BIJU PATNAIK UNIVERSITY OF TECHNOLOGY,ODISHA

Production Engineering

3rd SEMESTER			4th SEMESTER		
THEORY	*Contact Hours*		*THEORY*	*Contact Hours*	
Code Subject	*L-T-P*	*Credits*	Code Subject	*L-T-P*	*Credits*
BSCM1205 Mathematics – III	3-1-0	4	BSCM1210 Mathematics – IV	3-1-0	4
HSSM3204 Engineering Economics & Costing	3-0-0	3	HSSM3205 Organizational Behavior	3-0-0	3
PCPR4201 Manufacturing Processes- I	3-0-0	3	PCPR4203 **Manufacturing Processes- II**	3-0-0	3
PCPR4202 MEASUREMENT AND METROLOGY	3-0-0	3	PEPL5307 Strength of Materials	3-1-0	4
PCME4203 Introduction to Physical Metallurgy & Engineering Materials	3-1-0	4	PCPR 4204 Hydraulics & Hydraulic Machines	3-0-0	3
PCMF4203 Theory of Machines	3-0-0	3	PCMF4205 Work Study & Ergonomics	3-0-0	3
Credits (Theory)		20	**Credits (Theory)**		20
PRACTICALS/SESSIONALS			*PRACTICALS/SESSIONALS*		
PCPR7201 Measurement & Metrology Lab.	0-0-3	2	PCPR7204 Manufacturing Process Lab – II.	0-0-3	2
PCPR7202 Manufacturing Process Lab – I.	0-0-3	2	PCPR 7205 Material Testing Lab	0-0-3	2
PCPR7203 Computer Aided Drawing Lab.	0-0-3	2	PCPR 7206 Fluid Mechanics & Hydraulic Machines Lab	0-0-3	2
Credits (Practical / Sessionals)		6	**Credits (Practical/Sessionals)**		6
TOTAL SEMESTER CREDITS		26	**TOTAL SEMESTER CREDITS**		26
TOTAL CUMULATIVE CREDITS		84	**TOTAL CUMULATIVE CREDITS**		100

BSCM1205 MATHEMATICS - III

Module-I   **(18 hours)**

Partial differential equation of first order, Linear partial differential equation, Non-linear partial differential equation, Homogenous and non-homogeneous partial differential equation with constant co-efficient, Cauchy type, Monge's method, Second order partial differential equation

The vibrating string, the wave equation and its solution, the heat equation and its solution, Two dimensional wave equation and its solution, Laplace equation in polar, cylindrical and spherical coordinates, potential.

Module-II   **(12 hours)**

Complex Analysis:

Analytic function, Cauchy-Riemann equations, Laplace equation, Conformal mapping,

Complex integration: Line integral in the complex plane, Cauchy's integral theorem, Cauchy's integral formula, Derivatives of analytic functions

Module –III   **(10 hours)**

Power Series, Taylor's series, Laurent's series, Singularities and zeros, Residue integration method, evaluation of real integrals.

Text books:

1. E. Kreyszig," Advanced Engineering Mathematics:, Eighth Edition, Wiley India Reading Chapters: 11,12(except 12.10),13,14,15

2. B.V. Ramana, " Higher Engineering Mathematics", McGraw Hill Education, 2008 Reading chapter: 18

Reference books:

1. E.B. Saff, A.D.Snider, " Fundamental of Complex Analysis", Third Edition, Pearson Education, New Delhi

2. P. V. O'Neil, "Advanced Engineering Mathematics", CENGAGE Learning, New Delhi

HSSM3204 ENGINEERING ECONOMICS & COSTING

Module-I: (12 hours)

Engineering Economics – Nature and scope, General concepts on micro & macro economics. The Theory of demand, Demand function, Law of demand and its exceptions, Elasticity of demand, Law of supply and elasticity of supply. Determination of equilibrium price under perfect competition (Simple numerical problems to be solved). Theory of production, Law of variable proportion, Law of returns to scale.

Module-II: (12 hours)

Time value of money – Simple and compound interest, Cash flow diagram, Principle of economic equivalence. Evaluation of engineering projects – Present worth method, Future worth method, Annual worth method, internal rate of return method, Cost-benefit analysis in public projects. Depreciation policy, Depreciation of capital assets, Causes of depreciation, Straight line method and declining balance method.

Module-III: (12 hours)

Cost concepts, Elements of costs, Preparation of cost sheet, Segregation of costs into fixed and variable costs. Break-even analysis-Linear approach. (Simple numerical problems to be solved)

Banking: Meaning and functions of commercial banks; functions of Reserve Bank of India. Overview of Indian Financial system.

Text Books:

1. Riggs, Bedworth and Randhwa, "Engineering Economics", McGraw Hill Education India.

2. D.M. Mithani, Principles of Economics. Himalaya Publishing House

Reference Books :

1. Sasmita Mishra, "Engineering Economics & Costing ", PHI

2. Sullivan and Wicks, " Engineering Economy", Pearson

3. R.Paneer Seelvan, " Engineering Economics", PHI

4. Gupta, " Managerial Economics", TMH

5. Lal and Srivastav, " Cost Accounting", TMH

PCPR 4201 Manufacturing Processes- I

Module-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.

Module-II

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

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

Module-III

 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 welding process 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", Khanna Publishers.
2. Manufacturing Technology: Foundry, Forming and Welding by P.N. Rao, TMH.

References
1. Principles of manufacturing Materials and processes, by James S. Campbell, TMH.
2. Welding Metallurgy by G.E. Linnert, AWS.
3. Production Engineering Sciences by P.C. Pandey and C.K. Singh, Standard Publishers Ltd.
 4. Manufacturing Science by A. Ghosh and A.K. Mallick, Wiley Eastern.

PCPR 4202: MEASUREMENT AND METROLOGY

Module-I (8 Hours)

MECHANICAL MEASUREMENTS (4+2+2=8)

Introduction: Introduction to measurement and measuring instruments, Generalized measuring system and functional elements, units of measurement, static performance characteristics and elementary idea of dynamic performance characteristics of measurement devices, calibration, concept of error (systematic and random), sources of error, statistical analysis of errors. 4

Sensors and Transducers: Types of sensors, types of transducers and their characteristics. 2

Signal Transmission and Processing: Signal transmission and processing devices and systems. Signal display & recording devices 2

Module-II (10 Hours)

Time Related Measurements: (2+1+2+2+3=10)

Stroboscope, frequency measurement by direct comparison. Measurement of displacement

Measurement of Pressure: Gravitational, directing acting, elastic and indirect type pressure transducers. Measurement of very low pressures (high vacuum).

Strain Measurement: Types of strain gauges and their working, strain gauge circuits, temperature compensation. Strain rosettes, calibration.

Temperature Measurement: Thermometers, bimetallic thermocouples, thermistors and pyrometers.

Measurements of Force, Torque, Acceleration, and Vibration: Different types of load cells, elastic transducers, pneumatic & hydraulic systems. Seismic instruments, accelerometers vibration pick ups and decibel meters, vibrometers.

Module-III (14 Hours)

Measurement of Fluid Velocity and Flow rate: (2+2+2+1=7)

Measurement of fluid velocity, Hot Wire Anemometry, Laser Doppler Velocimetry. Flow measuring devices, Rotameter.

METROLOGY Metrology and Inspection : Standards of linear measurement, line and end standards. Limit fits and tolerances. Interchangeability and standardisation.

Linear and angular measurements devices and systems Comparators: Sigma, Johansson's Microkrator.

Limit gauges classification, Taylor's Principle of Gauge Design.

Measurement of Surface (2+1+2+1+1=7)

Measurement of geometric forms like straightness, flatness, roundness.

Tool makers microscope, profile project autocollimator.

Interferometry: principle and use of interferometry, optical flat.

Measurement of screw threads and gears.

Surface texture: quantitative evaluation of surface roughness and its measurement.

Books and References:

1. Experimental Methods for Engineers by Holman, TMH
2. Mechanical Measurements by Beckwith, Pearson
3. Principles of Measurement Systems by Bentley, Pearson
4. Metrology of Measurements by Bewoor and Kulkarni, TMH
5. Measurement Systems, Application Design by Doeblein, TMH
6. Hume K.J., "Engineering Metrology", MacDonald and Co
7. Jain, R.K., "Engineering Metrology" Khanna Publishers
8. Jain, R.K., "Mechanical Measurement" Khanna Publishers

PCME4203 INTRODUCTION TO PHYSICAL METALLURGY AND ENGINEERING MATERIALS

MODULE-I **(16 Lectures)**

Classification of Engineering Materials, Engineering properties of materials. Characteristic property of metals, bonding in solids, primary bonds like ionic, covalent and metallic bond, crystal systems, common crystal structure of metals, representations of planes and directions in crystals, atomic packing in crystals, calculation of packing density, voids in common crystal structures and imperfections crystals.

Concept of plastic deformation of metals, critical resolve shear stress, dislocation theory, deformation by slip and twin, plastic deformation in polycrystalline metals, yield point phenomenon and related effects, concept of cold working preferred orientation. Annealing ; recovery; recrystalization and grain growth; hot working.

MODULE-II **(16 Lectures)**

Concept of alloy formation, types of alloys, solid solutions, factors governing solids solubility viz. size factor, valency factor, crystal structure factor and chemical affinity factor; order-disorder transformation.

Binary phase diagrams a) Isomorphism system, (b) Eutectic system, (c) Peritectic system, (d)Eutectoid system and (e) Peritectoid system. Allotropic transformation. Lever rule and its application, Interpretation of solidification behaviors and microstructure of different alloys belonging to those systems, Effect of non-equilibrium cooling, coring and homogenization.

Iron-cementite and iron-graphite phase diagrams, microstructure and properties of different alloys (alloy steels; stainless steel, tool steel, HSS, high strength low alloy steel) types of cast iron, their microstructures and typical uses. Specification of steel. T.T.T. diagram: concept of heat treatment of steels i.e. annealing, normalizing, hardening and tempering; microstructural effects brought about by these processes and their influences on mechanical properties; factor affecting hardenability.

MODULE-III **(12 Lectures)**

Optical properties of Materials: Scattering, Refraction, Theory of Refraction and absorption, Atomic Theory of optical properties. Lasers, Optical fibres- Principle, structure, application of optical fibres.

Plastic-: Thermosetting and thermoplastics.

Ceramics: Types, structure, Mechanical properties, application

Composite Materials: Agglomerated Materials: Cermets .Reinforced Materials: Reinforced Concrete. Glass fiber reinforced plastics, Carbon fibre reinforced plastics, fibre reinforced plastics, Laminated plastic sheets. Tefnol, Properties of composites,

Metal matrix composites, manufacturing procedure for fiber reinforced composite. Introduction to Nano-materials

Text Books:

1. Engineering Physical Metallurgy and Heat Treatment by Y.Lakhtin, Mir Publisher, Moscow.

2. Introduction to Physical Metallurgy by Avner, Tata McGraw Hill

3. Materials Science and Engineering by W.D.Callister, Wiley and Sons Inc.

Reference Books :

1. Elements of Material Science and Engineering, L.H.Van Vlack, Addison Wesley

2. Physical Metallurgy: Principles and Practice by Ragahvan, PHI

3. The Science and Engineering of Materials by Donald R. Askeland and Pradeep P Phule, Thomson Learning (India Edition)

4. Materials Science and Engineering by V.Raghavan, Prentice Hall of India Pvt.Ltd.

5. Essentials of Material Science and Engineering by Donald R. Askeland and Pradeep P Phule, Thomson Learning

6. Processes and Material of manufacture by Lindberg, PHI.

7. Elements of Materials Science & Engineering by Van Vlack, Pearson

8. Mechanical Metallurgy by Dieter, Tata MacGraw Hill

9. Materials Science and Metallurgy By Daniel Yesudian, Scitech

10. Material Science and Metallurgy by C.K.Dutta, Dhanpat Rai

11. Materials Science and Metallurgy by R.B.Choudhary, Khanna Publishers

12. Principles of Engineering Metallurgy by L.Krishna Reddy, New Age International

13. Material Science and Processes by S.K.Hazra Chowdhury, Indian Book distributing Co.

14. Engineering Materials, Properties and Selection by Kenneth G. Budinski and Michael K. Budinski, Prentice Hall of India

15. Materials Science by M.S. Vijaya , G.Rangarajan, TMH

THEORY OF MACHINE

Module-I **(10 Hours)**

Mechanism: Basic Kinematic concepts and definitions, mechanism, link, kinematic pair, classification of kinematic pairs, degree of freedom, kinematic chain, binary ternary and quaternary joints and links, degrees of freedom for plane mechanism, grubler's equation, inversion of mechanism, four bar chains and their inversions, single slider crank chain, double slider crank chain and their inversion.

Module-II **(13 Hours)**

Friction of a screw and nut, square threaded crew, V-threaded screw, pivot and collar, friction circle, friction axis, friction clutches, transmission of power by single plate, multiplate and cone clutches.

Gear trains: simple train, compound train, reverted train, epicyclic train and their application. Toothed gears: Theory of shape and action of tooth properties methods of generation of standard Tooth profiles, Standard proportions, Interference and

Under-cutting,

Module-III **(12 Hours)**

Cams: Simple harmonic, constant velocity and constant acceleration types. Displacement, velocity and acceleration of follower. Cams with specified Contours.

Governors: Centrifugal Governors-watt and Porter Governors, Spring loaded
Governor-Hartnell Governor ,sensitiveness, stability, Isochronism ,Hunting, Balancing:
Balancing of revolving masses in one plane and different planes, Partial balance of single
cylinder engine.

TEXT BOOK

1. Theory of machines – SS Ratan, Tata McGraw Hill.
2. A Textbook of theory of machines (in S.I units) – R.K. Bansal, Laxmi Publication.

REFERENCES

1. Mechanism and machine Theory- Rao and Dukkipati, Wiley Eastern Ltd.
2. Theory of Machines –Thomas Beven.

PRACTICALS/SESSIONALS

Measurement & Metrology Lab.

LIST OF EXPERIMENTS

1. Calibration of Dial gauge, Micrometer, Vernier and Height gauge

2. Use of Sine bar for measuring angles

3. Study and use of Profile Projector

4. Measurement of thread parameters using Floating Carriage Micrometer

5. Surface roughness measurement

6. Use of Mechanical and Pneumatic comparator

7. Measurement of gear tooth thickness

8. Measurement of Internal, External angles and Bores using standard Balls, and Height gauge.

9. Measurement of Straightness and Flatness using precision level.

10. Study and use of Toolmaker's microscope

11. Study of Digital measuring instruments

MANUFACTURING TECHNOLOGY LAB- I

LIST OF EXPERIMENTS

Measurement of the Machined Components and Machining time estimation of:

1. Taper Turning

2. External thread cutting

3. Internal thread cutting

4. Eccentric Turning

5. Knurling

6. Square Head Shaping

7. Hexagonal Head Shaping

8. Drilling and Tapping

9. Determination of Cutting forces in Turning and Milling Operations.

REFERENCES

1. Hajra Choudhury, S.K and Hajra Choudhury. A.K., " Elements of Workshop Technology', Volume I and II, Media Promoters and Publishers Private Limited, Mumbai, 1997.

2. Sharma, P.C.A Text book of Production Technology, S. Chand and Co. Ltd., 2004.

3. Roy. A. Lindberg, "Process and Materials of Manufacture", Pearson Education Fourth Edition 2006

COMPUTER AIDED DESIGN LAB

1. Basic concepts of CAD/CAM.
2. Introduction to Fundamentals of AutoCAD with operating system commands/menus, familiarization with computerized drafting software use at help and tutorial menus.
3. Introduction to CAD tools and commands. To draw 2D basic shapes. Lines, curves, areas, circles etc.
4. Modify tools: copy, more, offset, array etc. Working with Blocks.
5. Dimensioning, Use of layers, & Drawing template. To draw simple 2D drawing.
6. Printing, export, import of CAD files in different format like jpg, dxf any dwg dwt., iges, stl. etc.
7. Introduction solid modeling of 3D components using sketching and feature like extrude, revolve, sweep, fillet etc.
8. Over view of projection of solid standard views, sectional views, and detail views.
9. Creating assembly drawing.
10. Development of drawing surface features.
11. Projection of different solid models.
12. Thread profiles Nomenclature types – Metric, BSP, BCW, ACME, Buttress, and Knuckle thread.
13. Nut & bold and fasteners.
14. Machining assemblies: Gib and cotton joint, shaft coupling.
15. Making one screw jack assembly and its 2D drawing and parts lists generation with bill of materials.

