### SEMESTER I

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OBJECTIVES

To facilitate the understanding of the principles and to cultivate the art of formulating physical problems in the language of mathematics.

UNIT I  MATRICES  9

UNIT II  FUNCTIONS OF SEVERAL VARIABLES  9

UNIT III  ANALYTIC FUNCTION  9
Analytic functions – Necessary and sufficient conditions for analyticity – Properties – Harmonic conjugates – Construction of analytic function – Conformal Mapping – Mapping by functions w = a + z, az, 1/z, - Bilinear transformation.

UNIT IV  COMPLEX INTEGRATION  9
Line Integral – Cauchy’s theorem and integral formula – Taylor’s and Laurent’s Series – Singularities – Residues – Residue theorem – Application of Residue theorem for evaluation of real integrals – Use of circular contour and semicircular contour with no pole on real axis.

UNIT V  LAPLACE TRANSFORMS  9

TOTAL: 45 PERIODS

OUTCOMES

To develop the use of matrix algebra techniques this is needed by engineers for practical applications.

To familiarize the student with functions of several variables. This is needed in many branches of engineering.

To develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence, in application areas such as heat conduction, elasticity, fluid dynamics and flow the of electric current.

To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.
BOOKS FOR STUDY

REFERENCES

PTPH8151 ENGINEERING PHYSICS

OBJECTIVE:
To introduce the basic physics concepts relevant to different branches of Engineering and Technology.

UNIT I PROPERTIES OF MATTER

UNIT II ACOUSTICS AND ULTRASONICS

UNIT III THERMAL PHYSICS
UNIT IV  APPLIED OPTICS

UNIT V  SOLID STATE PHYSICS
Nature of bonding - growth of single crystals (qualitative) - crystal systems - crystal planes and directions - expressions for interplanar distance - coordination number and packing factor for simple structures: SC, BCC, FCC and HCP - structure and significance of NaCl, ZnS, diamond and graphite - crystal imperfections: point defects, dislocations and stacking faults - unit cell, Bravais space lattices - miller indices.

TOTAL : 45 PERIODS

OUTCOMES:
• The students will have knowledge on the basics of physics related to properties of matter, optics, acoustics etc., and they will apply these fundamental principles to solve practical problems related to materials used for engineering applications.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- To understand about the chemical thermodynamics.
- To impart knowledge in the basics of polymer chemistry.
- To impart basic knowledge on photochemistry and spectroscopy.
- To develop sound knowledge on kinetics and catalysis.

UNIT I CHEMICAL THERMODYNAMICS
Second law: Entropy - entropy change for an ideal gas, reversible and irreversible processes; entropy of phase transitions; Clausius inequality. Free energy and work function: Criteria of spontaneity; Helmholtz and Gibbs free energy functions; Gibbs-Helmholtz equation; Clausius-Clapeyron equation; Maxwell relations – Van’t Hoff isotherm and isochore. Chemical potential; Gibbs-Duhem equation – variation of chemical potential with temperature and pressure.

UNIT II POLYMER CHEMISTRY
Introduction: Classification of polymers – Natural and Synthetic; Thermoplastic and Thermosetting. Functionality – Degree of polymerisation. Types and mechanism of polymerisation: Addition (Free Radical, cationic, anionic and living); condensation and copolymerisation. Properties of polymers: Tg, Tacticity, Molecular weight – weight average, number average and polydispersity index. Techniques of polymerisation: Bulk, emulsion, solution and suspension.

UNIT III KINETICS AND CATALYSIS

UNIT IV PHOTOCHEMISTRY AND SPECTROSCOPY

UNIT V NANO CHEMISTRY

TOTAL 45 PERIODS
OBJECTIVES:
- The students should be made to:
  - Learn the organization of a digital computer.
  - Be exposed to the number systems.
  - Learn to think logically and write pseudo code or draw flow charts for problems.
  - Be exposed to the syntax of C.
  - Be familiar with programming in C.
  - Learn to use arrays, strings, functions, pointers, structures and unions in C.

UNIT I  INTRODUCTION  8

UNIT II  C PROGRAMMING BASICS  10

UNIT III  ARRAYS AND STRINGS  9
UNIT IV    FUNCTIONS AND POINTERS    9

UNIT V    STRUCTURES AND UNIONS    9
Introduction – need for structure data type – structure definition – Structure declaration – Structure within a structure - Union - Programs using structures and Unions – Storage classes, Pre-processor directives.

OUTCOMES:
At the end of the course, the student should be able to:
- Design C Programs for problems.
- Write and execute C programs for simple applications

TEXT BOOKS

REFERENCES

PTGE8153    ENGINEERING MECHANICS    L T P C
3 0 0 3

OBJECTIVE
- To develop capacity to predict the effect of force and motion in the course of carrying out the design functions of engineering

UNIT I    BASICS AND STATICS OF PARTICLES    9

UNIT II    EQUILIBRIUM OF RIGID BODIES    9
Free body diagram – Types of supports –Action and reaction forces –stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon’s theorem – Single equivalent force -Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions
UNIT III  PROPERTIES OF SURFACES AND SOLIDS


UNIT IV  DYNAMICS OF PARTICLES


UNIT V  FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS

Friction force – Laws of sliding friction – equilibrium analysis of simple systems with sliding friction – wedge friction-. Rolling resistance -Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion of simple rigid bodies such as cylinder, disc/wheel and sphere.

OUTCOMES:

- ability to explain the differential principles applies to solve engineering problems dealing with force, displacement, velocity and acceleration.
- ability to analyse the forces in any structures.
- ability to solve rigid body subjected to dynamic forces.

TEXT BOOKS:


REFERENCES:

OBJECTIVE:
To understand the stresses developed in bars, compounds bars, beams, shafts, cylinders and spheres.

UNIT I  STRESS, STRAIN AND DEFORMATION OF SOLIDS  9

UNIT II  TRANSVERSE LOADING ON BEAMS AND STRESSES IN BEAM  9

UNIT III  TORSION  9
Torsion formulation stresses and deformation in circular and hollows shafts – Stepped shafts – Deflection in shafts fixed at the both ends – Stresses in helical springs – Deflection of helical springs, carriage springs.

UNIT IV  DEFLECTION OF BEAMS  9
Double Integration method – Macaulay’s method – Area moment Theorems for computation of slopes and deflections in beams - Conjugate beam and strain energy – Maxwell’s reciprocal theorems.

