markov chains and queuing networks. Mathematical programming models for supply chain planning, design, and optimization. Best practice supply chain solutions. Internet-enabled supply chains: e-marketplaces, e-procurement, e-logistics, e-fulfillment, customer relationship management, web services, Rosetta net, ERP and supply chains, supply chain automation, and supply chainintegration.

Books

1. W.J. Hopp and M.L. Spearman. Factory Physics: Foundations of Manufacturing Management. Irwin, McGraw-Hill,1996.
2. N. Viswanadham. Analysis of Manufacturing Enterprises. Kluwer Academic Publishers, 2000.
3. Sridhar Tayur, Ram Ganeshan, Michael Magazine (editors). Quantitative Models for Supply Chain Management. Kluwer Academic Publishers,1999.
4. R.B. Handfield and E.L. Nochols, Jr. Introduction to Supply Chain Management.Prentice Hall,1999.
4. N. Viswanadham and Y. Narahari. Performance Modeling of Automated manufacturing Systems. Prentice Hall of India, 1998.
6. Sunil Chopra and Peter Meindel. Supply Chain Management: Strategy, Planning,and Operation, Prentice Hall of India,2002.
7. Jeremy F. Shapiro. Modeling the Supply Chain. Duxbury Thomson Learning,2001.
8. David Simchi Levi, Philip kaminsky, and Edith Simchi Levi. Designing and Managing the Supply Chain: Concepts, Strategies, and Case Studies. Irwin McGrawHill,2000.

4. Managerial Economics

Interaction between economic theory and production and managerial decision making;

concept of firm, industry and economy. Consumer behaviour, utility, indifference curves and maps; consumer' supply, demand determinations, demand function. Production function, economy of scale, effect of technology, equilibrium condition, optimal expansion path. Short and long range cost functions. Perfect competition and monopoly, equilibrium of firm and industries, different models of firm. Determination of price, price discrimination, pricing of joint products.

References :

1. Modern Micro Ecomomics byKou.
2. Managerial Economics by Peterson &Lewis

5. Soft computing in Decision Technology

Evolution of Decision Making Role of Cognitive Mind in Decision Technology. Decision Making under certain, uncertain and risk environments. Distributed Decision Making. Role of Fuzzy Sets and Systems in Decision Making. Multi Criteria Decision Making (MCDM). Fuzzy Multi Criteria Decision Making (FMCDM) Artificial Neural Network (ANN) and application of ANN in Decision Sciences. Genetic Algorithm (GA) and application of GA in Decision Sciences. Application of ELECTRE, AHP,Fuzzy AHP, TOPSIS ,Fuzzy TOPSIS in Decision Making in various engineering problems. Data Mining and Data Warehousing. Data Envelope Analysis (DEA). Particle Swarm Optimization (PSO) and Ant Bee Colony Optimization (ABC) Techniques.

Reference:

1. **Amit Konar,** Computational Intelligence-Princeples, Techniques and Applications-Springer.
2. **Kalyanmoy Deb**, Optimization for Engineering Design-Algorithms andExamples-PHI.
3. **S.S.Rao,** Engineering Optimization-theory and Practice-New Age International Publishers.
4. **Sankar K. Pal & Paul P. Wang,** Genetic Algorithms for Pattern Recognition-CRC Press.
5. **D.E. Goldberg**, Genetic Algorithms-AddisonWesley.
6. **K.V.Mitter**,Optimization
7. **Liu & Lee,** Introduction to SoftComputing-PHI.

6. Mechatronics and Modern Control

Introduction to Mechatronics: Definition, Mechatronics in manufacturing, products and design. Comparison between Traditional and Mechatronics approach.

Electronics: review of fundamentals of electronics, logic gates and their operations, data conversion devices, sensors, micro-sensors, transducers, electrical contacts, actuators and switches, contactless input devices, signal processing devices; relays, output devices.

Drives: Stepper motors, servo-drives.

Mechanical: Ball screws, linear motion bearings, transfer systems.

Hydraulic: Hydraulic elements, actuators and various other elements. Design of hydraulic circuits.

Control systems: Open loop and closed loop control, block diagrams, transfer functions, Laplace transforms; Mathematical model of physical system; PI and PID controllers, 8085 microprocessor, PLC controller and Ladder diagrams, hydraulic and pneumatic controllers; Time domain analysis, , transient response of first and second order systems; Introduction to

non-linear control; state space analysis, optimal design and fabrication of Mechatronics systems.

References

1.Raven F. H., “Automatic control Engineering”, 5/e McGraw Hill International.
2.Ogata K, “Modern Control Engineering”, 3/e, Prentice Hall.
3.Kuo B. C., “Automatic control system”, 6/e, Prentice Hall.
4.HMT Ltd, “Mechatronics”, Tata McGraw Hill.
5.Kurtz G. W., Schueller J. K., Claar P. W., “Machine Design for mobile and industrial applications”,SAE.
6.Bolton W.,”Mechatonics”, AddisonWesley.

UPE08XXX: Project

UPE08P35: Comprehensive Viva voce:

A student will have to appear at the comprehensive viva-voce examination on all the subjects covering the whole syllabus before a board of examiners including one external expert.