Text Books:
1. Machine Drawing by N.D.Bhatt, V.M.Panchal, Charotar Publishing House.
2. Machine Drawing with AutoCAD by Goutam Pohit and Goutam Ghosh, Pearson Education
3. Machine Drawing includes AutoCAD by Ajeet Singh, Tata MacGraw Hill
4. Machine Drawing (Includes AutoCAD) by Ajeet Singh, Tata McGraw Hill
5. Engineering Drawing with an Introduction to AutoCAD by Dhanjay A. Johle, Tata McGraw Hill

Reference Books:
1. Engineering Drawing and Graphics using AUTOCAD by T.Jayapoovan, Vikas Publishing
2. Engineering Drawing by N.D.Bhatt, Charotar
3. Engineering Drawing and Graphics + AutoCAD by K. Venugopal, New Age International
4. Design Data Book, PSG Technology, Coimbatore

BSCM1210 **Mathematics – IV**

Module-I (20 hours)

Numerical Methods:

Approximation and round of errors, Truncation error and Taylor's series

Roots of equation: The bisection method, the false-position method, fixed point iteration, the Newton-Raphson method, Muller's method

Linear algebraic equation: LU decomposition, the matrix inverse, Gauss-Seidel method

Interpolation: Newton divided difference interpolation, Lagrange Interpolation, Newton's forward and backward interpolation.

Numerical integration: The trapezoidal rule, The Simpson's rules, Gauss quadrature

Ordinary differential equation: Euler's method, Improvement of Euler's method, Runge-Kutta methods

Module-II (10 Hours)

Probability:

Probability, Random variables, Probability distributions, Mean and variance of distribution, Binomial, Poisson and Hypergeometric distributions, Normal distribution, Distribution of several random variables.

Module-III (10 Hours)

Mathematical Statistics:

Random sampling, Estimation of Parameters, Confidence Intervals, Testing of hypothesis, Acceptance sampling, Chi square test for goodness of fit , Regression Analysis, Fitting Straight Lines, Correlation analysis.

Text books:

1. S. C. Chapra and R. P. Canale, " *Numerical methods for Engineers*", Fifth Edition, McGraw Hill Education

   Reading Chapters : 2, 3(3.1, 3.2), 4(4.2, 4.3), 5(5.1, 5.2, 5.3), 6(6.4), 9(9.1, 9.2), 10(10.2), 13(13.1,13.2,13.5), 16(16.1, 16.2), 17(17.3), 20(20.1, 20.2, 20.3)

2. E. Kreyszig," Advanced Engineering Mathematics:, Eighth Edition, Wiley India

   Reading Chapters: 22, 23(except 23.5 and 23.8)

Reference books:

1. Jay L. Devore, "Probability and Statistics for Engineering and Sciences",

Seventh Edition, Thomson/CENGAGE Learning India Pvt. Ltd

P. V.O'Neil, "Advanced Engineering Mathematics", CENGAGE Learning, New Delhi

HSSM 3205   **ORGANIZATIONAL BEHAVIOUR**

Module I

The study of Organizational Behaviour: Definition and Meaning, Why Study OB
Learning – Nature of Learning, How Learning occurs, Learning and OB.
Foundations of Individual Behaviour : Personality – Meaning and Definition, Determinants of Personality, Personality Traits, Personality and OB.
Perception – Meaning and Definition, Perceptual Process, Importance of Perception in OB.
Motivation – Nature and Importance, Herzberg's Two Factor Theory, Maslow's Need Hierarchy Theory, Alderfer's ERG Theory, Evaluations.

Module II

Organizational Behaviour Process : Communication – Importance, Types, Gateways and Barriers to Communication, Communication as a tool for improving Interpersonal Effectiveness, Groups in Organizations – Nature, Types, Why do people join groups, Group Cohesiveness and Group Decision-making Managerial Implications, Effective Team Building. Leadership-Leadership & Management, Theories of Leadership-Trait theory, Leader Behaviour theory, Contingency Theory, Leadership and Follower ship, How to be an effective Leader, Conflict-Nature of Conflict and Conflict Resolution. An Introduction to Transactional Analysis (TA).

Module-III

Organization : Organizational Culture – Meaning and Definition, Culture and Organizational Effectiveness. Introduction to Human Resource Management-Selection, Orientation, Training and Development, Performance Appraisal, Incentives Organizational Change – Importance of Change, Planned Change and OB techniques. International Organisational Behaviour – Trends in International Business, Cultural Differences and Similarities, Individual and Interpersonal Behaviour in Global Perspective.

Text Books :
1. Keith Davis, Organisational Behaviour, McGraw-Hill.
2. K.Aswathappa, Organisational Behaviour, Himalaya Publishing House.

Reference Books :
1. Stephen P. Robbins, Organisational Behaviour, Prentice Hall of India
2. Pradip N. Khandelwal, Organizational Behaviour, McGraw-Hill, New Delhi.
      3. Uma Sekaran, "Organizational Behaviour", TATA McGraw-Hill, New Delhi.
      4. Steven L McShane, Mary Ann Von Glinow, Radha R Sharma" Organizational Behaviour" , TATA McGraw- Hill.
5. D.K. Bhattachayya, "Organizational Behaviour", Oxford University Press
6. K.B.L.Srivastava & A.K.Samantaray, "Organizational Behaviour" India Tech
7. Kavita Singh, "Organizational Behaviour", Pearson

MANUFACTURING PROCESSES-II

Module-I **(16 Hours)**
Basic shapes of machine tools. Wedge action, function of different angles of cutting tools, tool geometry, and Nomenclatures ASA, ORS systems. Conversion of angles, geometry of twist drill & slab milling cutter, grinding of single point cutting tool. Tool materials.
Force system in turning- Merchant circle diagram, velocity relationship .Stress in conventional shear plane, Energy of cutting process, Ernst & Merchant angle relationship, Forces in drilling and plane slab milling. Measurement of forces-dynamometer for measuring turning & drilling forces.

Module-II **(10 Hours)**
Mechanism of chip formation: Mode of failure under stress- fracture & yielding mechanism.

Thermodynamics of chip formation: The shear plane temperature-interface temperature from dimensional analysis-Experimental determination of chip tool interface temperature. Coolants-mechanism cooling action

Module-III **(8 Hours)**
Tool wear: Criteria of wear. Machinability and tool life, Flank wear.
Taylor's tool life equation, Crater wear, Causes and mechanism of tool failure.
Vibration & chatter in machining. Economics of metal machining.

TEXT BOOK(S):
1. Metal cutting Theory & Practice- A.Bhattacharya, C.B.Pub.
2. Production Technology- P.C Sharma.

REFERENCE(S):
1. Fundamentals of Metals machining & machine Tools- Boothroyd- International student Edition.
2. Theory of Metal cutting- Milton Shaw

STRENGTH OF MATERIALS

Module I **(15 hours)**

Elasticity: Stress and strain, compressive, tensile, shear and bearing stress - Stress - strain diagram, Hooks law, modulus of elasticity, modulus of rigidity, bulk modulus of rigidity, bulk modulus, Poisson's ration. Relationship between elastic constraints and temperature stresses, composite bars, dead, live and shock loads.

Properties of section, calculation of areas, centroid, neutral axis, moment of inertia, modulus of section, radius of gyration with reference to structural shapes.

Module II **(15 hours)**

Theory of simple bends - relationship between load shearing force and bending moment. Bending moment and shear force diagram for cantilever, simple supported and over hanging beams - bending stresses.

Deflection - deflection of beams in simple cases. Principal stresses and stains.

Torsion in solid and hollow shafts - combined bending and torsion.

Module III **(15 hours)**

Thin and thick cylinders and shells subjected to internal and external pressures.

Column and struts - long and short columns - axial and eccentric loading - effect of end conditions – equivalent length and slenderness ratio - Euler and Rankine formulae.

References Books:

1. R.S. Khurmi, Applied Mechanics and Strength of Materials S.Chand & Co., (6th ed), New Delhi, 1987.
2. P.N. Singh and I.K.Jha, Elementary Mechanics and Solids, Wiley Eastern, New Delhi.
3. Timoshenko, Strength of Materials
4. Singer, Strength

PCPR 4204 **Hydraulics and Hydraulic Machines**

Module I (13 Lectures)
Introduction : Scope of fluid mechanics and its development as a science
Physical property of Fluid: Density, specific gravity, specific weight, specific volume, surface tension and capillarity, viscosity, compressibility and bulk modulus, Fluid classification.
Fluid statics: Pressure, Pascal's Law, Pressure variation for incompressible fluid, atmospheric pressure, absolute pressure, gauge pressure and vacuum pressure, manometer.
Hydrostatic process on submerged surface, force on a horizontal submerged plane surface, force on a vertical submerged plane surface.

Buoyancy and floatation, Archimedes' principle, stability of immersed and floating bodies, determination of metacentric height.
Fluid kinematics : Introduction, description of fluid flow, classification of fluid flow. Reynold's number, Acceleration of fluid particles, flow rate and continuity equation, differential equation of continuity,
Mathematical definitions of irrotational and rotational motion. Circulation, potential function and stream function. Flow net

Module II (12 Lectures)

Fluid dynamics : Introduction, Euler's equation along a streamline, energy equation, Bernoulli's equation and its application to siphon, venturimeter, orificemeter, pitot tube.

Flow in pipes and ducts: Loss due to friction, Minor energy losses in pipes Hydraulic Gradient Line (HGL), Total Energy Line (TEL), Power transmission in the fluid flow in pipes, fluid flow in pipes in series and parallel. Flow through nozzles.

Module III (15 Lectures)
Hydraulic turbine: Classification, Impulse and Reaction turbine; Tangential, Radial and axial turbine. Impulse turbine, Pelton wheel, bucket dimensions, number of buckets in pelton wheel, efficiency and performance curves.
Reaction Turbines: Francis turbine and Kaplan turbine, velocity triangle and efficiencies, performance curve. Function of draft tube and casing cavitation
Centrifugal Pump: constructional features, vane shape, velocity triangles, Efficiencies, Multi stage centrifugal pumps, Pump Characteristic, NPSH and Cavitation.

Positive displacement pumps: Reciprocating Pump, Working principle, Discharge, work done and power requirement, Slip, Indicator diagram

Text Books
1. Fluid Mechanics and Hydraulic Machines, Modi & Seth
2. Introduction to Fluid Mechanics and Fluid Machines by S.K. Som and G. Biswas, TMH
3. Fluid Mechanics, A.K.Jain, Khanna Publishers

Reference Books:

1. Fluid Mechanics by A.K. Mohanty, PHI
2. Introduction to Fluid Mechanics by Fox, McDonald, Willey Publications
3. Fluid Mechanics by Kundu, Elsevier
4. An Introduction to Fluid Dynamics by G.K.Batchelor, Cambridge University Press
5. Engineering Fluid Mechanics by Garde et. al., Scitech
6. First course in Fluid Mechanics by Narasimhan, University press
7. Fluid Mechanics by J.F.Douglas, J.M.Gasiorek, J.A.Swaffield and L.B.Jack, Pearson

WORK STUDY & ERGONOMICS

Module I **(10 hours)**

Introductory Concepts

Definition, objective and scope of work study and ergonomics and its historical background, Interrelationship between work study & ergonomics, role of work study & ergonomics in productivity improvement

Method Engineering

Definition, objectives and procedure of method analysis, Principles of motion economy and methodology of motion analysis.

Module II **(10 hours)**

Work Measurement

Definition, objective and different methods of work measurement – stop watch time study, predetermined motion time system (PMTS)

Work Sampling

Principle, techniques and applications of work sampling studies

Module III **(13 hours)**

Job Evaluation and Merit Rating

Definition, objectives and techniques of job evaluation and merit rating

Wages & Salary

Definition and principles of wage and salary administration, comparative study of incentive schemes

Ergonomics

Man – machine interaction, design of man-machine environment system, workstation design

TEXT BOOKS

1. Motion & Time Study Barnes Ralph. M., John Wieley & Sons, 7th edition.
2. Work Study O. P. Khanna, Dhanpat Rai & sons, New Delhi
3. Motion and Time study – Principles and Practice M.E.MUNDEL PRENTICE Hall India Pvt. Ltd.
4. Introduction to work Study – ILO
5. Human Factors in Engineering Design – E.J.McCormick, Tata Mc-GrawHill
6. Hand book of Ergonomic Design – Martin Helender

PCPR7204   MANUFACTURING PROCESS LAB – II.

LIST OF EXPERIMENTS
1. Measurement of cutting force in drilling.
2. Measurement of cutting force in milling.
3. Measurement of cutting force in turning.
4. Temperature measurement in turning.
5. Vibration study of machine tools.
6. Verification of Taylor's tool life equation.
7. Study of different types of chips.
8. Determination of shear angles.
9. Ring Compression test.
10. Determination of coefficient of friction by using compression tests.
11. Formability test-Ericsson cupping test.

PCPR7205   MATERIAL TESTING LAB

Material Testing:
LIST OF EXPERIMENTS

1. Impact strength
2. Hardness strength
3. Rigidity modulus
4. Compression / Bending strength
5. Fatigue strength
6. Determination of tensile strength of materials by Universal Testing Machine

PCPR7204   Fluid Mechanics & Hydraulic Machines Lab

LIST OF EXPERIMENTS

HYDRAULIC MACHINE:
1. Experiments on impact of Jets
2. Experiments on performance of reciprocating pump
3. Experiments on performance of centrifugal pump
4. Experiments on performance of Pelton Turbine
5. Experiments on performance of Francis Turbine
6. Experiments on performance of Kaplan Turbine

FLUID MECHANICS

7. Determination of Metacentric Height and application to stability of floating bodies.
8. Verification of Bernoulli's Theorem and its application to Venturimeter.
9. Determination of Cv and Cd of Orifices.

B.Tech(Production Engineering) Syllabus For Admission Batch 2014-15

5th SEMESTER				6th SEMESTER			
Theory		*Contact Hrs*	*Credit*	*Theory*		*Contact Hrs*	*Credit*
		L-T-P				**L-T-P**	
HSSM 3302	Optimization Engineering	3-0-0	3	PCME 4404	Production and Operation Management	3-0-0	3
HSSM 3303	Environmental Engineering and Safety	3-0-0	3	PCMF 4302	Tool Design	3-0-0	3
PCME 4303	Design of Machine Elements	3-0-0	3	PCME 5306	CAD/CAM	3-0-0	3
PCPR 4301	Principle of Machine Tools	3-0-0	3	PCMF 4301	Materials Deformation Process	3-0-0	3
	Professional Elective - I (Any one)	3-0-0	3		Professional Elective - II (Any one)	3-0-0	3
PEMF 5302	Advanced Casting and Welding			FEME 6301	Finite Element Methods		
PEMF 5303	Maintenance Engineering and Management			PETX 5412	Management Information System		
PEME 5303	Rapid Prototyping			PEME 5305	Robotics and Robotics Apllication		
	Free Elective - I (Any one)	3-0-0	3		Free Elective - II (Any one)	3-0-0	3
PEME 5408	Composite Material			PEME 5308	Non Conventional Energy Sources		
FEME 6302	Project Management			FEME 6303	Heat Power Engineering		
PEME 5304	Tribology			PEIT 5301	E Commerce		
BECS 2212	C++ and Object Oriented Programming						
	Credits (Theory)	18			Credits (Theory)	18	
	PRACTICALS/SESSIONALS				*PRACTICALS/SESSIONALS*		
PCMF 7305	Metallurgy and NDT Lab	0-0-3	2	PCMF 7304	Tool Design Sessional	0-0-3	2
PCMF 7302	Machine Design Sessional	0-0-3	2	PCPR 7301	NTM Lab	0-0-3	2
PCMF 7305	Manufacturing Lab-3(Machine Shop)	0-0-3	2	PCMF 7301	Manufacturing Lab-4	0-0-3	2
	Credits (Practicals / Sessionals)	6			Credits (Practicals / Sessionals)	6	
	TOTAL SEMESTER CREDITS 24				TOTAL SEMESTER CREDITS 24		
	TOTAL CUMULATIVE CREDITS 133				TOTAL CUMULATIVE CREDITS 157		

PRODUCTION ENGINEERING   *5th semester*

HSSM3302 OPTIMIZATION ENGINEERING   (3-0-0)

Module-I   (10 Hours)

Idea of Engineering optimization problems, Classification of optimization algorithms, Modeling of problems and principle of modeling. Linear programming: Formulation of LPP, Graphical solution, Simplex method, Big-M method, Revised simplex method, Duality theory and its application, Dual simplex method , Sensitivity analysis in linear programming

Module-II   (10   Hours)

Transportation problems: Finding an initial basic feasible solution by Northwest Corner rule, Least Cost rule, Vogel's approximation method, Degeneracy, Optimality test, MODI method, Stepping stone method Assignment problems: Hungarian method for solution of Assignment problems   Integer Programming: Branch and Bound algorithm for solution of integer Programming Problems Queuing models: General characteristics, Markovian queuing model, M/M/1 model, Limited queue capacity, Multiple server, Finite sources, Queue discipline.