UNIT V  THIN CYLINDERS, SPHERES AND THICK CYLINDERS  9
Stresses in thin cylindrical shell due to internal pressure circumferential and longitudinal stresses and deformation in thin cylinders – spherical shells subjected to internal pressure – Deformation in spherical shells – Lame’s theory – Application of theories of failure.

TOTAL: 45 Periods

OUTCOMES:
- Upon completion of this course, the students can able to apply mathematical knowledge to calculate the deformation behavior of simple structures.
- Critically analyse problem and solve the problems related to mechanical elements and analyse the deformation behavior for different types of loads.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- To introduce important analog electronic devices and their characteristics
- To introduce concepts analog amplifiers and oscillators in discrete and IC form
- To teach digital logic, related digital circuits and analog to digital and digital to analog conversions

UNIT I  SEMICONDUCTORS AND RECTIFIERS  9
Classification of solids based on energy band theory, Intrinsic semiconductors, Extrinsic semiconductors – P-type and N-type, P-N junction, VI Characteristics of PN junction diode, Half and Full wave rectifiers, Zener effect, Zener diode, Zener diode Characteristics, Zener diode as a regulator.

UNIT II  TRANSISTOR AND AMPLIFIERS  9
Bipolar junction transistors – CB, CE, CC configurations and characteristics, Biasing circuits – Fixed bias, Voltage divider bias, CE amplifier, Concept of feedback, Negative feedback, voltage series feedback amplifier, Current series feedback amplifier.

UNIT III  FET AND POWER ELECTRONIC DEVICES  9
FET – Configuration and characteristics, FET amplifier, Characteristics and simple applications of SCR, Diac, Triac and UJT.

UNIT IV  SIGNAL GENERATORS AND LINEAR ICs  9

UNIT V  DIGITAL ELECTRONICS  9
Boolean algebra, Logic Gates, Half and Full adders, Decoder, Encoder, Multiplexer, Demultiplexer, Flip flops, Digital to Analog converters - R-2R and weighted resistor types, Analog to Digital converters - Successive approximation and Flash types.

TOTAL : 45 PERIODS

OUTCOMES:
- ability to identify electronics components and use of them to design circuits.

TEXT BOOK:

REFERENCES:
OBJECTIVES
To the study of nature and the facts about environment.
- To finding and implementing scientific, technological, economic and political solutions to environmental problems.
- To study the interrelationship between living organism and environment.
- To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
- To study the dynamic processes and understand the features of the earth’s interior and surface.
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 14
Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.
Field study of common plants, insects, birds
Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II ENVIRONMENTAL POLLUTION 8
Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – soil waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides.
Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III NATURAL RESOURCES 10
Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.
Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT


UNIT V HUMAN POPULATION AND THE ENVIRONMENT


TOTAL : 45 PERIODS

OUTCOMES:
Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.

- Public awareness of environmental is at infant stage.
- Ignorance and incomplete knowledge has lead to misconceptions.
- Development and improvement in std. of living has lead to serious environmental disasters.

TEXT BOOKS:

REFERENCE BOOKS
OBJECTIVE:
- To introduce the essential principles of materials science for mechanical and related Engineering applications.

UNIT I  MECHANICAL PROPERTIES

UNIT II  PHASE DIAGRAMS
Solid solutions - Hume Rothery's rules - free energy of solid solution - intermediate phases - The phase rule - single component system - one-component system of iron - binary phase diagrams - isomorphous systems - the tie-line rule - the level rule - application to isomorphous system - eutectic phase diagram - peritectic phase diagram - other invariant reactions - microstructural change during cooling.

UNIT III  FERROUS ALLOYS AND HEAT TREATMENT

UNIT IV  ELECTRONIC MATERIALS
Classification of solids - energy bands - concept of Fermi level - conductor, semiconductor, insulator - Semiconductors: intrinsic, extrinsic - carrier concentration expression (qualitative) - compound semiconductors (qualitative) - dielectric materials - polarization mechanisms - dielectric breakdown - magnetic materials - ferromagnetic materials &hysterisis - ferrites - superconducting materials, properties, types and applications.

UNIT V  NEW MATERIALS AND APPLICATIONS

OUTCOMES:
- Upon completion of this course, the students can able to apply the different materials, their processing, and heat treatments in suitable application in mechanical engineering fields.
TEXT BOOKS

REFERENCE BOOKS:

PTME8251 MECHANICS OF MACHINES
(Industrial, Printing, Manufacturing)  L  T  P  C
(Industrial, Printing, Manufacturing)  3  0  0  3

OBJECTIVES:
- To understand the principles in the formation of mechanisms and their kinematics.
- To understand the effect of friction in different machine elements.
- To analyze the forces and toques acting on simple mechanical systems
- To understand the importance of balancing and vibration.

UNIT I KINEMATIC OF MECHANICS
9

UNIT II GEARS AND GEAR TRAINS
9

UNIT III FRICTION IN MACHINE ELEMENTS
9
Surface contacts – Sliding and Rolling friction – Friction drives – Friction in screw threads – Bearings and lubrication – Friction clutches – Belt and rope drives – Friction aspects in brakes – Friction in vehicle propulsion and braking.

UNIT IV FORCE ANALYSIS
9

UNIT V BALANCING AND VIBRATION
9

TOTAL: 45 PERIODS

OUTCOME
- The students can apply mathematical knowledge to predict the properties and characteristics of a fluid.
- Can critically analyse the performance of pumps and turbines.

TEXT BOOK:

REFERENCES:

STANDARDS:
OBJECTIVE
To learn the basics of deterministic optimization tools

UNIT I  LINEAR PROGRAMMING
Introduction - formulation of linear programming model - Graphical solution – solving LPP using simplex algorithm – Revised Simplex Method

UNIT II  ADVANCES IN LPP –I
Duality theory - Dual simplex method - Sensitivity analysis – Transportation problems – Assignment problems- Traveling sales man problem

UNIT III  ADVANCES IN LPP –II
Integer programming – Multi objective optimization: Goal programming–Introduction to Data Envelopment Analysis

UNIT IV  NETWORK MODELS

UNIT V  DYNAMIC PROGRAMMING
Elements of dynamic programming – state –stage-recursive equations – computational procedure – applications

TOTAL : 45 PERIODS

OUTCOME:
The students can solve optimization problems of deterministic nature

TEXT BOOKS:

REFERENCES:
OBJECTIVE

- To impart knowledge in the area of Method study and Time study so that students can implement these principles and techniques to improve productivity in manufacturing and Service sectors.