Module-III   (10   Hours)

Non-linear programming: Introduction to non-linear programming. Unconstraint optimization: Fibonacci and Golden Section Search method.   Constrained optimization with equality constraint: Lagrange multiplier, Projected gradient method Constrained optimization with inequality constraint: Kuhn-Tucker condition, Quadratic programming Introduction to Genetic Algorithm.

Recommended text books

1. A. Ravindran, D. T. Philips, J. Solberg, " Operations Research- Principle and   Practice", Second edition, Wiley India Pvt Ltd
2. Kalyanmoy Deb, " Optimization for Engineering Design", PHI Learning Pvt   Ltd
Recommended Reference

 Books:
1.Stephen G. Nash, A. Sofer, " Linear and Non-linear Programming", McGraw Hill
2. A.Ravindran, K.M.Ragsdell, G.V.Reklaitis," Engineering Optimization",   Second edition, Wiley India Pvt. Ltd
 3.H.A.Taha,A.M.Natarajan, P.Balasubramanie, A.Tamilarasi, "Operations Research", Eighth Edition, Pearson Education
4. F.S.Hiller, G.J.Lieberman, " Operations Research", Eighth Edition, Tata McDraw Hill 5. P.K.Gupta, D.S.Hira, "Operations Research", S.Chand and   Company Ltd.

HSSM3303 ENVIRONMENTAL ENGINEERING & SAFETY (3-0-0)

Module - I
Ecological Concepts: Biotic components, Ecosystem Process: Energy, Food Chain, Water cycle, Oxygen cycle, Nitrogen cycle etc., Environmental gradients, Tolerance levels of environment factor, EU, US and Indian Environmental Law. Chemistry in Environmental Engineering: Atmospheric chemistry, Soil chemistry. Noise pollution- Noise standards, measurement and control. Water Treatment: water quality standards and parameters, Ground water. Water treatment processes, Pre-treatment of water, Conventional process, Advanced water treatment process.

Module - II :

(a)Waste Water Treatment: DO and BOD of Waste water treatment process, pretreatment, primary and secondary treatment of waste water, Activated sludge treatment: Anaerobic digestion, Reactor configurations and methane production.
(b)Air Pollution : Air pollution and pollutants, criteria pollutants, Acid deposition, Global climate change -greenhouse gases, non-criteria pollutants, air pollution meteorology, Atmospheric dispersion. Industrial Air Emission Control. Flue gas desulphurization, NOx removal, Fugitive emissions.
(c) Solid waste, Hazardous waste management, Solid Waste Management, Source classification and composition of MSW: Separation, storage and transportation, Reuse and recycling, Waste Minimization Techniques. Hazardous Waste Management, Hazardous waste and their generation, Transportation and treatment: Incinerators, Inorganic waste treatment. E.I.A., Environmental auditing,

Module - III : Occupational Safety and Health Acts, Safety procedures, Type of Accidents, Chemical and Heat Burns, Prevention of Accidents involving Hazardous substances, Human error and Hazard Analysis. Hazard Control Measures in integratednsteel industry, Petroleum Refinery, L.P.G. Bottling, Pharmaceutical industry. Fire Prevention - Detection, Extinguishing Fire, Electrical Safety, Product Safety. Safety Management- Safety Handling and Storage of Hazardous Materials, Corrosive Substances, Gas Cylinders, Hydro Carbons and Wastes. Personal Protective Equipments.

Text Book :
1. Environmental Engineering Irwin/ McGraw Hill International Edition, 1997, G. Kiely,
2. Environmental Engineering by Prof B.K. Mohapatra, Dhanpat Rai & Co Publication
3. Industrial Safety Management, L. M. Deshmukh, Tata McGraw Hill Publication.

Reference Books
1. Environmental Engineering by Arcadio P. Sincero & Gergoria A. Sincero PHI Publication
2. Principles of Environmental Engineering and Science, M. L. Davis and S. J. Masen, McGraw Hill International Edition, 2004
3. Environmental Science, Curringham & Saigo, TMH,
4. Man and Environment by Dash & Mishra
5. An Introduction to Environmental Engineering and Science by Gilbert M. Masters & Wendell P. Ela - PHI Publication.
6. Industrial Safety Management and Technology, Colling. D A - Prentice Hall, New Delhi

PCME4303 DESIGN OF MACHINE ELEMENTS (3-1-0)

Module-I (12 hours)
Stages in design, Standardization, Interchangeability, Preferred numbers, Fits and Tolerances, Engineering materials, Ferrous, Non-ferrous, Non-metals, Indian standard specifications for Ferrous materials, Fundamentals of Machine Design, Allowable stress, Factor of safety, Use of Code/Data books.
Design of Joints: Riveted joints, Boiler joints, Welded and bolted joints based on different types of loading. Illustrative problems with solutions.

Module-II (14 hours)
Design of Cotter joints with socket and spigot, with a Gib. Design of knuckle joint. Illustrative problems with solutions.
Design of shafts, solid and hollow based on strength and on rigidity. Illustrative problems with solutions.
Design of keys and pins, Suck key, Feather key, Taper pin. Illustrative problems with solutions.
Design of shaft couplings : Rigid Flange coupling, Flexible Flange coupling.

Module-III (14 hours)
Design of circular section, Helical springs, Tension and compression types, Design of leaf springs: Cantilever and semi-elliptical types. Illustrative problems with solutions.
Levers, classification, Design of Foot levers, Hand lever, Cranked lever, Lever of lever loaded - safety - valve. Design of belt and pulley Power screw design with square thread, such as screw jack. Illustrative problems with solutions.
[Only specified data book as mentioned in the syllabus is permitted during examination]

TEXT BOOKS:
1. Mechanical Engineerng Design, J.E.Shigley, C.R.Mischke, R.G.Budynas and K.J.Nisbett, TMH
2. Machine Design, P.Kanaiah, Scietech Publications

REFERENCE BOOKS:

1. Design of Machine Elements, V.B. Bhandari, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2nd Edition 2007.

2. Machine Design, P.C.Sharma and D.K.Agrawal, S.K.Kataria & Sons

3. Machine Design, Pandya and Shah, Charotar Book Stall

4. Machine Design, Robert L. Norton, Pearson Education Asia, 2001.

5. Machine Design, A CAD Approach: Andrew D Dimarogonas, John Wiley Sons, Inc, 2001.

6. Fundamentals of Machine Component Design, Robert C. Juvinall and Kurt M Marshek, Wiley India Pvt. Ltd., New Delhi, 3rd Edition, 2007

7. A Text Book of Machine Design, R.S.Khurmi and J.K.Gupta, S.Chand Publication

8. Machine Design, H.Timothy and P.E.Wentzell, Cengage Learning

9. Computer Aided Analysis and Design, S.P.Regalla, I.K.International Publishing

DESIGN DATA HAND BOOKS:

1. P.S.G.Design Data Hand Book, PSG College of Tech Coimbature

2. Design Data Hand Book, K. Lingaiah, McGraw Hill, 2nd Ed. 2003.3. Design Hand Book by S.M.Jalaluddin ; Anuradha Agencies Publications

PRINCIPLE OF MACHINE TOOLS

Module-1   **14 Hrs**

conventional machining process and machine tools-Turning, Drilling, Shaping, Planning, Milling, Grinding Machine tools for these processes, their specifications and various techniques used, calculation of cutting time, speed, feed ,MRR etc.

Module-2

principle of machine tools: kinematics of machine tools ,speed transmission from motor to spindle, speed reversal mechanism, mechanism for feed motion, Tool holding and job holding methods in different machine tools, Types of surface generated, Indexing mechanism and thread cutting mechanism, Quick return mechanism.

Module-3

Production Machine tools-Capstan and turret lathes, single spindle and multi spindle semiautomatics, Gear shaper and Gear hopping machines, Coping lathe and transfer machine

PROFESSIONAL ELECTIVE-I
PEMF5302 ADVANCED CASTING & WELDING (3-0-0)

MODULE- I   (12 hours)

MELTING AND POURING: Principles of melting practice-fluxing- Degasification and inoculation- types of furnaces- Crucibles, Cupola, Oil fired furnaces - Electric arc and induction furnaces -Melting practice of cast iron, SG iron, steel, aluminium and copper alloys.

CASTING DESIGN: Solidification of pure metals and alloys-shrinkage in cast metals-design of sprue, runner, gate and risers-problems in design and manufacture of thin and unequal sections designing for directional solidification, minimum distortion and for overall economy - design problems of L, T, V, X and Y junctions.

MODULE II   (10 hours)

WELD DESIGN AND WELDING METALLURGY: Design of welded components-symbolic representation of welds on drawings- welding classes-residual stresses in welds-weld distortions-design consideration-strength consideration of welded joints-analysis of statistically loaded welded joints-welded structures subjected to fatigue loads.

MODULE III   (12 hours)

SPECIAL CASTING AND WELDING PROCESSES: Evaporative pattern casting-ceramic mould casting - electro magnetic moulding-squeeze casting -investment casting-shell moulding- PAW-electron beam welding-laser beam welding- friction welding-ultrasonic welding - diffusion welding-high velocity oxy fuel processes

QUALITY CONTROL AND AUTOMATION : Cleaning and inspection of castings - Casting defect and remedies - foundry automations-moulding machines-Automation of sand plant, moulding and fettling sections of foundry-Dust and fume control-Welding defects -causes and remedies - Non Destructive tests - arc welding using robots-weld positioner and manipulators -weld seam tracking-vision system-arc sensing welding

TEXT BOOKS
1. PARMAR, R.S., Welding Processes and Technology, Khanna Publishers, 1997.
2. JAIN, P.L., Principles of Foundry Technology, Tata McGraw Hill, 2003.
REFERENCES
1. A.S.M Hand book, vol 15, casting, ASM international, 1988
2. KLAS WEMAN, welding processes hand book, CRC press, 2003
3. CARY and HOWARD,B., Modern Welding Technology, Prentice-Hall, 1989.
4. HEINE, R.W., LOPER.L.R., and ROSENTHAL,C, Principles of Metal Casting, TMH
5. MINKOFF,J., solidification and cast structure,wiley.1986
6. DAVIES, A.C., Welding (10th Edition), Cambridge University Press, 1996.

PEMF5303 MAINTENANCE ENGINEERING & MANAGEMENT (3-0-0)

MODULE- I (12 hours)

MAINTENANCE CONCEPTS:

Objectives and functions - Tero technology - Reliability Centered Maintenance (RCM) - maintainability prediction - availability and system effectiveness- maintenance costs - maintenance organization, Minimal repair - maintenance types - balancing PM and breakdown maintenance- PM schedules: deviations on both sides of target values - PM schedules: functional characteristics - replacement models

MODULE- II (10 hours)

TOTAL PRODUCTIVE MAINTENANCE: Zero breakdowns - Zero Defects and TPM - maximizing equipment effectiveness - autonomous maintenance program - five pillars of TPM - TPM small group activities - TPM organization - management decision - educational campaign - creation of organizations - establishment of basic policies and goals - formation of master plan. - TPM implementation

MODULE- III (13 hours)

MAINTENANCE LOGISTICS : Human factors in maintenance - maintenance manuals - maintenance staffing methods - queuing applications - simulation - spare parts management - maintenance planning and scheduling

DIAGNOSTIC MAINTENANCE: Leak detection-wear monitoring-Temperature monitoring Vibration monitoring-Signature analysis-Shock monitoring-Lubricant-Analysis-Methodology-Equipments-Applications

ONLINE MONITORING: Condition Monitoring Techniques- Vibration Monitoring, Signature Analysis - Wear Debris Monitoring - Maintenance Management Information System - Expert systems - Corrosion Monitoring and Control

TEXT BOOKS

1. Seiichi Nakajima, Introduction to TPM, Productivity Press, Chennai, 1992.

2. Gopalakrishnan, P. and Banerji, A.K., Maintenance and Spare Parts Management,

3. Prentice - Hall of India Pvt. Ltd., 1991.

REFERENCES
1. Goto, F., "Equipment planning for TPM Maintenance Prevention Design", Productivity Press, 1992.
2. Shirose, K., "Total Productive Maintenance for Workshop Leaders", Productivity Press, 1992.
3. Shirose, K., "TPM for Operators", Productivity Press, 1996.
4. Suzuki, T., "New Directions for TPM", Productivity Press, 1993.
5. Kelly, A.., "Maintenance Planning and Control", Butterworth, London, 1991.

PEMF5404RAPID PROTOTYPING (3-0-0)

MODULE -I (12 hours)

INTRODUCTION: History - Development of RP systems - Applications in Product Development, Reverse Engineering, Rapid Tooling, Rapid Manufacturing- Principle - Fundamental - File formatOther translators - medical applications of RP - On demand manufacturing - Direct material deposition - Shape Deposition Manufacturing.

LIQUID BASED AND SOLID BASED RAPID PROTOTYPING SYSTEMS: Classification - Liquid based system - Stereo lithography Apparatus (SLA), details of SL process, products, Advantages, Limitations, Applications and Uses. Solid based system- Fused Deposition Modeling, principle, process, products, advantages, applications and uses - Laminated Object Manufacturing

MODULE -II (11hours)

POWDER BASED RAPID PROTOTYPING SYSTEMS: Selective Laser Sintering - principles of SLS process, principle of sinter bonding process, Laser sintering materials, products, advantages, limitations, applications and uses. Three Dimensional Printing - process, major applications, research and development. Direct shell production casting -key strengths, process, applications and uses, case studies, research and development. Laser Sintering System, e-manufacturing using Laser sintering, customized plastic parts, customized metal parts, e-manufacturing - Laser Engineered Net Shaping (LENS).

MODULE -III (12hours)

MATERIALS FOR RAPID PROTOTYPING SYSTEMS: Nature of material - type of material - polymers, metals, ceramics and composites liquid based materials, photo polymer development -solid based materials, powder based materials - case study.

REVERSEENGINEERING AND NEW TECHNOLOGIES :Introduction, measuring device- contact type and non-contact type, CAD model creation from point clouds-pre-processing, point clouds to surface model creation, medical data processing - types of medical imaging, software for making medical models, medical materials, other applications - Case study.

TEXT BOOKS

1. Rafiq I. Noorani, Rapid Prototyping - Principles and Applications, Wiley & Sons, 2006.
2. Chua C.K, Leong K.F and Lim C.S, Rapid Prototyping: Principles and Applications, second edition, World Scientific, 2003.

REFERENCES

1. N.HOPKINSON, R.J.M, HAUGE, P M, DICKENS, "Rapid Manufacturing - An Industrial revolution for the digital age", Wiley, 2006
2. IAN GIBSON, "Advanced Manufacturing Technology for Medical applications: Reverse Engineering, Software conversion and Rapid Prototyping", Wiley, 2006
3. Paul F.Jacobs, Rapid Prototyping and Manufacturing, "Fundamentals of Stereo lithography", McGraw Hill 1993.
4. D.t.Pham and S.S.Dimov, "Rapid Manufacturing", Springer Verlog 2001.

PEME5408 COMPOSITE MATERIALS

Module - I   **(14 hours)**

1. Introduction :

Classification and characteristics of composite materials, mechanical behaviour of composites, constituents, Reinforcements, Matrices, Fillers, Additives, Applications and advantages of composites.

2. Processing :

Initial form of constituent materials, Manufacturing procedures for fibre-reinforced plastics, quality control.

3. Macromechanical Behaviour :

Stress strain relations of anisotropic materials - Engineering constants for orthotropic materials, Stress strain relations for specially orthotropic lamina. Transformation relationships for a lamina of arbitrary fibre orientation.

Module - II   **(12 hours)**

Testing of Composites, Evaluation of Engineering Constants and Strengths.

Micromechanical Analyses of orthotropic lamina, Evaluation of Engineering Constants using Micromechanical principles, Rules of Mixtures, Kelly Davis Model for Minimum and Critical Volume Fractions.

Module - III   **(10 hours)**

FRP Composite Laminate designation and codes, Macromechanical Behaviour of FRP Composite Laminates, Classical Lamination Theory.

General Design Consideration and Suitable laminating Scheme.

Text Book

1. Mechanics of Composite Materials, R.M. Jones, Mc. Graw Hill Book Co.

Reference Book :

1. Fibre - Reinforced composites :- Materials, manufacturing and Design by P.K. Mallick, CRC Press.

2. Engineering Mechanics of Composite Materials, I.M.Danel, O.Issai, Oxord University Press

3. Composite materials, Broutman & Crock,

4. Principles of Composite Material Mechanics, R.F.Gibson, CRC Press

FEME6302 PROJECT MANAGEMENT

Module-I

Project Management Concepts and Needs Identification Attributes of a Project, Project Life Cycle, The Project management Process, Benefits of Project Management, Needs Identification, Project Selection, Project organization, the project as part of the functional organization. Project feasibility Analysis: Technical feasibility, commercial and financial visibility, Environment Analysis.

Module-II

Project Planning and Scheduling: Design of project management system; project work system; work breakdown structure,
project execution plan, work packaging plan, project procedure manual; project scheduling;
bar charts, line of balance (LOB) and Network Techniques (PERT / CPM)/ GERT, Resource
allocation, Crashing and Resource Sharing, capacity planning and expansion capacity
decision.

Module III

Project Monitoring and Control and Project Performance Planning, Monitoring and Control; Design of monitoring system; Computerized PMIS (Project Management Information System). Coordination; Procedures, Meetings, Control; Scope/Progress control, Performance control, Schedule control, Cost control, Performance Indicators; Project Audit; Project Audit Life Cycle, Responsibilities of Evaluator/ Auditor, Responsibilities of the Project Manager.

Books:

1. Project Planning, Analysis, Selection, Financing, Prasana Chandra, TMH

2. Project Management, Grey, TMH.

3. Project Management, Richman, PHI

4. Project Management, Vasant Desai, HPH

5. Project Management, Bhavesh M.Patel, Vikash

6. Project Engineering & Management- Prasanna Chandra, Prentice Hall.

PEME5304   TRIBOLOGY

MODULE- I   (12 hours)

Study of various parameters: Viscosity, flow of fluids, viscosity and its variation -absolute and kinematic viscosity, temperature variation, viscosity index determination of viscosity, different viscometers used. Hydrostatic lubrication: Hydrostatic step bearing, application to pivoted pad thrust bearing and other applications, hydrostatic lifts, hydrostatic squeeze films and its application to journal bearing.

MODULE -II   (11 hours)

Hydrodynamic theory of lubrication: Various theories of lubrication, petroffs equation, Reynold's equation in two dimensions -Effects of side leakage - Reynolds equation in three dimensions, Friction in sliding bearing, hydro dynamic theory applied to journal bearing, minimum oil film thickness, oil whip and whirl anti -friction bearing.

MODULE- III   (12 hours)

 Concept of gas lubricated bearing -Concept of Elastohydrodynamic lubrication -Friction and power losses in journal bearings: Calibration of friction loss friction in concentric bearings, bearing modulus, Sommerfield number, heat balance, practical consideration of journal bearing design considerations. Air lubricated bearing: Advantages and disadvantages application to Hydrodynamic journal bearings, hydrodynamic thrust bearings. Hydrostatic thrust bearings. Hydrostatic bearing Analysis including compressibility effect. Bearing materials: General requirements of bearing materials, types of bearing materials.

TEXT BOOKS:

1. Fundamentals of Tribology, Basu, SenGupta and Ahuja/PHI

2. Tribology in Industry: Sushil Kumar Srivatsava, S. Chand &Co. REFERENCE:

1. Introduction to Tribology of Bearings - B.C. Majumdar, S. Chand & Co.

2. Tribology - Hutchins, Asterix Publishers(1992)

3. Tribology - Lambert M Surhone, Miriam T Timpledon, Susan F Marseken, Betascript Publishing(2010)

BECS2212 C++ AND OBJECT ORIENTED PROGRAMMING

Module I   (08 hrs)
Introduction to object oriented programming, user defined types, structures, unions, polymorphism, encapsulation. Getting started with C++ syntax, data-type, variables, strings, functions, default values in functions, recursion, namespaces, operators, flow control, arrays and pointers.

Module II   (16 hrs)
Abstraction mechanism: Classes, private, public, constructors, destructors, member data, member functions, inline function, friend functions, static members, and references.
Inheritance: Class hierarchy, derived classes, single inheritance, multiple, multilevel, hybrid inheritance, role of virtual base class, constructor and destructor execution, base initialization using derived class constructors.
Polymorphism: Binding, Static binding, Dynamic binding, Static polymorphism: Function Overloading, Ambiguity in function overloading, Dynamic polymorphism: Base class pointer, object slicing, late binding, method overriding with virtual functions, pure virtual functions, abstract classes.
Operator Overloading: This pointer, applications of this pointer, Operator function, member and non member operator function, operator overloading, I/O operators.
Exception handling: Try, throw, and catch, exceptions and derived classes, function exception declaration.

Module III   (08 hrs)

Dynamic memory management, new and delete operators, object copying, copy constructor, assignment operator, virtual destructor.
Template: template classes, template functions.
Namespaces: user defined namespaces, namespaces provided by library.

Text Books:
  1.   Object Oriented Programming with C++ - E. Balagurusamy, McGraw-Hill Education (India)
  2.   ANSI and Turbo C++ - Ashoke N. Kamthane, Pearson Education

Reference Books:

  1.   Big C++ - Wiley India
  2.   C++: The Complete Reference- Schildt, McGraw-Hill Education (India)
  3.   "C++ and Object Oriented Programming" - Jana, PHI Learning.
  4.   "Object Oriented Programming with C++ "- Rajiv Sahay, Oxford
  5.   Mastering C++ - Venugopal, McGraw-Hill Education (India)

"Object Oriented Programming with C++", David Parsons, Cengage Learning.

PCMF7302   MACHINE DESIGN SESSIONAL (0-0-3)

LIST OF EXPERIMENTS:

1. Design of coupling -Rigid & flexible type
2. Design of riveted joints (under axial & eccentric loading)
3. Design of Welded joints (under axial & eccentric loading)
4. Design of cotter & knuckle joint
5. Design & Analysis of leaf & Helical springs under various loading
6. Design of Piston
7. Design of Connected rod/crankshaft,
8. Design of Spur gear under various loading
9. Design of Helical & bevel gear under various loading
10. Design of Screw Jack under various loading
11. Practice in computer aided design of some of the above mentioned design using 3D Software

PCMF 7303   MANUFACTURING LABORATORY - III   (0-0-3)
(DYNAMIC LAB)

LIST OF EXPERIMENTS:
1. a) Study of gear parameters.
   b) Experimental study of velocity ratios of simple, compound, Epicyclic and differential
   20 gear trains.
2. a) Kinematics of Four Bar, Slider Crank, Crank Rocker, Double crank, Double rocker,
   Oscillating cylinder Mechanisms.
   b) Kinematics of single and double universal joints.
3. a) Determination of Mass moment of inertia of Fly wheel and Axle system.
   b) Determination of Mass Moment of Inertia of axis symmetric bodies using Turn   Table apparatus.
   c) Determination of Mass Moment of Inertia using bifilar suspension and   compound pendulum.
4. Motorized gyroscope - Study of gyroscopic effect and couple.
5. Governor - Determination of range sensitivity, effort etc., for Watts, Porter, Proell,
   and Hartnell Governors.
6. Cams - Cam profile drawing, Motion curves and study of jump phenomenon
7. a) Single degree of freedom Spring Mass System - Determination of natural
   frequency and verification of Laws of springs - Damping coefficient determination.
   b) Multi degree freedom suspension system - Determination of influence coefficient.
8. a) Determination of torsional natural frequency of single and Double Rotor systems.-
   Undamped and Damped Natural frequencies.
   b) Vibration Absorber - Tuned vibration absorber.
9. Vibration of Equivalent Spring mass system - Undamped and damped vibration.
10. Whirling of shafts - Determination of critical speeds of shafts with concentrated Loads.
11. a). Balancing of rotating masses.
    b). Balancing of reciprocating masses.
12. a) Transverse vibration of Free-Free beam - with and without concentrated masses.
    b) Forced Vibration of Cantilever beam - Mode shapes and natural frequencies.
    c) Determination of transmissibility ratio using vibrating table.

PCMF7305 METALLURGY & NON DESTRUCTIVE TESTING LAB.

1. Microstructure analysis of steel (Mild, Medium carbon, High carbon, Hardened & Spheroidised Steel), Cast iron

2. Jominy and Quench test apparatus

3. Microstructure analysis of Non ferrous alloys

4. Heat treatment of steel

5. Cooling curve experiment

6. Liquid penetrant test

7. Ultrasonic flaw detection

8. Magnetic particle testing

9. Eddy current testing.

B.Tech(Production Engineering) Syllabus For Admission Batch 2014-15

5th SEMESTER				6th SEMESTER			
Theory		Contact Hrs	Credit	*Theory*		Contact Hrs	Credit
		L-T-P				**L-T-P**	
HSSM 3302	Optimization Engineering	3-0-0	3	PCME 4404	Production and Operation Management	3-0-0	3
HSSM 3303	Environmental Engineering and Safety	3-0-0	3	PCMF 4302	Tool Design	3-0-0	3
PCME 4303	Design of Machine Elements	3-0-0	3	PCME 5306	CAD/CAM	3-0-0	3
PCPR 4301	Principle of Machine Tools	3-0-0	3	PCMF 4301	Materials Deformation Process	3-0-0	3
	Professional Elective - I (Any one)	3-0-0	3		Professional Elective - II (Any one)	3-0-0	3
PEMF 5302	Advanced Casting and Welding			FEME 6301	Finite Element Methods		
PEMF 5303	Maintenance Engineering and Management			PETX 5412	Management Information System		
PEME 5303	Rapid Prototyping			PEME 5305	Robotics and Robotics Apllication		
	Free Elective - I (Any one)	3-0-0	3		Free Elective - II (Any one)	3-0-0	3
PEME 5408	Composite Material			PEME 5308	Non Conventional Energy Sources		
FEME 6302	Project Management			FEME 6303	Heat Power Engineering		
PEME 5304	Tribology			PEIT 5301	E Commerce		
BECS 2212	C++ and Object Oriented Programming						
	Credits (Theory)		18		Credits (Theory)		18
	PRACTICALS/SESSIONALS				*PRACTICALS/SESSIONALS*		
PCMF 7305	Metallurgy and NDT Lab	0-0-3	2	PCMF 7304	Tool Design Sessional	0-0-3	2
PCMF 7302	Machine Design Sessional	0-0-3	2	PCPR 7301	NTM Lab	0-0-3	2
PCMF 7305	Manufacturing Lab-3(Machine Shop)	0-0-3	2	PCMF 7301	Manufacturing Lab-4	0-0-3	2
	Credits (Practicals / Sessionals)		6		Credits (Practicals / Sessionals)		6
	TOTAL SEMESTER CREDITS 24				TOTAL SEMESTER CREDITS 24		
	TOTAL CUMULATIVE CREDITS 133				TOTAL CUMULATIVE CREDITS 157		

PRODUCTION & OPERATION MANAGEMENT

Objective : The course aims at acquainting all engineering graduates irrespective of their specializations the basic issues and tools of managing production and operations functions of an organization.

Module I

1. Operations Function in an Organization, Manufacturing Vrs Service Operations, System view of Operations, Strategic Role of Operations, Operations Strategies for Competitive Advantage, Operations Quality and Productivity Focus, Meeting Global Challenges of Production and Operations Imperatives. **(3 Hours)**

2. Designing Products, Services and Processes: New Product Design- Product Life Cycle, Product Development Process, Process Technology : Project, Jobshop, Batch, Assembly Line, Continuous Manufacturing; Process Technology Life Cycle, Process Technology Trends, FMS, CIM, CAD, CAM; Design for Services, Services Process Technology.
(4 Hours)

3. Work Study: Methods Study- Techniques of Analysis, recording, improvement and standardization; Work Measurement : Work Measurement Principles using Stopwatch Time Study, Predetermined Motion Time Standards and Work Sampling, Standard Time Estimation. **(4 Hours)**

Module II

4. Location and Layout Planning : Factor Influencing Plant and Warehouse Locations, Impact of Location on cost and revenues. Facility Location Procedure and Models : Qualitative Models, Breakeven Analysis, location Model, centroid method.
Layout Planning: Layout Types : Process Layout, Product Layout, Fixed Position Layout Planning, block diagramming, line balancing, computerized layout planning- overview.
Group Technology **(4 Hours)**

5. Forecasting : Principles and Method, Moving Average, weighted Moving Average, Exponential Smoothing, Winter's Method for Seasonal Demand, Forecasting Error.**(4 Hours)**

6. Manufacturing Planning and Control : The Framework and Components : Aggregate Planning, Master Production Scheduling, Rough-cut-Capacity Planning, Material Requirements Planning, Capacity Requirements Planning. **(5 Hours)**

Module III

7. Sequencing and Scheduling : Single Machine Sequencing : Basics and Performance Evaluation Criteria, Methods for Minimizing Mean Flow Time, Parallel Machines : Minimization of Makespan, Flowshop sequencing : 2 and 3 machines cases : Johnson's Rule and Jobshop Scheduling : Priority dispatching Rules. **(3 Hours)**

8. Inventory Control : Relevant Costs, Basic EOQ Model, Model with Quantity discount, Economic Batch Quantity, Periodic and Continuous Review Systems, Safety Stock, Reorder Point and Order Quantity Calculations. ABC Analysis. **(4 Hours)**

9. Modern Trends in Manufacturing : Just in Time (JIT) System : Shop Floor Control By Kanbans, Total Quality Management, Total Productive Maintenance, ISO 9000, Quality Circle, Kaizen, Poka Yoke, Supply Chain Management. **(4 Hours)**

Reference Book:

1. S.N.Chary, "Production and Operations Management", Tata McGraw Hill.
2. R. Paneerselvam, "Production and Operations Management, Prentice Hall of India.
3. Aswathappa & Bhatt – Production & Operations Management, HPH.
4. Gaither & Frazier - Operations Management, Cengage Publication
5. Russell & Taylor - Operations Management, PHI Publication
6. Chase, Aquilanno, Jacob & Agarwal - Operations Management, TMH Publication.
7. E.E. Adam and R.J. Ebert "Production and Operations Management", Prentice Hall of India

PCMF4302 TOOL DESIGN (3-0-0)

Module-I (12 hours)

INTRODUCTION: Tool design objectives - types of tools, Principles of design and construction of jigs and fixtures, principles of location and clamping, locating and clamping devices, Analysis of clamping force-Tolerance and error analysis.