UNIT I PRODUCTIVITY
Total time for a job or operation, total work content and ineffective time, – Production and Productivity - Productivity and standard of living, Factors affecting Productivity, Introduction to Productivity measurement Models.

UNIT II METHODS ENGINEERING
Methods Engineering-Steps -Tools and techniques, Motion study.

UNIT III WORK MEASUREMENT

UNIT IV APPLIED WORK MEASUREMENT
Work sampling, Group Timing Technique (GTT), predetermined time systems, types, Methods Time Measurement (MTM), Introduction to MOST standard, Wage incentive plans.

UNIT V WORK DESIGN FOR OFFICE WORK
Organization and methods (O & M), Work measurement of office work, Work Analysis techniques applied to support staff, Form design and control.

OUTCOMES:
- The Students should be able to measure productivity of a work system through work system design and apply various above mentioned techniques.

TEXT BOOK

REFERENCES
OBJECTIVES:

- To make the students acquire a sound knowledge in statistical techniques that model engineering problems.
- The Students will have a fundamental knowledge of the concepts of probability.

UNIT I 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

UNIT II 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).

UNIT III TESTS OF SIGNIFICANCE

UNIT IV DESIGN OF EXPERIMENTS
Completely randomized design – Randomized block design – Latin square design - 22- factorial design - Taguchi’s robust parameter design.

UNIT V STATISTICAL QUALITY CONTROL
Control charts for measurements ( X and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits - Acceptance sampling.

TOTAL: 45 PERIODS

OUTCOMES:

After successfully completing the course, students should be able to do the following:

- Use statistical methodology and tools in the engineering problem-solving process.
- Compute and interpret descriptive statistics using numerical and graphical techniques.
- Understand the basic concepts of probability, random variables, probability distribution, and joint probability distribution.
- Compute point estimation of parameters, explain sampling distributions, and understand the central limit theorem.

TEXT BOOKS:

REFERENCES

PTME8351 MACHINE DESIGN
(Industrial, Manufacturing )

OBJECTIVES
• To familiarize the various steps involved in the Design Process
• To understand the principles involved in evaluating the shape and dimensions of a component to satisfy functional and strength requirements.
• To learn to use standard practices and standard data
• To learn to use catalogues and standard machine components

UNIT I STABLE STRESSES IN MACHINE MEMBERS
Introduction to the design process - factor influencing machine design, selection of materials based on mechanical properties - Preferred numbers, fits and tolerances – Direct, Bending and torsional stress equations – Impact and shock loading – calculation of principle stresses for various load combinations, eccentric loading -Factor of safety - theories of failure – Design based on strength and stiffness.

UNIT II SHAFTS, COUPLINGS, JOINTS AND BEARINGS
Design of solid and hollow shafts based on strength, rigidity and critical speed – Keys, key ways and splines –Rigid and flexible couplings.
Threaded fasteners, Welded joints and riveted joints for structures, Sliding contact and rolling contact bearings (Simple problems)

UNIT III ENERGY STORING ELEMENTS AND ENGINE COMPONENTS
Various types of springs, optimization of helical springs - Flywheels considering stresses in rims and arms for engines and punching machines- Connecting Rods and crank shafts.

UNIT IV DESIGN FOR FLEXIBLE ELEMENTS
Design of Flat belts and pulleys - Selection of V belts and pulleys – Selection of hoisting wire ropes and pulleys – Design of Transmission chains and Sprockets.

UNIT V SPUR GEARS, HELICAL GEARS AND GEAR BOXES
Speed ratios and number of teeth-Force analysis -Tooth stresses - Dynamic effects - Fatigue strength - Factor of safety - Gear materials – Design of straight tooth spur & helical gears based on strength and wear considerations.
Geometric progression - Standard step ratio - Ray diagram, kinematics layout - Design of sliding mesh gear box - Constant mesh gear box. – Design of multi speed gear box for machine tool applications – Variable speed gear box

TOTAL: 45 PERIODS

Note: (Use of P S G Design Data Book is permitted in the University examination)

OUTCOMES:
• Upon completion of this course, the students can able to successfully design machine components

TEXT BOOK:

REFERENCES:

STANDARDS:

PTIE8311 WORK SYSTEM DESIGN LABORATORY L T P C
0 0 3 2

OBJECTIVE:
To understand the theory better and apply in practice, practical training is given in the following areas:
  1. Graphic tools for method study
  2. Peg board experiment
  3. Stop watch time study
  4. Performance rating exercise
     a. Walking rating
b. Card dealing
5. Work sampling
6. MTM practice
7. Video Based Time Study

TOTAL: 45 PERIODS

OUTCOMES:
• Students should able to design, analyse and apply the above mentioned techniques to measure productivity

PTIE8401  APPLIED ERGONOMICS  L  T  P  C
3  0  0  3

OBJECTIVE:
To explain the general principles that govern the interaction of humans and their working environment for improving worker performance and safety.

UNIT I  INTRODUCTION

UNIT II  HUMAN PERFORMANCE

UNIT III  PHYSIOLOGICAL ASPECTS OF HUMAN AT WORK

UNIT IV  WORK PLACE DESIGN
Problems of body size, Anthropometry measures, Work posture – Work space layout and work station design – Design of displays, controls and VDT work stations – Hand tool design, illumination.

UNIT V  OCCUPATIONAL HEALTH AND SAFETY
Industrial accidents, Personnel Protective devices, Safety Management practices – Effect of Environment – heat, cold & noise – NIOSH regulations and Factories Act

TOTAL: 45 PERIODS

OUTCOMES:
• The Student should apply ergonomic principles to design workplaces for the improvement of human performance and implement latest occupational health and safety to the work place.

TEXT BOOKS:
REFERENCES:

PTIE8402 MANUFACTURING AUTOMATION  

OBJECTIVE: 
To give a brief exposure to automation principles and applications to production systems covering few types of automation.

UNIT I MANUFACTURING OPERATIONS 9
Automation in production systems, principles and strategies, Product/production relationships, Production concepts and mathematical models, manufacturing economics.

UNIT II CONTROL TECHNOLOGIES 9
Automated systems – elements, functions, levels, Continuous Vs discrete control, Computer process control, Sensors, Actuators, ADC, DAC, Programmable logic controllers – ladder logic diagrams.

UNIT III TRANSFER LINES 9
Automated production lines – applications, Analysis – with and without buffers, automated assembly systems, line unbalancing concept.