JIGS: Different types of jigs-plate latch, channel, box, post, angle plate, angular post, turnover, pot jigs-Automatic drill jigs-Rack and pinion operated. Air operated Jigs components. Drill bushes Design and development of Jigs for given components.

FIXTURES: General principles of boring, lathe, milling and broaching fixtures- Grinding, planning and shaping fixtures, assembly, Inspection and welding fixtures- Modular fixtures. Design and development of fixtures for given components.

MODULE- II (12 hours)

PRESS WORKING:

Terminologies and elements of dies and strip layout. Press working terminology-Presses and press accessories-Computation of capacities and tonnage requirements. Elements of progressive, combination and compound dies: Die block-die shoe. Bolster plate-punch plate-punch holder-guide pins and bushes – strippers –knockouts-stops – pilots-Selection of standard die sets strip lay out-strip lay out calculations.

MODULE –III (11 hours)

DESIGN AND DEVELOPMENT OF DIES:

Design and development of progressive and compound dies for Blanking and piercing operations. Bending dies – development of bending dies-forming and drawing dies-Development of drawing dies. Design of tools for production of holes, surfaces of revolution, and flat surfaces like single point cutting tools, drills, form tools and milling cutters. Economics of toolings.

(Use of approved design data book is permitted)

TEXT BOOKS

1. Edward G Hoffman, Jigs & Fixture Design, Thomson – Delmar Learning, Singapore 2004
2. Donaldson. C, Tool Design, Tata McGraw-Hill, 1986

REFERENCES

1. Kempster, "Jigs & Fixtures Design, The English Language Book Society", 1978
2. Joshi, P.H., "Jigs & Fixtures, Second Edition", TMH Publishing, New Delhi 2004
3. Hiram E Grant, "Jigs and Fixture" Tata McGraw-Hill, New Delhi, 2003
3. "Fundamentals of Tool Design", CEEE Edition, ASTME, 1983
4. PSG College of Technology, Coimbatore - Design Data Handbook

PEME5302 **COMPUTER AIDED DESIGN AND COMPUTER AIDED MANUFACTURING** (3-0-0)

Module I (11 hour)
Fundamentals of CAD: Design process, Applications of computer for design, Creating the Manufacturing Database, The Design workstation, Graphical Terminal, Operator input Devices, Plotters and other devices, Central Processing Unit, Memory types.

Module II (11 hour)
Computer graphics Software and Database: Configuration, Graphics Packages, Constructing the Geometry, Transformations of geometry, Database structure and content, Wire frame versus solid modeling, Constraint– Based modeling, Geometric commands, Display control commands, Editing.

Module III (14 hour)
CAM - Numerical Control and NC Part Programming: Numerical Control, Numerical Control elements, NC Cordinate system, NC motion control system, Manual and Computer Aided programming, the APT language, Miscellaneous Functions, M, Advanced part-programming methods.
Problems with conventional NC, NC technology: CNC, DNC, Combined DNC/ CNC system, Adaptive control manufacturing systems, Computer Integrated Manufacturing system, Machine Tools and related equipment, Materials Handling system: AGV, Robots, Lean manufacturing.

Text Books
1. CAD/CAM Computer Aided Design and Manufacturing, M.P.Goover and E.W.Zimmers, Jr., Pearson

Reference Books
1. CAD/CAM Theory and Practice, Zeid and Subramanian, TMH
2. CAD/CAM Principles, Practice and Manufacturing Management, McMahon and Browne, Pearson Education
3. CAD/CAM Concepts and Applications, C.R.Alavala, PHI
4. Computer Aided Design and Manufacturing, Lalit Narayan, Mallkarjuna Rao and Sarcar, PHI
5. CAD/CAM Theory and Conepts, K.Sareen and C.Grewal, S.Chand Publication
6. CAD/CAM/CAE, N.K.Chougule, Scitech
7. Principle of Interactive Computer Graphics, W.W.Newman, R.F.Sproull, TMH

PCMF4301 MATERIALS DEFORMATION PROCESSES (3-1-0)

MODULE I (16 hours)

INTRODUCTION TO METAL FORMING**:** Classification of Forming Processes - Temperature in Metal working - Hot and Cold working - Introduction to the theory of Plastic Deformation.

THEORY AND PRACTICE OF BULK FORMING PROCESSES **:**Analysis of plastic deformation in Forging, Rolling, Extrusion and rod/wire drawing processes - Effect of friction, calculation of forces, work done - Process parameters, equipment used - Defects - applications - Recent advances in Forging, Rolling, Extrusion and drawing processes - Experimental techniques of evaluation of friction in metal forming.

MODULE II (14 hours)

SHEET METAL FORMING: Conventional processes - H.E.R.F. techniques - Super plastic forming techniques - Principles and process parameters - Advantages, limitations and applications.

SPECIAL FORMING PROCESSES: Orbital forging - Isothermal forging - Hot and cold Isostatic pressing - High speed extrusion - Rubber pad forming - Water hammer forming - Fine blanking.

MODULE III (10 hours)

POWDER METALLURGY FORMING**:** Overview of P/M technique - Advantages - applications - Powder perform forging - powder rolling - Tooling and process parameters.

TEXT BOOK

1. George E. Dieter, Mechanical Metallurgy, McGraw Hill International Book Company, 1988.

REFERENCES

1. Schuler - Metal forming hand book - Springer verlag publication, 1998.
   Hosford, WF and CAD Dell, R.M. - Metal forming : Mechanics and Metallurgy,
2. Prentice Hall, Englewood Cliffs, 1993.
3. Narayanasamy,R - Theory of Metal Forming Plasticity, Narosa Publishers, New Delhi Nagpal,G.R - Metal Forming Processes, Khanna Publishers, 1988.
4. Chakrabarthy,J - Theory of Plasticity, McGraw Hill Co, 1987.
5. Altan T - Metal Forming - Fundamentals and applications - American Society of Metals.

FEME6301 FINITE ELEMENT METHODS (3-0-0)

Module – I (12 hours)

Review of 2-D and 3-D stress analyses, vibration, fluid flow and heat conduction problems. FEM fundamental concepts, Variational principles, Rayleigh Ritz and Galerkin Methods.

Finite Element Modeling of one dimensional problems.

Finite Element Analysis of 2-D and 3-D framed structures.

Module – II (12 hours)

FEM formulation of 2-D and 3-D stress analysis problems.

Axisymmetric solids subjected to axisymmetric loadings.

Two-dimensional isoparametric elements and numerical integration.

Module – III (12 hours)

FE modeling of basic vibration problems

Finite element modeling of fluid flow and heat conduction problems

Computer programs: preprocessing and post processing.

Exposure to commercial FE codes such as ANSYS, NASTRAN and IDEAS etc.

Text Books

1. Finite Elements in Engineering, T.R.Chandraputla and A.D.Belegundu, PHI

2. The Finite Element Method – Its Basis & Fundamentals, Zienkiewicz, Taylor and Zhu, Elsevier, 6th Edn

Reference

1. Introduction to Finite Element Method, C.Desai and J.F.Abel, CBS publishers
2. Introduction to Finite Element Method, J.N.Reddy, Tata McGraw Hill
3. Numerical Methods in Finite Element Analysis, K.J.Bathe and E.L.Wilson, PHI
4. Concepts & Applications of Finite Element Analysis,Cook, D.S.Malkus & M.E.Plesha, Wiley
5. The Finite Element Method in Engineering, S.S.Rao, Elsevier
6. A First Course in the Finite Element Method, D.L.Logan, Cengage Learning
7. Fundamentals of Finite Element Analysis, David V. Hutton, Tata McGraw Hill

PETX5412 MANAGEMENT INFORMATION SYSTEM

Module – I (12 hours)

Overview: Definition of MIS, Data processing and MIS, Characteristics of MIS, Need / importance of MIS in organization, Limitations of MIS; MIS and other disciplines

Data and Information; Characteristics of Information; Types of Information – Operational, Tactical and Strategic information; Managers as Information Processors;

System Approach: MIS as a system, Sub-systems of MIS – Activity sub-systems, Functional sub-system

Decision Making: Decision-making under certainty, risk and uncertainty; Phases of Decision-making Process; Decision Models - Classical Economic Model, Administrative Model; Organizational Decision-making

Planning for development of MIS: Feasibility Analysis – Technical, Economic, Motivational, Schedule and Operational Feasibility; MIS development as a project;

Module – II (12 hours)

Overview of System Life Cycle Models – Waterfall model, Prototyping model and Spiral model

System Analysis and Design (SAD): Purpose, Requirement engineering, Typical content of System Requirement Specification (SRS), System Design – high level design and low level design, Characteristics of good design – coupling and cohesion

Overview of tools used in SAD – Context diagram, Data Flow Diagram (DFD), Data Dictionary, ER diagram, Structure charts, HIPO documentation, Decision Table, Decision Tree, Pseudocode

Module – III (12 hours)

MIS in Organization: MIS in Marketing; Manufacturing; HRM; Accounting and Finance, Enterprise Resource Planning (ERP) System.

Business Intelligence (BI): Role of BI in marketing, finance, human resource, and manufacturing; Overview of DSS, Data Mining and Data Warehouse

Implementation of MIS: Critical Success Factor

Information System Security, Privacy, Social and Ethical issues

Books:
1. Management Information Systems, M Jaiswal& M Mital, Oxford Univ. Press
2. Information Systems for Modern Management, Murdick, Ross &Claggett, PHI
3. Management Information System, Launden&Launden, Pearson
4. Management Information System, James O Brian, TMH
5. Management Information Systems, A K Gupta, Sultan Chand & Sons
6. Management Information System, Jawadekar, McGraw Hill

PEME5305 **ROBOTICS & ROBOT APPLICATIONS** (3-0-0)

Module – I

1. Fundamentals of Robotics: Evolution of robots and robotics, Definition of industrial robot, Laws of Robotics, Classification, Robot Anatomy, Work volume and work envelope, Human arm characteristics, Design and control issues, Manipulation and control, Resolution; accuracy and repeatability, Robot configuration, Economic and social issues, Present and future application.

2. Mathematical modeling of a robot: Mapping between frames, Description of objects in space, Transformation of vectors.
   Direct Kinematic model: Mechanical Structure and notations, Description of links and joints, Kinematic modeling of the manipulator, Denavit-Hartenberg Notation, Kinematic relationship between adjacent links, Manipulator Transformation matrix.

Module – II

3. Inverse Kinematics: Manipulator workspace, Solvable of inverse kinematic model, Manipulator Jacobian, Jacobian inverse, Jacobian singularity, Static analysis.
4. Dynamic modeling: Lagrangian mechanics, 2D- Dynamic model, Lagrange-Euler formulation, Newton-Euler formulation.
5. Robot Sensors: Internal and external sensors, force sensors, Thermocouples, Performance characteristic of a robot.

Module – III

6. Robot Actuators: Hydraulic and pneumatic actuators, Electrical actuators, Brushless permanent magnet DC motor, Servomotor, Stepper motor, Micro actuator, Micro gripper, Micro motor, Drive selection.
7. Trajectory Planning: Definition and planning tasks, Joint space planning, Cartesian space planning.
8. Applications of Robotics: Capabilities of robots, Material handling, Machine loading and unloading, Robot assembly, Inspection, Welding, Obstacle avoidance.

Text Books:
1. Robotics and Control, R.K. Mittal and I.J. Nagrath, Tata McGraw Hill
2. Introduction to Robotics: Mechanics and control, John J Craig, PHI
3. Robotics Technology and Flexible Automation, S.R.Deb and S. Deb, TMH

Reference Books:
1. Introduction to Robotics, S. K. Saha, Tata McGraw Hill
2. Robotics: Control, Sensing, Vision and Intelligence, K.S.Fu, R.C.Gonzalez and C.S.G.Lee, McGraw Hill
3. Robotics, Appuu Kuttan K.K., I.K. international
4. Robot Dynamics and Control, M.W.Spong and M. Vidyasagar , Wiley India.
5. Industrial Robotics Technology, programming and application, M.P.Groover, TMH.
6. Introduction to Robotics: Analysis, Systems, Applications, S.B.Niku, PHI
7. Robotics: Fundamental Concepts and Analysis, A. Ghosal, Oxford University Press
8. Fundamentals of Robotics: Analysis and Control, R. J. Schilling, PHI
9. Robotic Engineering: An Integrated Approach, R.D. KLAFTER, T. A. Chmielewski, and M. Negin, PHI
10. Robot Technology: Fundamentals: J. G. Keramas, Cengage Learning

PEME5308 NON-CONVENTIONAL ENERGY SOURCES (3-0-0)

Module I (10 Hours)

Energy, Ecology and environment: Introduction, Classification of Energy Resources, Common Forms of Energy, Energy Chain, Advantages and Disadvantages of Conventional Energy Sources, Importance and Salient Features of Non-Conventional Energy Sources, Environmental and ecological Aspects of Energy use, Environment-Economy-Energy and Sustainable Development, World Energy Status, Energy Scenario in India.

Energy Conservation and Energy Storage: Salient Features of "Energy Conservation Act, 2001", Various Aspects of Energy Conservation, Principles of Energy Conservation, General Electrical ECO's (Energy Conservation Opportunities),

Solar Energy: Basics, The Sun as a Source of Energy, Sun, Earth Radiation Spectrums, Extraterrestrial and Terrestrial Radiations, Spectral Energy Distribution of Solar Radiation, Depletion of Solar Radiation, Measurements of Solar Radiation, Solar Time (Local Apparent Time), Solar Radiation Geometry, Solar Day Length, Empirical Equations for Estimating Solar Radiation(Hourly Global, Diffuse and Beam Radiations) on Horizontal Surface Under Cloudless and Cloudy Skies, Solar Radiation on Inclined Plane Surface only (empirical relations for numerical)

Module II (15 Hours)

Solar Thermal Systems: Solar Collectors: Flat plate and concentric collectors, Solar Water Heater, Solar Passive Space - Heating and Cooling Systems, Solar Refrigeration and Air-Conditioning Systems, Solar Cookers, Solar Furnaces, Solar Green House, Solar Dryer, Solar Distillation (or Desalination of Water),

Solar Photovoltaic Systems: Solar Cell Fundamentals, Solar Cell Characteristics, Solar Cell Classification, Solar Cell, Module, Panel and Array Construction, Solar PV Systems, Solar PV Applications.

Wind Energy: Origin of Winds, Nature of Winds, Wind Turbine Siting, Major Applications of Wind Power, Wind Turbine Types and Their Construction, Wind Energy Conversion Systems (WECS), Effects of Wind Speed and Grid Condition (System Integration),

Module III (15 Hours)

Biomass Energy: Photosynthesis Process, Usable Forms of Biomass, their Composition and Fuel Properties, Biomass Resources , Biomass Conversion Technologies, Urban Waste to Energy Conversion, Biomass Gasification ,Biomass Liquefaction, Biomass to Ethanol Production, Biogas Production from Waste Biomass, Energy Farming.

Miscellaneous Non-conventional Technologies

Geothermal Energy: Applications, Origin and Distribution of Geothermal Energy, Types of Geothermal Resource.

Ocean Energy: Tidal Energy, Wave Energy, Ocean Thermal Energy

Fuel Cell Technology: Types, Principle of operation, Advantages and disadvantages.

Text Book:

1. Non Conventional Energy Sources: B.M Khan, TMH Publications

2. Renewable Energy Sources and Emerging Technology: D.P.Kothari and etal., PHI

3. Renewable Energy Sources & Conversion Technology: N.K.Bansal, Manfred Kleenman & Michael Meliss, TMH Publication.

Reference:

1. Renewable Energy Sources:Fundamentals & Applications:G.N.Tiwari & M.K.Ghosal, Narosa Pub
2. Non Conventional Energy Resources: D.S. Chauhan and S.K.Srivastava, New Age International
3. Non Conventional Energy Sources: H.P.Garg

4. Non-Conventional Energy Systems: G.D.Rai, Khanna publications

FEMF6303 HEAT POWER ENGINEERING (3-0-0)

Module I (12 Hrs)

Water tube & fire tube boilers, circulating principles, forced circulation, critical pressure, superheaters, 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.

Module II (12 Hrs)

Rotary thermodynamic devices – steam turbines & their classifications – impulse & reaction type turbines, thermodynamics of compressible fluid-flow, equation and continuity – isentropic flow through nozzles, velocity diagram, blade efficiency, optimum velocity ratio, multi-staging, velocity & pressure compounding,

Module III (11 Hrs)

losses in turbines, erosion of turbine blades, turbine governing, performance analysis of turbine, condensing system.Ic engines – classification. Analysis of a standard cycle, fuel characteristic of si & ci engine, combustion, engine performance. Automotive engine exhaust emission and their control. Gas turbine analysis – regeneration - reheating, isentropic efficiency. Combustion efficiency.

Text books:

1. P.k.Nag- Engineering Thermodynamics – TMH ,2nd Ed.
2. P k Nag- power plant engg. - TMH publication
3. P.S. Ballaney- thermal engineering – khanna pub
4. Domkundwar & Arora- power plant engineering –.dhanpat rai & co.

Reference books:

1. Cengel --- Thermodynamics , 3/e ,tmh
2. ET-WAKIL—power plant engineering , mh
3. M W ZEMANSKY & R.H.DITTMAN -heat and thermodynamics – MCGRAW HILL ,7th Ed.

PEIT5301 E COMMERCE (3-0-0)

MODULE I:

Introduction to e-business and e-commerce: Introduction, What is the difference between e-commerce and e-business?, How significant are e-commerce and e- business?, Business adoption of digital technologies for e-commerce and e-business, Introducing the B2B and B2C companies, Management responses to e-commerce and e-business.

MODULE II:

E-commerce fundamentals: Introduction, The e-commerce environment, The e- commerce marketplace, Focus on portals, Location of trading in the marketplace, Commercial arrangement for transactions, Focus on auctions, Business models for e- commerce, Revenue models, Focus on internet start-up companies-the dot-coms.

MODULE III:

E-business infrastructure: Introduction, What is the internet?, How does it work? Internet standards, Focus on who controls the internet, Managing e-business infrastructure, Focus on web service and service and service-oriented, Focus on new access devices,

Text Book:

 Dave Chaffey, "E-Business and E-Commerce Management", Third Edition, 2009, Pearson Education.

Reference Books:

1. Henry Chan, Raymod Lee and etl., "E-Commerce Fundamental and Applications", Wiley.
2. Brian Mennecke and Troy Strader, "Mobile Commerce: Technology, Theory and Applications", Idea Group, 2003.
3. Nansi Shi, "Mobile Commerce Applications", IGI Global, 2004.
4. Gary P. Schneider, "Electronic Commerce", Seventh Edition, CENGAGE Learning India Pvt. Ltd., New Delhi.
5. K. K. Bajaj, D. Nag "E-Commerce", 2nd Edition, McGraw Hill Education, New Delhi
6. P. T. Joseph, "E-Commerce an Indian Perspective", PHI Publication, New Delhi.
7. Bhaskar Bharat, "Electronic Commerce-Technology and Application", McGraw Hill Education, New Delhi

PRACTICALS/SESSIONALS
PCMF7304 TOOL DESIGN LABORATORY

TOOL DESIGN

1. Design and development of dies for Blanking and piercing operations.
2. Exercise on wire drawing die.
3. Exercise on Press tool Design.
4. Exercise on Forging Die Design.
5. Exercise on Plastics Mould Design.
   a. Two Plate / Three plate
   b. Three Plate Mould

A. SIMULATION

1. MATLAB basics, Dealing with matrices, Graphing-Functions of one variable and two variables
2. Use of Matlab to solve simple problems in vibration and Laplace Transforms

B. ANALYSIS

1. Stress analysis of a plate with a circular hole.
2. Stress analysis of rectangular L bracket

3. Stress analysis of an axi-symmetric components

4. Stress analysis of beams (Cantilever, Simply supported, Fixed ends)
5. Mode frequency analysis of a 2 D component
6. Mode frequency analysis of beams (Cantilever, Simply supported, Fixed ends)
7. Harmonic analysis of a 2D component
8. Transient analysis of spring mass system
9. Spectrum analysis of spring mass system
10. Thermal stress analysis of a axisymmetric component
11. Conductive heat transfer analysis of a 2D component
12. Convective heat transfer analysis of a 2D component

NTM Lab
"will be uploaded soon"

Manufacturing Lab-IV (NC Lab)
"will be uploaded soon"

B.Tech(Production Engineering) Syllabus For Admission Batch 2014-15

7th SEMESTER				8th SEMESTER			
THEORY		*Contact Hours*		*THEORY*		*Contact Hours*	
Code	*Subject*	*L-T-P*	*Credits*	*Code*	*Subject*	*L-T-P*	*Credits*
PCMF4402	Statistical Quality Control & Reliability	3-0-0	3	PCMF4404	Flexible Manufacturing System & Robotics	3-0-0	3
PCMF4401	Non Traditional Machining	3-0-0	3	FEMT6041	Total Quality Management	3-0-0	3
PEME 5413 PEME 5406 PEEE 5407	**Professional Elective – III(*Any One*)** Machinery Fault Diagnosis and Condition Monitoring/Simulation , Modelling and Control/Industrial Automation nad Control	3-0-0	3	PEMF5405 PEMF5406 PEMF5404	**Professional Elective – V (*Any One*)** Statistical Methods & Design of Experiments / Computer Integrated Manufacturing / Precision Engineering	3-0-0	3
PEMF 5401 PEMF5402	**Professional Elective – IV (*Any One*)** Product design and Development/Surface Engineering	3-0-0	3	FEMF6401 PETX5412 PEEE5406	**Free Elective – IV (*Any One*)** Supply Chain Management/ Management Information System / Soft Computing	3-0-0	3
FEME6401 HSSM3401 HSSM3403	**Free Elective – III (*Any One*)** Human Resources Management Entrepreneurship Development Marketing Management	3-0-0	3				
Credits (Theory)			18	**Credits (Theory)**			12
PRACTICALS/SESSIONALS				*PRACTICALS/SESSIONALS*			
PCMF7401	Project- 1	0-0-3	2	PCMF7404	Project-2	0-0-6	4
PCMF7405	Entrepreneurship Project	0-0-3	2		Comprehensive viva	0-0-3	2
PCMF7403	Seminar -1	0-0-3	2	PCMF7406	SeminarPCMF7407 Comprehensive Viva voce	0-0-3 0-0-3	2 2
Credits (Practicals / Sessionals)			6	**Credits (Practicals/Sessionals)**			10
TOTAL SEMESTER CREDITS			24	**TOTAL SEMESTER CREDITS**			22
TOTAL CUMULATIVE CREDITS			182	**TOTAL CUMULATIVE CREDITS**			204

PCMF4401 NON TRADITIONAL MACHINING (3-0-0)

MODULE -I (11 hours)

INTRODUCTION: History, Classification, comparison between conventional and Non-conventional machining process selection. Ultra sonic machining (USM): Introduction, equipment, tool materials & tool size, abrasive slurry, cutting tool system design:- Effect of parameter: Effect of amplitude and frequency and vibration, Effect of abrasive grain diameter, effect of applied static load, effect of slurry, tool & work material, USM process characteristics: Material removal rate, tool wear, Accuracy, surface finish, applications, advantages & Disadvantages of USM.

MODULE –II (12 hours)

ABRASIVE JET MACHINING (AJM): Introduction, Equipment, Variables in AJM: Carrier Gas, Type of abrasive, size of abrasive grain, velocity of the abrasive jet, mean number. Applications, advantages & Disadvantages of AJM. Water Jet Machining: Principal, Equipment, Operation, Application, Advantages and limitations of water Jet machinery

ELECTROCHEMICAL MACHINING (ECM): Introduction, study of ECM machine, elements of ECM process: Cathode tool, Anode work piece, source of DC power, Electrolyte, chemistry of the process, ECM Process characteristics – Material removal rate, Accuracy, surface finish, ECM Tooling: Applications such as Electrochemical turning, Electrochemical Grinding, Electrochemical Honing, deburring, Advantages, Limitations.

MODULE –III (12 hours)

ELECTRICAL DISCHARGE MACHINING (EDM): Introduction, machine, mechanism of metal removal, dielectric fluid, spark generator, EDM tools (electrodes) Electrode feed control, Electrode manufacture, Electrode wear , EDM tool design choice of machining operation electrode material selection, under sizing and length of electrode , machining time. Application EDM accessories / applications, electrical discharge grinding, Traveling wire EDM.

PLASMA ARC MACHINING (PAM): Introduction, equipment non-thermal generation of plasma, selection of gas, Mechanism of metal removal, PAM parameters, process characteristics. Safety precautions, Applications, Advantages and limitations.LASER BEAM MACHINING (LBM): Introduction, equipment of LBM mechanism of metal removal, LBM parameters, Process characteristics, Applications, Advantages & limitations.

TEXT BOOKS:

1. Advanced machining processes / VK Jain/ Allied Publishers

REFERENCE BOOKS:

1. Modern Machining Process / Pandey P.C. and Shah H.S./ TMH
2. New Technology / Bhattacharya A/ the Institution of Engineers, India 1984

PCMF4402 STATISTICAL QUALITY CONTROL & RELIABILITY (3-0-0)

MODULE -I (12 hours)

STATISTICAL QUALITY CONTROL:Methods and Philosophy of Statistical Process Control - Control Charts for Variables andAttributes -Cumulative sum and Exponentially weighted moving average control charts -Other SPC Techniques – Process - Capability Analysis - Six sigma concept.

ACCEPTANCE SAMPLING :Acceptance Sampling Problem - Single sampling plans for attributes – double sampling -multiple sampling - sequential sampling - Military standards - The Dodge Romingsampling plans – Random sampling.

MODULE –II (13 hours)

RELIABILITY ENGINEERING: Definition of reliability – Performance and reliability - Reliability requirements – Life Testing -Systemlife cycle – Mean time between failures – Mean time to failure - Mortality Curve -Availability – Maintainability.

FAILURE DATA ANALYSIS:Statistical failures of components – failute distributions – Bath tub curve – Negativeexponential distribution – Normal distribution - log normal distribution – Gammadistribution - Weibull distribution Life distribution measurements – Accelerated life tests - Data requirements for reliability.

MODULE –III (10 hours)

RELIABILITY PREDICTION AND MANAGEMENT:

Failure rate estimates - Effect of environment and stress - Series and Parallel systems - RDB analysis – Standby Systems - Complex Systems - Reliability demonstration testing - Reliability growth testing - Duane curve - Risk assessment – FMEA and Fault tree analysis.

TEXT BOOKS

1. Khanna, O.P., Statistical Quality Control, DhanpatRai Publications (P) Ltd., 2001.

2. Lewis, E.E., Introduction to Reliability Engineering, John Wiley and Sons, 1987.

REFERENCES

1. Mohamed Zairi, "Total Quality Management for Engineers ", Woodhead Publishing Limited 1991.

2. HarvidNoori and Russel, " Production and Operations Management - Total Quality and Responsiveness ", McGraw-Hill Inc, 1995.

3. Douglus C. Montgomery, " Introduction to Statistical Quality Control ", 2nd Edition, John Wiley and Sons, 1991.

4. Klaasssen , H.B. and Van Peppen, J.C.L., System reliability concepts and applications, Edward Arnold, 1989.

PEME5407 MECHATRONICS (3-0-0)

MODULE I: Introduction to Mechatronics Systems – Measurement Systems – Control Systems – Microprocessor based Controllers. Sensors and Transducers – Performance Terminology – Sensors for Displacement, Position and Proximity; Velocity, Motion, Force, Fluid Pressure, Liquid Flow, Liquid Level, Temperature, Light Sensors – Selection of Sensors

MODULE II: Actuation systems: Pneumatic and Hydraulic Systems – Directional Control Valves – Rotary Actuators. Mechanical Actuation Systems – Cams – Gear Trains – Ratchet and pawl – Belt and Chain Drives – Bearings. Electrical Actuation Systems – Mechanical Switches – Solid State Switches – Solenoids – D.C Motors – A.C Motors – Stepper Motors.

SYSTEM MODELS AND CONTROLLERS: Building blocks of Mechanical, Electrical, Fluid and Thermal Systems, Rotational – Transnational Systems, Electromechanical Systems – Hydraulic – Mechanical Systems. Continuous and discrete process Controllers – Control Mode – Two – Step mode – Proportional Mode – Derivative Mode – Integral Mode – PID Controllers – Digital Controllers – Velocity Control – Adaptive Control – Digital Logic Control – Micro Processors Control.

MODULE III: Programmable Logic Controllers – Basic Structure – Input / Output Processing – Programming – Mnemonics – Timers, Internal relays and counters – Shift Registers – Master and Jump Controls – Data Handling – Analogs Input / Output – Selection of a PLC Problem. DESIGN OF MECHATRONICS SYSTEM: Stages in designing Mechatronics Systems – Traditional and Mechatronics Design - Possible Design Solutions Case Studies of Mechatronics Systems, Pick and place robot – automatic Car Park Systems – Engine Management Systems.

TEXT BOOK:

1. W. Bolton, "Mechatronics", Pearson Education, Second Edition, 1999.

REFERENCE BOOKS:

1. Michael B. Histand and David G. Alciatore, " Introduction to Mechatronics and Measurement Systems", McGraw-Hill International Editions, 2000.

2. Bradley D. A., Dawson D., Buru N.C. and. Loader A.J, "Mechatronics", Chapman and Hall, 1993.

3. Dan Necsulesu, "Mechatronics", Pearson Education Asia, 2002 (Indian Reprint)

4. Lawrence J. Kamm, "Understanding Electro – Mechanical Engineering", An Introduction to Mechatronics, Prentice – Hall of India Pvt., Ltd., 2000.

5. NitaigourPremchandMahadik, "Mechatronics", Tata McGraw-Hill publishing Company Ltd, 2003

MACHINERY FAULT DIAGNOSTICS AND CONDITION MONITORING

Module – I 13 hours

Principles of Maintenance, Fault analysis planning and system availability: Failure modes, effects and criticality analysis (FMECA), Failure effects assessment (FEA), Critical areas assessment, Fault tree method, Availability concepts, Failure prediction/reliability assessment

Data Processing and Signal Analysis: Computer-Aided Data Acquisition, Time Domain Analysis, Frequency Domain Analysis - Fast Fourier Transform

Performance trend monitoring: Primary monitoring – performance, Primary and secondary performance parameters, Performance trend analysis

Module – II 12 hours

Vibration Analysis: Vibration monitoring equipment, System monitors and vibration limit detectors, vibration monitoring experience

Discrete frequencies: Introduction, Simple vibrations, Gear excitation, Rolling element bearings, Blade vibration, Fans and Pumps and Case Studies on Vibration Monitoring

Contaminant analysis: Contaminants in used lubricating oils, Carrier fluid degradation, Contaminant monitoring techniques (Wear processes), Oil degradation analysis, Abrasive particles in lubrication oil, Abrasive particle in bearings, Abrasive particle in hydraulic systems, Dissolved gas fault monitoring

Module – III 11 hours

Electric Motor Current and Signature Analysis

Non-Destructive Test and Evaluation technology: Overview:

Radiography, Ultrasonics: Principle, transducers, equipments and testing

Liquid Penetrant Test, Magnetic Particle Test, Eddy Current Test.