UNIT IV NUMERICAL CONTROL AND ROBOTICS 9

UNIT V AUTOMATED HANDLING AND STORAGE 9
Automated guided vehicle systems, AS/RS, Carousel storage, Automatic data capture - Bar code technology.

TOTAL: 45 PERIODS

OUTCOMES:
- To provide employability in the industries using various automated equipments such as transfer lines, CNC machines, industrial robots, automated inspection, material handling, storage and data collection systems.

REFERENCES:
OBJECTIVE
To impart knowledge on some probabilistic optimization techniques

UNIT I  DETERMINISTIC INVENTORY MODELS
Purchase model with no shortages – manufacturing model with no shortages – purchase model with shortages – manufacturing model with shortages – Model with price breaks.

UNIT II  PROBABILISTIC INVENTORY MODELS
Probabilistic inventory model – Reorder point model – Multiproduct-selective inventory control

UNIT III  QUEUING THEORY
Queueing theory terminology – Single server, multi server, limited queue capacity, limited population capacity – applications – Markov chains.

UNIT IV  DECISION THEORY
Decision making under certainty – Decision making under risk – Decision making under uncertainty – Decision tree analysis – Introduction to MCDM; AHP. Game Theory – Two person zero sum games, pure and mixed strategies – Theory of dominance - Graphical Solution – Solving by LP.

UNIT V  NON-LINEAR PROGRAMMING
Introduction to non-linear programming – Unconstrained extreme points – Constrained problems with equality constraints: Lagrangean method - Constrained problems with inequalities: Kuhn tucker conditions – Quadratic programming.

TOTAL: 45 PERIODS

OUTCOMES:
- The students will be able to handle optimization problems of probabilistic nature.
- They can also apply scientific method for decision making.

TEXT BOOKS:

REFERENCES:
UNIT I INTRODUCTION

UNIT II FORECASTING
Need, Determinants of Demand, Demand Patterns, Measures of forecast error, Qualitative Forecasting Methods-Delphi techniques. Market Research, Nominal Group Technique Quantitative Forecasting methods – Moving Average Methods, Exponential Smoothing Methods, Regression methods, Monitoring and Control of Forecasts, Requirements and Selection of Good forecasting methods.

UNIT III AGGREGATE PLANNING
Role of aggregate Product planning, Managerial inputs to Aggregate planning, Pure and Mixed strategies, Mathematical Models for Aggregate planning – Transportation Method, Linear programming Formulation, Linear Decision Rules, Master Production Schedule(MPS), Procedure for developing MPS, MRP, Lot sizing methods of MRP, MRP Implementation issues, MRP – II.

UNIT IV CAPACITY MANAGEMENT
Measures of capacity, Factors affecting capacity, Capacity planning, Systematic approach to capacity planning, Long-term and short-term capacity decisions, Tools for capacity planning, Capacity Requirement planning- Business process outsourcing

UNIT V PRODUCTION ACTIVITY CONTROL
Objectives and Activities of Production Activity Control, Flow-shop, Intermittent flow shop, Job shop, Shop floor control – High volume Production Activity Control, Job-shop Production Activity Control.

TOTAL: 45 PERIODS

OUTCOMES
- Upon completion of this course, the students will be able to demonstrate the knowledge in fundamental concepts and issues of operations management in creating and enhancing a firm’s competitive advantages

REFERENCES:
4. Panneerselvam,R. Production & operations Management, PHI,2005
PTIE8411 OPTIMIZATION LAB  

OBJECTIVES:
To give adequate exposure to applications of software packages in the area of operations research.

Problem Formulation, Solving Using C, C++, Excel and Optimisation Package  
(TORA/Lindo/Lingo)  
LP Models  
Transportation Problem  
Assignment Problems  
Maximal Flow  
Minimal Spanning Tree  
Shortest route  
Project Management- PERT and CPM  
Goal Programming  
AHP and DEA

TOTAL : 45 PERIODS

OUTCOMES:
- Due to the practical exposure, to the theoretical knowledge gained earlier, the students are capable of selecting to right tool to solve optimization problems.

PTGE8551 ENGINEERING ETHICS AND HUMAN VALUES  

OBJECTIVES:
- To enable the students to create an awareness on Engineering Ethics and Human Values, to instill Moral and Social Values and Loyalty and to appreciate the rights of others.

UNIT I HUMAN VALUES  

UNIT II ENGINEERING ETHICS  

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION  
Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law – The Challenger Case Study

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS  

UNIT V GLOBAL ISSUES 8

TOTAL: 45 PERIODS

OUTCOMES:
- Upon completion of the course, the student should be able to apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities and rights in the society

TEXTBOOK

REFERENCES:

WEB SOURCES:
1. www.onlineethics.org
2. www.nspe.org
3. www.globalethics.org
4. www.ethics.org

PTIE8501 ENGINEERING ECONOMY AND COST ESTIMATION

OBJECTIVES:
- To study and understand the concept of Engineering Economics and apply in the real word.
- To gain knowledge in the field of cost estimation to enable the students to estimate the cost of various manufacturing processes.

UNIT I INTRODUCTION TO MANAGERIAL ECONOMICS AND DEMAND ANALYSIS 9
UNIT II PRODUCTION AND COST ANALYSIS

UNIT III PRICING

UNIT IV ESTIMATION OF MATERIAL AND LABOUR COSTS

UNIT V ESTIMATION OF OPERATIONAL COST

TOTAL: 45 PERIODS

OUTCOMES:
- Students will become familiar with principles of micro economics and cost estimation.
  They will be able to apply these principles to appreciate the functioning of product and input market as well as the economy

TEXT BOOKS:

REFERENCES:

PTIE8502 FACILITY LAYOUT AND MATERIALS HANDLING  L  T  P  C
                                       3  0  0  3

OBJECTIVE:
To explain the basic principles in facilities planning, location, layout designs and material handling systems

UNIT I PLANT LOCATION
UNIT II  FACILITY LAYOUT DESIGN  9  
Need for Layout study, Factors influencing plant layout, Objectives of a good facility layout, Classification of layout, Layout procedure – Nadler’s ideal system approach, Immer’s basic steps, Apple’s layout procedure, Reed’s layout procedure – Layout planning – Systematic Layout Planning – Information gathering, flow analysis and activity analysis, relationship diagram, space requirements and availability, designing the layout. Utilities planning

UNIT III COMPUTERISED LAYOUT PLANNING  9  

UNIT IV DESIGNING PRODUCT LAYOUT  9  
Line balancing - Objectives, Line balancing techniques – Largest Candidate rule- Kilbridge and Wester method- RPW method- COMSOAL.