Other Topics: Thermal Infrared Imaging, Acoustic Emission, Leak Testing

Industrial Applications of NDE

Text Books

1. Mechanical Fault Diagnosis and Condition Monitoring by Ralph Albert Collacott, Wiley (or Chapman and Hall, 1977)

Reference Books

1. Condition Based Maintenance and Machine Diagnostics, John W Williams, Alan Davies, Paul R Drake, Springer, 2006
2. Rotating Machinery Vibration; From Analysis to Troubleshooting, Maurice L. Adams, Jr., CRC Press
3. Lubrication and Maintenance of Industrial Machinery; Best Practices and Reliability, R.M.Gresam and G.E.Totten, CRC Press
4. Vibration, Monitoring and Diagnosis: Techniques for Cost-effective Plant Maintenance by Ralph Albert Collacott, 1979, Wiley
5. Handbook on Condition Monitoring, B.K.N. Rao, Elsevier Science 1998
6. Handbook of Condition Monitoring Techniques and Methodology, M.Davies, Springer 2006
7. Vibratory Condition Monitoring of Machines", J.S.Rao, *CRC Press*, 2000
8. Vibration Monitoring, Testing, and Instrumentation, Editor(s): Clarence W. de Silva, *University of British Columbia, Vancouver, Canada*, Series: Mechanical Engineering Series, CRC Press (Taylor & Francis)
9. Non-destructive Test and Evaluation of Materials, J.Prasad and C.G.K.Nair, Tata-McGraw-Hill
10. Machinery Condition Monitoring and Trouble Shooting, John S. Mitchell

SIMULATION MODELLING & CONTROL

Module I 14 hours

Basic simulation modeling, Discrete event simulation, Simulation of queuing and te Carlo simulations.

inventory systems, Continuous, Discrete-continuous and Mon

Statistical models in simulation, Discrete and continuous distributions, Poisson process, Empirical distribution, Generation of pseudo random numbers, Analysis of simulation data, Parameter estimation, Goodness-of-fit tests, Multivariable time

series models.

Module II 12 hours

Overview of feedback control systems, Dynamics of mechanical systems, Differential equations and state variable form, Models of electromechanical, Heat-and fluid flow models, Linearization and scaling, Models from experimental data, Dynamic response using pole-zero locations, Time domain specifications, Classical 3-term controllers and its digital implementation, Stability analysis by Routh Criterion.

Modules III 10 hours

Simulation of manufacturing and material handling systems, Goals and performance measures, Modeling downtime and failures, Trace driven models, Case studies.

Text Books :

1. Discrete-Event system simulation by Jerry Banks, J.S. Carson, B.L. Nelson and D.M. Nicol (Pearson Publications).
2. Feedback control of dynamic systems by G.F. Franklin, J.D. Powell, A-Naeini, Pearson Publications.
3. Simulation modeling and analysis by A.M. Law, W.D. Kelton, Tata McGrawHill Publications.

INDUSTERIAL AUTOMATION & CONTROL

Module I: (12 Hours)

Process Control: Introduction: Process Definition, Feedback Control, PID Control, Multivariable Control. (Chapter 1 of Text Book 1)

PID Controller Tuning: Introduction, Zeigler-Nichols Tuning Method (Based on Ultimate Gain and Period, and Process Reaction Curve), Digital PID Controllers. (Chapter 13 of Text Book 2)

Module II: (15 Hours)

Special Control Structures: Cascade Control, Feedfroward Control, Feedfroward-Feedback Control Configuration, Ratio Control, Selective Control, Adaptive Control, Adaptive Control Configuration. (Chapter 10 and 11 of Text book 3)

Actuators: Introduction, Pneumatic Actuation, Hydraulic Actuation, Electric Actuation, Motor Actuators and Control Valves. (Chapter 8 of Text Book 1)

Module III: (10 Hours)

Industrial Automation: Programmable Logic Controllers: Introduction, Principles of operation, Architecture, Programming (Programming Languages, Ladder Diagram, Boolean Mnemonics) (Chapter 5 of Text Book 1)

Distributed Control: Distributed vs. Centralized, Advantages, Functional Requirements, System Architecture, Distributed Control Systems (DCS), Communication options in DCS. (Chapter 6 of Text Book 1)

Real-time Programming: Multi-tasking, Task Management, Inter-task Communication, Real-time Operating System. (Chapter 9 of Text Book 1)

Text Books:

1. Krishna Kant, "Computer-Based Industrial Control", PHI, 2009.

2. M. Gopal, "Digital Control and State Variable Methods" Tata McGraw Hill, 2003.

3. Surekha Bhanot, Process Control: Principles and Applications, Oxford university Press, 2010

Reference Books:

1. Smith Carlos and Corripio, "Principles and Practice of Automatic Process Control", John Wiley & Sons, 2006.

2. Jon Stenerson, "Industrial Automation and Process Control", Prentice Hall, 2003.

3. C. Johnson, "Process Control Instrumentation Technology", PHI, New Delhi

4. D.R. Coughnowr, "Process System analysis and Control", McGraw Hill.

PEMF5401PRODUCT DESIGN & DEVELOPMENT (3-0-0)

MODULE -I (11 hours)

Need for IPPD – Strategic importance of Product development – integration of customer,designer, material supplier and process planner, Competitor and customer – Behaviouranalysis. Understanding customer – prompting customer understanding – involvecustomer in development and managing requirements – Organization – processmanagement and improvement – Plan and establish product specifications.

CONCEPT GNERATION AND SELECTION :Task – Structured approaches – clarification – search – externally and internally –explore systematically – reflect on the solutions and processes – concept selection –methodology – benefits.

MODULE -II (14 hours)

PRODUCT ARCHITECTURE :Implications – Product change – variety – component standardization – productperformance – manufacturability – product development management – establishing thearchitecture – creation – clustering – geometric layout development – fundamental andincidental interactions – related system level design issues – secondary systems –architecture of the chunks – creating detailed interface specifications.

INDUSTRIAL DESIGN : Integrate process design – Managing costs – Robust design – Integrating CAE, CAD,CAM tools – Simulating product performance and manufacturing processeselectronically – Need for industrial design – impact – design process – investigation offor industrial design – impact – design process – investigation of customer needs –conceptualization – refinement – management of the industrial design process –

Technology driven products – user – driven products – assessing the quality of industrialdesign.

MODULE -III (10 hours)

DESIGN FOR MANUFACTURING AND PRODUCT DEVELOPMENT**:**Definition – Estimation of Manufacturing cost – reducing the component costs and

assembly costs – Minimize system complexity – Prototype basics – principles ofprototyping – planning for prototypes – Economic Analysis – Understanding andrepresenting tasks – baseline project planning – accelerating the project – projectexecution.

TEXT BOOK

    1. Kari T.Ulrich and Steven D.Eppinger,"Product Design and Development", McGrtaw-Hill International Edns. 1999.

REFERENCES

    1. KemnnethCrow,"Concurrent Engg./Integrated Product Development", DRM

    1. Associates, 26/3, Via Olivera, Palos Verdes, CA 90274(310) 377-569, Workshop

    2. Book.

    3. Stephen Rosenthal, "Effective Product Design and Development", Business

    4. OneOrwin, Homewood, 1992, ISBN 1-55623-603-4.

3. Staurt Pugh, "Tool Design –Integrated Methods for Successful Product Engineering", Addison Wesley Publishing, New york, NY.

PEMF5402 SURFACE ENGINEERING (3-0-0)

MODULE –I (10 hours)

Definition and Scope of Surface Coating : Purpose of surface coating, resistance / wear hardness, corrosion resistance, weather resistance, surface coating for conduction and insulation, aesthetics and surface finish, etc. Pretreatment for Surface Coating: Degreasing, pickling, phosphating, descaling, cleaning, etc. Metal Coatings: Characteristics; Operational parameters, application and limitations of galvanizing, sherardising, chromating, zinc and aluminum spraying. Hot dipping, gas spraying, arc spraying, plasma spraying.

MODULE- II (14 hours)

Electro Plating : Vat, barrel, automatic reverse current plating, equipment, operational parameters and electrolytes for electro plating; productivity comparison between metal coating and electroplating, base metals and plating metals, application and limitations. Ceramic Coating: Characteristics of ceramic coating, types of ceramics used for coating, base materials, methods of ceramic coating, vitreous enameling. Polymer Coating: Characteristics, types of polymers and their relative merits and demerits, base materials for polymer coating, equipment for polymer coating; types of polymer coating, spraying, dipping, fluidized bed, powder spraying; use of extrusion, principles, selection of polymers.

MODULE –III (11 hours)

Paint Coating: Types of paints, their characteristics and properties, selection of paints; technology of application of paints, brush, spray, electrostatic spray, airless spray, dipping flow coating, rumbling, roller coating, etc.

Curing of Paint Coatings: air drying, catalyst drying, convention staving, infrared staving, electron beam curing, UV curing. Miscellaneous Processes: Chemical coloring, blackening, bluing, etc; chromating, chemical polishing, lead sheathing, Newer coating processes and advances in surface technology.

TEXT BOOKS:

1. Electroplating and Other Surface Treatments; C.D.Varghese; TMH, 1993.

2. Metal Pretreatment; N.D.Banik; TMH, 1992.

HMM3401 ENTREPRENEURSHIP DEVELOPMENT (3-0-0)

MODULE I

ENTREPRENEURSHIP - Entrepreneur – Types of Entrepreneurs – Difference between Entrepreneur and Intrapreneur – Entrepreneurship in Economic Growth, Factors Affecting Entrepreneurial Growth.MOTIVATION - Major Motives Influencing an Entrepreneur – Achievement Motivation Training, self Rating, Business Game, Thematic Apperception Test – Stress management,Entrepreneurship Development Programs – Need, Objectives.

MODULE II

BUSINESS - Small Enterprises – Definition, Classification – Characteristics, Ownership Structures – Project Formulation – Steps involved in setting up a Business – identifying, selecting a Good Business opportunity, Market Survey and Research, Techno Economic Feasibility Assessment – Preparation of Preliminary Project Reports – Project Appraisal – Sources of Information – Classification of Needs and Agencies.

FINANCING AND ACCOUNTING - Need – Sources of Finance, Term Loans, Capital Structure, Financial Institution, management of working Capital, Costing, Break Even Analysis, Network Analysis Techniques of PERT/CPM – Taxation – Income Tax, Excise Duty – Sales Tax.

MODULE III

SUPPORT TO ENTREPRENEURS - Sickness in small Business – Concept, Magnitude, causes and consequences, Corrective Measures – Government Policy for Small Scale Enterprises – Growth Strategies in small industry – Expansion, Diversification, Joint Venture, Merger and SubContracting.

TEXT BOOKS:

1. S.S.Khanka "Entrepreneurial Development" S.Chand& Co. Ltd. Ram Nagar NewDelhi, 1999.
2. Kuratko&Hodgetts, "Entrepreneurship – Theory, process and practices", Thomsonlearning 6th edition.

REFERENCES:

1. Hisrich R D and Peters M P, "Entrepreneurship" 5th Edition Tata McGraw-Hill, 2002.
2. Mathew J Manimala," Entrepreneurship theory at cross roads: paradigms and praxis"Dream tech 2nd edition 2006.
3. Rabindra N. Kanungo "Entrepreneurship and innovation", Sage Publications, NewDelhi, 1998.
4. EDII "Faulty and External Experts – A Hand Book for New Entrepreneurs Publishers: Entrepreneurship Development" Institute of India, Ahmadabad, 1986.

FEME6401 HUMAN RESOURCES MANAGEMENT (3-0-0)

MODULE I

Perceptive in human resource management- Evolution of human resource management – The importance of the human factor – Objectives of human resource management – Inclusive growth and affirmative action -Role of human resource manager – Human resource policies – Computer applications in human resource management – Human resource accounting and audit.

MODULE II

Importance of Human Resource Planning – Forecasting human resource requirement – Internal and External sources. Selection process screening – Tests - Validation – Interview - Medical examination – Recruitment introduction – Importance – Practices – Socialization benefits. Training and executive development- Types of training methods purpose benefits resistance. Executive development programmes – Common practices - Benefits – Self development – Knowledge management.

Module III : Sustaining employee interest - Compensation plan – Reward – Motivation – Theories of motivation – Career management – Development of mentor – Protégé relationships. Performance evaluation and control process- Method of performance evaluation – Feedback – Industry practices. Promotion, Demotion, Transfer and Separation – Implication of job change. The control process – Importance – Methods – Requirement of effective control systems grievances – Causes – Implications – Redressal methods.

Text Books

1. Decenzo and Robbins, Human Resource Management, Wiley, 8th Edition, 2007. 2. Dessler Human Resource Management, Pearson Education Limited, 2007

Reference Books

1. Mamoria C.B. and Mamoria S. Personnel Management, Himalaya Publishing Company, 2007
2.Bernadin , Human Resource Management ,Tata Mcgraw Hill ,6th edition 2006.
3. EugenceMckenna and Nic Beach, Human Resource Management, Pearson Education Limited, 2007.
4. Wayne Cascio, Managing Human Resource, McGraw Hill, 2007.
5. Ivancevich, Human Resource Management, McGraw Hill 2002.

HSSM3403MARKETING MANAGEMENT (3-0-0)

Module -I (10 hours)
Marketing Management: Concept, Process, Functions and relevance in the current context.
Marketing Environment: Elements of micro and macro environment
Competition Analysis: Factors contributing to competition, porter's five forces model, Identifying and analyzing competitors.
Marketing Planning: Exploring Opportunity, Product –market selection, Marketing Planning Process.
Market Research and Information Systems: Research Process, The Internet and World Wide Web based Information collection and processing, Database, Data Warehouses and Data Mining, Global Market Research.
Consumer Behavior: Factors influencing consumer behavior, consumer decision process. Organizational buying behaviour.
Module II (10 hours)
Market Segmentation, Targeting and Positioning: Definition, Bases of segmenting consumer and Industrial markets. Target Market strategies: Market Positioning.
Market Demand Forecasting: Key Terms, Forecasting Tools: Short term tools: Moving average and Exponential smoothing methods, Long-term forecasting Tools: Time series analysis, Econometrics methods, Qualitative tools : Buying Intention Survey, Sales Force Opinion and Delphi Techniques.
Product Planning : Product Life Cycle, New Product Development Process, Branding
Strategy, Positioning a Brand, Brand Equity, Packaging and Labeling, Product-mix and Product Line, Planned Obsolescence.
Module – III (10 hours)
Pricing Decision: Objectives and Factors influencing pricing, Pricing method and strategies.
Integrated Marketing Communication (IMC)- Concept of IMC, the marketing communication process, Promotion Mix, elements of promotion mix, Direct marketing.
Channels of Distributions: Types of intermediaries, functions of distribution channels,
channel levels, Designing Distribution Channels, Physical Distribution, Supply Chain
Management (Basic only).
Trends in Marketing: Green Marketing, Customer Relationship Management, E-marketing, Rural Marketing and Service Marketing (concepts only)
Text Book:
1. Etzel , Walker ,Stanton and Pandit, Marketing, 14/e, Tata McGraw Hill.
2. Philip Kolter ,KoshyJha " Marketing Management" Pearson Education Indian Adapted Edition 2007.

3. Saxena, "Marketing Management" Tata McGraw Hill, 4/e.

Reference
1. Grewal, Levy, 'Marketing' Tata McGraw Hill, special Indian edition.
2. Karunakaran "Marketing Management", Himalaya Publishing House, 2010/e.

PCMF7405 ENTREPRENEURSHIP PROJECT
PCMF7401 PROJECT- 1

The main objective us give the students hands on training in the fabrication of one or more component working model which has been designed by them. The students maybe grouped into small groups and work under a Project supervisor. The components tobe fabricated may be decided in consultation with the Supervisor and if possible with anindustry.

PCMF7403 SEMINAR-1 (TECHNICAL)

PCMF4404FLEXIBLE MANUFACTURING SYSTEM & ROBOTICS

(3-0-0)

MODULE –I (12 Hours)

Introduction –Types of flexibility - Components of FMS - Application workstations - Computer control and functions - Planning, scheduling and control of FMS - Scheduling - Knowledge based scheduling - composition of FMS- Hierarchy of computer control-Computer control of work center and assembly lines- FMS Supervisory computer- FMS Simulation And Data base – FMS Application in machining , sheet metal fabrications- Prismatic component Production – aerospace application – FMS development to factory of Future- Artificial Intelligence & expert system in FMS.

MODULE –II (12 Hours)

Definition of Robot – Robot Anatomy – Coordinate System – Types & classifications – Pitch ,yaw, roll ,joint notations – Speed of motion – pay load- Robot parts & their Functions- Different Applications – ROBOT DRIVE System – Pneumatic Drive- Hydraulic Drive – Mechanical Drive- Electrical Drive – Salient feature – Applications & Comparison of all these Drives. End Effectors – Grippers – Types of Grippers - Selections & Design Considerations.