UNIT V MATERIAL HANDLING AND PACKAGING  9  
Objectives and benefits of Material handling, Relationship between layout and Material handling, Principles of material handling, Unit load concept, Classification of material handling equipments, Equipment selection, Packaging.

TOTAL: 45 PERIODS

OUTCOMES:  
- Students must analyse, design and apply layout principles for layout product, material handling and packaging.

TEXT BOOK  

REFERENCES  

PTIE8503 QUALITY CONTROL AND ASSURANCE  L T P C 3 0 0 3  

OBJECTIVES:  
- To impart knowledge to enable the students to design and implement Statistical Process Control in any industry  
- To design and implement acceptance sampling inspection methods in industry

UNIT I QUALITY FUNDAMENTALS  9  
Importance of quality- evolution of quality- definitions of quality- dimensions of quality- quality control- quality assurance- areas of quality- quality planning- quality objectives and policies- quality costs- economics of quality- quality loss function- quality Vs productivity- Quality Vs reliability.
UNIT II  CONTROL CHARTS FOR VARIABLES
Process variation- preliminary decisions- control limits and their computation- construction and application of X bar, R and S charts- warning and modified control limits- process adjustment for trend,- Comparison of process variation with specification limits- O.C. curve for X bar chart.

UNIT III  STATISTICAL PROCESS CONTROL
Process stability- process capability study using control charts- capability evaluation- C_p, C_{pk} and C_{pm} – capability analysis using histogram and normal probability plot- machine capability study-gauge capability study- setting statistical tolerances for components and assemblies- individual measurement charts- X-chart, moving average and moving range chart, multi-vari chart.

UNIT IV  CONTROL CHARTS FOR ATTRIBUTES
Limitations of variable control charts- Control charts for fraction non-conforming- p and np charts, variable sample size, operating characteristic function, run length- Control chart for nonconformities (defects)- c, u, ku charts, demerits control chart- applications.

UNIT V  ACCEPTANCE SAMPLING
Need- economics of sampling- sampling procedure- single and double sampling- O.C. curves-Average outgoing quality- Average sample number- Average total inspection- Multiple and sequential sampling- Standard sampling plans- Military, Dodge-Roming, IS 2500.

TOTAL: 45 PERIODS

OUTCOMES:
- Control the quality of processes using control charts for variables in manufacturing industries.
- Control the occurrence of defective product and the defects in manufacturing companies.
- Control the occurrence of defects in services.
- Achieve savings in rupees to the companies through quality control and improvement programmes.

TEXT BOOK:

REFERENCES:

PTIE8504  SUPPLY CHAIN AND LOGISTICS MANAGEMENT

OBJECTIVE:
To teach the basic principles of supply chains and associated logistics management
UNIT I  INTRODUCTION
Role of Logistics and Supply chain Management: Scope and Importance- Evolution of Supply Chain -Decision Phases in Supply Chain - Competitive and Supply chain Strategies – Drivers of Supply Chain Performance and Obstacles.

UNIT II  SUPPLY CHAIN NETWORK DESIGN

UNIT III  LOGISTICS IN SUPPLY CHAIN
Role of transportation in supply chain – factors affecting transportations decision – Design option for transportation network – Tailored transportation – Routing and scheduling in transportation

UNIT IV  SOURCING AND COORDINATION IN SUPPLY CHAIN
Role of sourcing supply chain supplier selection assessment and contracts- Design collaboration - sourcing planning and analysis -supply chain co-ordination - Bull whip effect – Effect of lack of co-ordination in supply chain and obstacles – Building strategic partnerships and trust within a supply chain

UNIT V  SUPPLY CHAIN AND INFORMATION TECHNOLOGY
The role IT in supply chain- The supply chain IT frame work Customer Relationship Management – Internal supply chain management – supplier relationship management – future of IT in supply chain –E-Business in supply chain

TOTAL: 45 PERIODS

OUTCOMES:
• The student would understand the framework and scope of supply chain networks and functions.

TEXT BOOKS

REFERENCES

PTIE8601  SIMULATION MODELING AND ANALYSIS
L T P C
3 0 0 3

OBJECTIVE
• To cover various aspects of discrete dynamic, stochastic systems modeling and conducting experiments with those models on a computer.
UNIT I  INTRODUCTION  3
Systems – Modelling – types – systems components – Simulation basics

UNIT II  RANDOM NUMBERS / VARIATES  10

UNIT III  DESIGN OF SIMULATION EXPERIMENTS  12
Steps on Design of Simulation Experiments – Development of models using High level language for systems like Queing, Inventory, Replacement, Production etc., - Model validation and verification, Output analysis. Use of DOE tools.

UNIT IV  SIMULATION LANGUAGES  12
Need for simulation Languages – Study of GPSS and introduction to ARENA.

UNIT V  CASE STUDIES USING SIMULATION LANGUAGES  8
TOTAL: 45 PERIODS

OUTCOMES:
• Will be able to analyse, models and simulate experiments to meet real world system and evaluate the performance.

REFERENCES:

PTMG8651  TOTAL QUALITY MANAGEMENT  L T P C
(EEE, Mechanical, Automobile, Printing, Industrial, Manufacturing, CSE, ECE, IT, Leather, Production)  3 0 0 3

AIM
To provide comprehensive knowledge about the principles, practices, tools and techniques of Total quality management.

OBJECTIVES
• To understand the various principles, practices of TQM to achieve quality.
• To learn the various statistical approaches for Quality control.
• To understand the TQM tools for continuous process improvement.
• To learn the importance of ISO and Quality systems
UNIT I  INTRODUCTION

UNIT II  TQM PRINCIPLES
Quality statements - Customer focus –Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Continuous process improvement – PDCA cycle, 5s, Kaizen - Supplier partnership – Partnering, Supplier selection, Supplier Rating.

UNIT III  TQM TOOLS & TECHNIQUES I

UNIT IV  TQM TOOLS & TECHNIQUES II

UNIT V  QUALITY SYSTEMS

TOTAL : 45 PERIODS

OUTCOMES:
• The student would be able to apply the tools and techniques of quality management to manufacturing and services processes.

TEXT BOOK:

REFERENCE BOOKS:
OBJECTIVE:
To improve communication skills and to give an opportunity for the students to apply the concepts of various techniques covered in the areas of Industrial Engineering in a given practical situation.

Projects shall be assigned in the following areas:
- Forecasting and Aggregate Planning
- Materials Requirement Planning and Capacity Planning
- Transportation and Distribution of goods
- Group technology and Cellular manufacturing
- Production and Project Scheduling
- Quality Control
- Plant Layout Design
- Methods improvement in manufacturing and service organisation

TOTAL : 45 PERIODS

OBJECTIVES:
- To impart knowledge to design experiments to a problem situation using traditional experimental designs as well as Taguchi Methods.
- To develop skill to conduct experiments and analyze the data to determine the optimal process parameters that optimize the process.

UNIT I FUNDAMENTALS OF EXPERIMENTAL DESIGNS 9
Hypothesis testing – single mean, two means, dependant/ correlated samples – confidence intervals, Experimentation – need, Conventional test strategies, Analysis of variance, F-test, terminology, basic principles of design, steps in experimentation – choice of sample size – Normal and half normal probability plot – simple linear and multiple linear regression, testing using Analysis of variance.

UNIT II SINGLE FACTOR EXPERIMENTS 9

UNIT III FACTORIAL DESIGNS 9
Main and Interaction effects- Two and three factor full factorial designs- Fixed effects and random effects model- Rule for sum of squares and Expected Mean Squares- $2^k$ Design with two and three factors- Yate’s Algorithm- fitting regression model- Randomized Block Factorial Design- practical applications
UNIT IV SPECIAL EXPERIMENTAL DESIGNS
Blocking and Confounding in $2^k$ Designs- blocking in replicated design- $2^k$ Factorial Design in two blocks- Complete and partial confounding- Confounding $2^k$ Design in four blocks- Two level Fractional Factorial Designs- one-half fraction of $2^k$ Design, design resolution, Construction of one-half fraction with highest design resolution, one-quarter fraction of $2^k$ Design- introduction to response surface methods, central composite design.

UNIT V TAGUCHI METHODS
Design of experiments using Orthogonal Arrays, Data analysis from Orthogonal experiments- Response Graph Method, ANOVA- attribute data analysis- Robust design- noise factors, Signal to noise ratios, Inner/outer OA design- case studies.

OUTCOMES:
• Able to apply experimental techniques to practical problems to improve quality of processes / products by optimizing the process / product parameters.

TEXT BOOKS:

REFERENCES:

PTMG8551 PRINCIPLES OF MANAGEMENT (ECE, CSE, Civil, Industrial, EEE) 3 0 0 3

AIM
To learn the different principles and techniques of management in planning, organizing, directing and controlling.

OBJECTIVES
• To study the Evolution of Management
• To study the functions and principles of management
• To learn the application of the principles in an organization

UNIT I INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS

UNIT II PLANNING
UNIT III ORGANISING

UNIT IV DIRECTING

UNIT V CONTROLLING
System and process of controlling – budgetary and non-budgetary control techniques – use of computers and IT in Management control – Productivity problems and management – control and performance – direct and preventive control – reporting.

TOTAL: 45 PERIODS

OUTCOMES:
- Upon completion of the course, students will be able to have clear understanding of managerial functions like planning, organizing, staffing, leading & controlling and have same basic knowledge on international aspect of management

TEXT BOOKS:

REFERENCES:

PTIE8001 ACCOUNTING AND FINANCE FOR MANAGEMENT

AIM
- To enable students to understand the accounting procedure, interpretation of financial accounting with cost account.

UNIT I INTRODUCTION
UNIT II  FINANCIAL ACCOUNTING  
Salient features of Balance Sheet and Profit and Loss statement, cash flow and Fund flow analysis (Elementary), working capital management, ratio analysis – Depreciation.

UNIT III  COST ACCOUNTING  
Cost accounting systems : Job Costing, process costing, allocation of overheads, Activity based costing, variance analysis – marginal costing – Break even analysis.

UNIT IV  BUDGETING  
Requirements for a sound budget, fixed budget – preparation of sales and production budget, flexible budgets, zero based budgets and budgetary control.

UNIT V  FINANCIAL MANAGEMENT  
Investment decisions – Investment appraisal techniques – payback period method, accounting rate of return, net present value method, internal rate of return and profitability index method-cost of capital.

TOTAL: 45 PERIODS

OUTCOMES:
- To possess the principles and techniques of accounting and managing finance in an organization

REFERENCES:

PTIE8002  ADVANCED OPTIMIZATION TECHNIQUES  

OBJECTIVES:
- Understand the nonlinear problem.
- Know about multi-objective problem.
- To create awareness of meta heuristic algorithms.

UNIT I  DECISION ANALYSIS  
Decision Trees, Utility theory, Game theory, MCDM – Goal programming, AHP and ANP; Markov Decision processes

UNIT II  NON-LINEAR OPTIMIZATION - I  
Types of Non-linear programming problems, Unconstrained optimization, KKT conditions for constrained optimization, Quadratic programming

UNIT III  NON-LINEAR OPTIMIZATION - II  
Separable programming, Convex programming, Non-convex programming, Geometric programming, Stochastic programming
UNIT IV  NON-TRADITIONAL OPTIMIZATION - I  9
An overview of Genetic Algorithms, Simulated annealing, Tabu search, Ant Colony Optimization

UNIT V  NON-TRADITIONAL OPTIMIZATION - II  9
Neural network based optimization, Optimization of Fuzzy systems

OUTCOMES:
The Students must be able to
- Solve a nonlinear problem through its linear approximation.
- Solve a multi-objective problem through weighted and constrained methods.
- Apply various direct and indirect search methods.

REFERENCES

PTIE8003  APPLIED MULTI-VARIATE ANALYSIS  L  T  P  C
3  0  0  3

OBJECTIVE:
To impart knowledge on the applications of multivariate statistical analysis

UNIT I  MULTIVARIATE METHODS  9
An overview of multivariate methods, Multivariate normal distribution, Eigen values and Eigen vectors.