MODULE- III (11 Hours)

Requirements of Sensor-Principles & applications of Sensor –types of sensors- Robot Kinematics – Homogenous Transformation Equation – Forward Kinematics – inverse kinematics - Forward & Reverse Kinematics of manipulators – lead through programming – Robot programming languages- VAL programming –Motion commands – Sensor Commands – End Effector commands & Simple program.

TEXT BOOKS:

1. Groover M.P., "Automation, Production Systems and Computer Integrated Manufacturing ", Prentice-Hall of India Pvt. Ltd., New Delhi, 1996.
2. M.P Groover ," Industrial Robotics –Technology ,Programming & applications McGraw Hill 2001.
3. Jha, N.K. "Handbook of Flexible Manufacturing Systems ", Academic Press Inc., 1991.
4. Kalpakjian, "Manufacturing Engineering and Technology ", Addison-Wesley Publishing Co., 1995.
5. TaiichiOhno, Toyota, "Production System beyond Large-Scale production ", Productivity Press (India) Pvt. Ltd., 1992.
6. R.D.Klafter , Chemieleskio, T.A.andnegin ., "Robotics Engineering an Integrated approach", Prentice Hall, 1989

REFERENCE BOOKS:

1. G.Bekey, Autonomous Robots, MIT Press, 2005.
2. J.J.Craig, "Introduction to Robotics"Addision Wesley Publishers, 2005.

FEMT6041 TOTAL QUALITY MANAGEMENT (3-0-0)

MODULE I

INTRODUCTION- Definition of Quality, Dimensions of Quality, Quality Planning, Quality costs - Analysis Techniques for Quality Costs, Basic concepts of Total Quality Management, Historical Review, Principles of TQM, Leadership – Concepts, Role of Senior Management, Quality Council, Quality Statements, Strategic Planning, Deming Philosophy, Barriers to TQM Implementation. **TQM PRINCIPLES** - Customer satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement – Motivation, 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, Performance Measure.

MODULE II

STATISTICAL PROCESS CONTROL - The seven tools of quality, Statistical Fundamentals – Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables and attributes, Process capability, Concept of six sigma, New seven Management tools. **TQM TOOLS** - Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) – Concept, Improvement Needs, FMEA – Stages of FMEA.

MODULE III

QUALITY SYSTEMS - Need for ISO 9000 and Other Quality Systems, ISO 9000:2000 Quality System – Elements, Implementation of Quality System, Documentation, Quality Auditing, TS 16949, ISO 14000 – Concept, Requirements and Benefits.

TEXT BOOK

1. Dale H.Besterfiled, et al., "Total Quality Management", Pearson Education, Inc. 2003.(Indian reprint 2004).ISBN 81-297-0260-6.

REFERENCE BOOKS

1. James R.Evans& William M.Lidsay, "The Management and Control of Quality", (5th Edition), South-Western (Thomson Learning), 2002 (ISBN 0-324-06680-5).
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 International 1996.
5. Zeiri. "Total Quality Management for Engineers", Wood Head Publishers, 1991.

PEMF5405 STATISTICAL METHODS & DESIGN OF EXPERIMENTS (3-0-0)

MODULE -I (**13 hours**)

RANDOM VARIABLES Discrete and Continuous random variables – Moments – Moment generating functions –Binomial, Poisson, Geometric, Uniform, Exponential, Gamma, Weibull and Normal distributions - Functions of a random variable.

TWO-DIMENSIONAL RANDOM VARIABLES :Joint distributions – Marginal and Conditional distributions – Covariance – Correlation and Linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

MODULE –II (**12hours**)

TESTING OF HYPOTHESIS :Sampling distributions - Tests for single mean, proportion, Difference of means (large and small samples) – Tests for single variance and equality of variances – $\chi 2$-test for goodness of fit – Independence of attributes – Non-parametric tests: Test for Randomness and Rank-sum test (Wilcoxon test).

MODULE-III (**10 hours**)

DESIGN OF EXPERIMENTS: Completely randomized design – Randomized block design – Latin square design - 22 -factorial design- Test of Significance and Model lack of fit

TEXT BOOKS

1. Milton, J. S. and Arnold, J.C., "Introduction to Probability and Statistics", TataMcGraw Hill, 4th edition, (2007).

2. Johnson, R.A. and Gupta, C.B., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 7th edition, (2007).

PEMF5406 COMPUTER INTEGRATED MANUFACTURING (3-0-0)

MODULE -I (**12 hours**)

PRODUCTION PLANNING AND CONTROL : Basic concepts – Types of production System - Functions of production planning and control – problems with Production Planning and Control – Computer Integrated Production Management System– Forecasting – Purpose and methods of forecasting – Single and Double Moving average methods – Single and Double exponential smoothing methods – Simple regression method of forecasting – errors in forecasting.

MODULE -II (**11 hours**)

MATERIAL REQUIREMENT PLANNING: Basic MRP Concepts – Inputs to the MRP System – Master production Schedule – Bill of Materials, Inventory Record File – MRP Logic – Gross requirements, net requirements, lot sizing - MRP reports – Capacity Planning – Benefits of MRP Manufacturing Resource Planning (MRP II). SHOP FLOOR CONTROL**:** Functions of shop floor control – order scheduling – order progress – Data logging and acquisition – Automated data collection – Control types – Sensor Technology.

MODULE -III (**12 hours**)

COMPUTER AIDED PROCESS PLANNING : Need for process planning – Functions of process planning – Future trend of CAPP – Expert process planning system – case studies.-Variant process planning – part family search – Generative method of CAPP – Forward and Backward planning – input format – part description methods – CAD Models – Decision Logic – Artificial Intelligence – Knowledge Representation – Databases and Algorithms – Automatic Process Planning – Programming Practice using C, C++ for Computer Integrated Production Management System Applications

TEXT BOOKS

1. MikellP.Groover, "Automation, Production Systems and Computer Integrated Manufacturing", Prentice Hall of India, 2004.
2. S.Kant Vajpayee, Principles of Computer Integrated Manufacturing, Prentice Hall of India, 2006

REFERENCES

1. MikellP.Groover M.P., Emory W. Zimmers, "CAD/CAM, Computer Aided Design and
1. Manufacturing", Prentice Hall of India, 2006.
2. Gideonha and Roland D.Well, "Principles of process planning", Chapman and Hall,1995.
3. T.C.Chand, "Expert process planning for manufacturing", Addison Wesley publishing company, 1990

PEMF5304 PRECISION ENGINEERING (3-0-0)

MODULE -I (12 hours)

PRECISION ENGINEERING**:** Introduction - Accuracy & precision – Need – application precision machining –Tool based Micro & Ultra precision Machining grinding – Thermal effects – Materials for tools and machine elements – carbides – ceramic, CBN & diamond. TOLERANCE AND FITS **:**Tolerance – Zone – fits – Variation – Hole & shaft system – limits – expected Accuracy of machining processes – Selective assembly – gauges acceptance tests for machine tools.

MODULE- II (12 hours)

ULTRA PRECISION MACHINE ELEMENTS**:** Introduction – Guide ways – Drive systems – Spindle drive – preferred numbers – Rolling elements – hydrodynamic & hydrostatic bearings – pneumatic bearings. MEMS: Introduction – MEMS – principle – Elements – Characteristics – Design – Application: automobile defence, aerospace etc.,

MODULE-III (11 hours)

ERROR CONTROL **:**Error – Sources – Static stiffness – Variation of the cutting force – total compliance –Different machining methods – Thermal effects – heat source – heat dissipation –Stabilization – decreasing thermal effects – forced vibration on accuracy – clamping &setting errors – Control – errors due to locations – principle of constant location surfaces.

TEXT BOOKS

1. Nakazawa, H. Principles of Precision Engineering, Oxford University Press, 1994.
2. Precision Engineering – R.L. Murthy

REFERENCE
1. Institute of Physics Publishing, Bristol and Philadelphia, Bristol, BSI 6BE U.K.

FEMF6401 SUPPLY CHAIN MANAGEMENT (3-0-0)

MODULE I :

SCM : Changing Business Environment , Need ,Conceptual Model of Supply Chain Management ;Evolution - Traditional and Modern Approach Elements in SCM , Demand management in supply chain: Demand Planning and Forecasting, Demand Forecasting methods, Characteristics Measures of Forecast Error , Customer Order Decoupling Point (CODP) . Industries: Classification Based on Nature of Work , Volume , Manufacturing Environment ,Need for Strategy SCM in The Market: A Paradigm Shift - Collaboration Strategy' , Demand Flow Strategy , Customer Service Strategy , Technology integration Strategy . CPFR(Collaborative Planning Forecasting Replenishment) : Concept and shift to CPFR , Issues and Facts in Collaboration , Connect Interact, integrate, and Collaborate , CPFR Implementations, Profile of a Collaborative Company.

MODULE II :

Operations Management In Supply Chain : Introduction: Manufacturing System - Mass, Lean, Agile, Quick Response Manufacturing. Lean Manufacturing – Evolution, Toyota Production System, Basic Idea and Framework, Continuous Flow, Standardized Work, Value Stream, Value added Activities, Pull Production, Integration of Lean Manufacturing and SCM. Mass Customization: Meaning, Evolution, Drivers of Mass Customization: Technology and Globalization, Characteristics, Approaches, Methods and Levels of Customization, Information Cycle in mass customization, Benefits and Limitations, Supply Chain Management for Mass Customization.

Procurement Management In Supply Chain : Introduction, Purchasing Cycle, Type and classification of Purchases , Inventory Models ,Economic Order Quantity , Practicalities, Safety Stock ,Fixed Order interval System and Fixed Order Quantity System . Material Requirements Planning (MRP) ,and Just in Time (JIT) Vendor Managed Inventory(VMI) - VMI Business Model , Challenges and Limitations of VMI ,Just in Time (JIT)-II ,Multi-tier Supplier Partnership

MODULE III:

Logistics Management Introduction, Evolution of Logistics Elements of Logistics Management. Customer Order Processing, Location Analysis, Inventory Control, Material Handling, Packaging, Transportation, Warehousing,Customer Service Distribution Management.Transportation Management: Distribution Strategies - Cross Docking, Milk Runs, Direct Shipping, Hub and Spoke Model, Pool Distribution. Packaging for Logistics: Concept, Requirements, Trends of Packaging, Functionality ,Participants ,Transportation Formats, Private Fleet , Modes of transportation , Decision Factors ,Transport Documentation .Service innovation, Inter-modal Transportation Mode ,Containerization ,RFID Third-Party Logistics (TPL/3PL) , Operations of Indian 3PLs Fourth-Party Logistics (4PL)- Key Components including GPS and *G*IS Technology . Technology Component of 4PL .GPS and *G*IS Technology, Performance Measurement And Controls Benchmarking: Introduction and Concept Forms, Gap Analysis

TEXT BOOKS:

1. Supply Chain Management : Sunil Chopra , Peter Meindl ,D V Kalra ,Pearson Prentice Hall , 2007
2. Supply Chain Management: A.S.Altekar PHI Second Ed.2006
3. Logistics Management: James Stock and Douglas Lambert. McGraw Hill International Ed.2006

REFERENCE BOOKS:

1. Supply Chain Management for Global Competitiveness: Ed.B.S.Sahay McMillan Publication 2000
2. Emerging Trends in Supply Chain Management: Ed.B.S.Sahay McMillan Publication 2000. 3. Logistics Management: Bowersox TMH 2004

PETX5412 MANAGEMENT INFORMATION SYSTEM

Module – I (12 hours)

Overview: Definition of MIS, Data processing and MIS, Characteristics of MIS, Need / importance of MIS in organization, Limitations of MIS; MIS and other disciplines

Data and Information; Characteristics of Information; Types of Information – Operational, Tactical and Strategic information; Managers as Information Processors;

System Approach: MIS as a system, Sub-systems of MIS – Activity sub-systems, Functional sub-system

Decision Making: Decision-making under certainty, risk and uncertainty; Phases of Decision-making Process; Decision Models - Classical Economic Model, Administrative Model; Organizational Decision-making

Planning for development of MIS: Feasibility Analysis – Technical, Economic, Motivational, Schedule and Operational Feasibility; MIS development as a project;

Module – II (12 hours)

Overview of System Life Cycle Models – Waterfall model, Prototyping model and Spiral model

System Analysis and Design (SAD): Purpose, Requirement engineering, Typical content of System Requirement Specification (SRS), System Design – high level design and low level design, Characteristics of good design – coupling and cohesion

Overview of tools used in SAD – Context diagram, Data Flow Diagram (DFD), Data Dictionary, ER diagram, Structure charts, HIPO documentation, Decision Table, Decision Tree, Pseudocode

Module – III (12 hours)

MIS in Organization: MIS in Marketing; Manufacturing; HRM; Accounting and Finance, Enterprise Resource Planning (ERP) System.

Business Intelligence (BI): Role of BI in marketing, finance, human resource, and manufacturing; Overview of DSS, Data Mining and Data Warehouse

Implementation of MIS: Critical Success Factor

Information System Security, Privacy, Social and Ethical issues

Books:
1. Management Information Systems, M Jaiswal& M Mital, Oxford Univ. Press
2. Information Systems for Modern Management, Murdick, Ross &Claggett, PHI
3. Management Information System, Launden&Launden, Pearson
4. Management Information System, James O Brian, TMH
5. Management Information Systems, A K Gupta, Sultan Chand & Sons
6. Management Information System, Jawadekar, McGraw

PEEE5401 SOFT COMPUTING (3-0-0)

MODULE I : Fuzzy set theory - Introduction to Neuro – Fuzzy and Soft Computing – Fuzzy Sets – Basic Definition and Terminology – Set-theoretic Operations – Member Function Formulation and Parameterization – Fuzzy Rules and Fuzzy Reasoning – Extension Principle and Fuzzy Relations – Fuzzy If-Then Rules – Fuzzy Reasoning – Fuzzy Inference Systems – Mamdani Fuzzy Models – Sugeno Fuzzy Models – Tsukamoto Fuzzy Models – Input Space Partitioning and Fuzzy Modeling.

MODULE II: Optimization- Derivative-based Optimization – Descent Methods – The Method of Steepest Descent – Classical Newton's Method – Step Size Determination – Derivative-free Optimization – Genetic Algorithms – Simulated Annealing – Random Search – Downhill Simplex Search.

MODULE III : Neural networks - Supervised Learning Neural Networks – Perceptrons - Adaline – Back propagation Multilayer Perceptrons – Radial Basis Function Networks – Unsupervised Learning Neural Networks – Competitive Learning Networks – Kohonen Self-Organizing Networks – Learning Vector Quantization – Hebbian Learning- Applications of computational intelligence - Printed Character Recognition – Inverse Kinematics Problems – Automobile Fuel Efficiency Prediction – Soft Computing for Color Recipe Prediction. **TEXT BOOK**

1. J.S.R.Jang, C.T.Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", PHI, 2004, Pearson Education 2004.

REFERENCE BOOKS

1. Timothy J.Ross, "Fuzzy Logic with Engineering Applications", McGraw-Hill, 1997.
2. Davis E.Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y., 1989.
3. S. Rajasekaran and G.A.V.Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, 2003.
4. R.Eberhart, P.Simpson and R.Dobbins,

PCMF7404PROJECT

A Project topic must be selected either from published lists or the studentsthemselves may propose suitable topics in consultation with their guides. The aim of theproject work is to deepen comprehension of principles by applying them to a newproblem which may be the design and manufacture of a device, a research investigation,a computer or management project or a design problem.

The progress of the project is evaluated based on a minimum of three reviews.

The review committee may be constituted by the Head of the Department.A project report is required at the end of the semester. The project work isevaluated jointly by external and internal examiners constituted by the Head of theDepartment based on oral presentation and the project report.

PCMF7406SEMINAR-2 (TECHNICAL)

PCMF7407COMPREHENSIVE VIVA VOICE