UNIT II  REGRESSION  9
Simple Regression, and Correlation – estimation using the regression line, correlation analysis, Multiple Regression and Canonical Correlation analysis – inferences about population parameters

UNIT III  FACTOR ANALYSIS  9
Principal components analysis – objectives, estimation of principal components, testing for independence of variables, Factor analysis model – factor analysis equations and solution

UNIT IV  DISCRIMINANT ANALYSIS  9
Discriminant analysis – discrimination for two multi variate normal populations

UNIT V  CLUSTER ANALYSIS  9
Cluster analysis – clustering methods, Multivariate analysis of variance

TOTAL : 45 PERIODS

OUTCOMES:
- Can apply the multivariate, regression, factor, discriminant and cluster analysis techniques for statistical analysis.
TEXT BOOK:

REFERENCES

PTIE8004 COMPUTATIONAL METHODS AND ALGORITHMS L T P C
3 0 0 3

OBJECTIVE
A brief introduction to algorithmic design tools with some applications

UNIT I INTRODUCTION 5
Review of C/C++ - writing and debugging large programs-controlling numerical errors

UNIT II ALGORITHM DESIGN METHODS 12

UNIT III BASIC TOOLS 12
Structured approach – networks – trees – data structures

UNIT IV COMPUTATIONAL PERFORMANCE 6
Time complexity – space complexity – algorithm complexity

UNIT V APPLICATIONS 10

TOTAL: 45 PERIODS

OUTCOMES:
• Student must be able to design algorithm computational tools used in manufacturing process.

REFERENCES:
3. Dromey, R.G., How to solve it with computers?, PHI, 2002
OBJECTIVE:
To provide some aspects of Fixed, Flexible and integrated automation along with their applications

UNIT I  GT AND FMS
Part families, production flow analysis, cellular manufacturing, ROC, Flexible manufacturing systems- components, FMS applications, FMS analysis – bottleneck model.

UNIT II  COMPUTER-AIDED DESIGN
Fundamentals of CAD – design process, manufacturing database – Computer graphics – functions, constructing the geometry, transformation, wire frame Vs solid modelling.

UNIT III  MANUFACTURING SUPPORT SYSTEMS
Product design and CAD, CAD/CAM and CIM, Computer aided process planning- variant and generative approaches, Concurrent engineering and design for manufacture, Lean production, Agile manufacturing.

UNIT IV  FUNDAMENTALS OF COMMUNICATIONS
Information, Communications matrix, Computer communications, Network architecture, Tools and techniques.

UNIT V  DATABASE AND CIM MANAGEMENT
Manufacturing data, database technology, Database management, Management of CIM – role, cost justification, expert systems

TOTAL: 45 PERIODS

OUTCOMES:
- The students will gain knowledge and find placement in industries which uses hardware and software of CIM control systems.

REFERENCES:
2. S.Kant Vajpayee, Principles of Computer-Integrated Manufacturing, PHI, 2005
UNIT II ANALYSIS 10
DSS components- Data warehousing, access, analysis, mining and visualization-modeling and analysis-DSS development.

UNIT III TECHNOLOGIES 10
Group support systems- enterprise DSS- supply chain and DSS-knowledge management methods, technologies and tools.

UNIT IV EXPERT SYSTEMS 10
Artificial intelligence and expert systems-concepts, structure, types-knowledge acquisition and validation-difficulties, methods, selection.

UNIT V SEMANTIC NETWORKS 10
Representation in logic and schemas, semantic networks, production rules and frames, inference techniques, intelligent system development, implementation and integration of management support systems.

TOTAL : 45 PERIODS

OUTCOMES:
- The students will be able to make decisions in the semi structured and unstructured problem situations using systems and semantic networks.

REFERENCES

PTIE8007 EVOLUTIONARY OPTIMIZATION L T P C
UNIT I 9
Conventional Optimization techniques, Overview of evolutionary computation, Historical branches of evolutionary computation

UNIT II 9
Search operators, Selection schemes, Ranking methods, Importance of representation

UNIT III 9
Evolutionary combinatorial optimization: evolutionary algorithms, constrained optimization, Evolutionary multi-objective optimization.

UNIT IV 9
Genetic programming – steps, Search operators on trees, examples Hybrid genetic algorithms, combining choices of heuristics
UNIT V
Pareto optimality, Analysis of evolutionary algorithms

TOTAL: 45 PERIODS

OUTCOMES:
- The students will be able to make decisions in the semi structured and unstructured problem situations.

REFERENCES

PTIE8008 INFORMATION SYSTEMS ANALYSIS AND DESIGN

L T P C
3 0 0 3

OBJECTIVES:
- To describe the design data flow and ER diagrams Management Information Systems to business organisation

UNIT I OVERVIEW
Information concepts, System concepts, Examples of Information systems, Information Systems analysis overview, Information gathering – sources

UNIT II DATA FLOW DIAGRAMS and ER DIAGRAMS
System Requirements specifications, Feasibility analysis, Data flow diagrams – logical and physical DFDs, Process specification methods, Decision tables
Logical database design – ER model, Normalizing relations; Data input methods; Structured Systems Analysis and Design

UNIT III MANAGEMENT INFORMATION SYSTEMS
Development of MIS, Choice of Information technology, Applications in manufacturing and service sector, Enterprise management systems

UNIT IV TECHNOLOGY and INFORMATION SYSTEMS
Database management systems, Object oriented technology, Client-server architecture, Local area network, network topology

UNIT V APPLICATIONS
Data warehouse design and implementation, Models of E-business, MIS and E-business, Web enabled business management, Introduction to ERP, Case studies

TOTAL: 45 PERIODS
OUTCOMES:
- The Student must be able to design data flow and ER diagrams, manage information system and apply modern concepts to business organizations.

REFERENCES:

PTIE8009 MAINTENANCE ENGINEERING AND MANAGEMENT L T P C
3 0 0 3

OBJECTIVE:
To provide maintenance concepts and maintenance policies with maintenance management tools and techniques.

UNIT I MAINTENANCE CONCEPT
7

UNIT II MAINTENANCE MODELS
11

UNIT III MAINTENANCE QUALITY
8

UNIT IV MAINTENANCE MANAGEMENT
11

UNIT V TOTAL PRODUCTIVE MAINTENANCE
8

TOTAL: 45 PERIODS

OUTCOMES:
- The students would gain knowledge on maintenance logistics, fault diagnosis and TP M.

REFERENCES:
OBJECTIVE:
To impart knowledge about linear and angular measuring instruments.

UNIT I  LINEAR MEASUREMENT AND ANGULAR MEASUREMENT  12
Accuracy, Precision, Readability, Sensitivity etc., Linear measuring instruments-vernier –
micrometer-Gauge blocks- dial indicator-comparators – Angle standards – vernier bevel
protractor-sine bar – autocollimator.

UNIT II  STANDARDS FOR LINEAR AND ANGULAR MEASUREMENTS  8
Shop floor standards and their calibration, light interference, Method of coincidence, Slip gauge
 calibration, Measurement errors, Limits, fits, Tolerance, Gauges, Gauge design.

UNIT III  MEASUREMENT APPLICATION  8
Measurement of screw threads and gears – Radius measurement – surface finish
measurement -Measurement of straightness-flatness-parallelism – squareness- roundness
– circularity

UNIT IV  MODERN CONCEPTS  8
Image processing and its application in Metrology, Co-ordinate measuring machine, Types of
CMM, Probes used, Application, Non-contact CMM using Electro-optical sensors for
dimensional metrology.

UNIT V  INTRODUCTION TO MEASUREMENT SYSTEMS  9
System configuration, basic characteristics of measuring devices, Displacement, force and
torque measurement, standards, Calibration, Sensors, Basic principles and concepts of
temperature, Pressure and flow measurement, Destructive testing – Nondestructive testing.

TOTAL: 45 PERIODS

OUTCOMES:
The student must be able to

- Apply various linear and angular measuring instruments.
- Apply measure linear, angular and surface profile using CMM.
- Apply non-destructive techniques.
- Students will be able to apply the maintenance philosophies and techniques to upkeep
  the systems with economic life cycle cost.

TEXT BOOK:

REFERENCES:
2. Robinson, S.L. and Miller R.K. Automated Inspection and Quality Assurance, Marcel Dekker
   Inc.1989.
OBJECTIVES:
• To introduce the students different models used to describe the manufacturing systems and use of them for effective operations of manufacturing industries.

UNIT I INTRODUCTION
Manufacturing systems types and concepts, manufacturing automation, performance measures types, classification and uses of manufacturing system models

UNIT II FOCUSED FACTORIES
Focused flow lines – work cells- work centers, Group technology, Process planning types, General serial systems – analysis of paced and unpaced lines, system effectiveness, impact of random processing times, FMS planning and scheduling – part selection and loading problems.

UNIT III MARKOV AND PETRINET MODELS
Stochastic processes in manufacturing, Markov chain models – DTMC and CTMC, steady state analysis, Petrinets in manufacturing – basic concepts, stochastic petrinets.

UNIT IV QUEUING MODELS OF MANUFACTURING
Basic queuing models, Queuing networks in manufacturing – Jackson and Gordon Newell, product form solution

UNIT V LEAN SYSTEMS
Characteristics of lean systems, Pull method of work flow, lot size reduction, Kanban system, Value stream mapping, JIT principles

TOTAL : 45 PERIODS

OUTCOMES:
• The Student must be able to apply the principles behind focused factory, Markov and Petrinet Models, Queuing models, lean system to model modern manufacturing systems.

REFERENCES:
UNIT I  SCHEDULING THEORY  8

UNIT II  SINGLE MACHINE SCHEDULING  10

UNIT III  PARALLEL MACHINE SCHEDULING  9

UNIT IV  FLOW SHOP SCHEDULING  9

UNIT V  JOB SHOP SCHEDULING  9

TOTAL: 45 PERIODS

OUTCOMES:
- Students will be able to design, analyse and implement single machine, parallel machine, flow shop, and job shop scheduling algorithms.

REFERENCES:

PTIE8013  PRINCIPLES OF MARKETING MANAGEMENT  L  T  P  C
3  0  0  3

OBJECTIVES:
- To enable students to deal with newer concepts of marketing concepts like strategic marketing segmentation, pricing, advertisement and strategic formulation. The course will enable a student to take up marketing as a professional career.

UNIT I  INTRODUCTION  9
Definition, Needs wants and Demands, Marketing Concepts, Environment, Mix, types, Philosophies, Selling Vs. Marketing, Consumer goods, Industrial goods, product hierarchy
UNIT II  MARKETING PLANNING AND STRATEGY FORMULATION  9  
Value delivery process, Core Competencies, Strategy formulation and the marketing process - Strategy implementation – SWOT Analysis, Portfolio Analysis , BCG , GEC grids, Components Of a marketing plan

UNIT III  BUYING BEHAVIOUR AND MARKET SEGMENTATION  9  
Building customer value, Consumer behavior – influencing factors, motivation, perception, learning, buying decisions process. Segmentation - levels, demographic, psychographic geographic and behavioural segmentation, process, patterns

UNIT IV  PRODUCT PRICING AND MARKETING RESEARCH  9  
Pricing Objectives, decisions and methods, Pricing management, Marketing Research – Introduction, uses, system, process of marketing research

UNIT V  ADVERTISING, SALES PROMOTION & DISTRIBUTION  9  
Advertising – objectives, types, developing Advertising campaign, Sales promotion, Retailing, Wholesaling, Market Logistics, Modern trends

TOTAL: 45 PERIODS

OUTCOMES:
- To acquire the knowledge of analytical skills in solving marketing to related problems and create awareness about marketing management process.

TEXT BOOKS

REFERENCES

PTIE8014  PRODUCT DESIGN AND VALUE ENGINEERING  L T P C  3 0 0 3

OBJECTIVES:
- The course aims at providing the basic concepts of product design, product features and its architecture so that student can have a basic knowledge in the common features a product has and how to incorporate them suitably in product.
UNIT I VALUE ENGINEERING BASICS 9
Origin of Value Engineering, Meaning of value, Definition of Value Engineering and Value analysis, Difference between Value analysis and Value Engineering, Types of Value, function - Basic and Secondary functions, concept of cost and worth, creativity in Value Engineering.

UNIT II VALUE ENGINEERING JOB PLAN AND PROCESS 9
Seven phases of job plan, FAST Diagram as Value Engineering Tool, Behavioural and organizational aspects of Value Engineering, Ten principles of Value analysis, Benefits of Value Engineering.

UNIT III IDENTIFYING CUSTOMER NEEDS and PRODUCT SPECIFICATIONS 9

UNIT IV CONCEPT GENERATION, SELECTION AND PRODUCT ARCHITECTURE 9

UNIT V INDUSTRIAL DESIGN, PROTOTYPING AND ECONOMICS OF PRODUCT DEVELOPMENT 9

TOTAL : 45 PERIODS

OUTCOMES:
- The student will be able to design some products for the given set of applications; also the knowledge gained through prototyping technology will help the student to make a prototype of a problem and hence product design and development can be achieved.

TEXT BOOKS:

REFERENCES:
OBJECTIVE:
To introduce the basic principles of Productivity Models and the applications of Re-Engineering Concepts required for various organizations.

UNIT I  INTRODUCTION  3
Basic concept and meaning of Productivity – Significance of Productivity – Factors affecting Productivity – Productivity cycle, Scope of Productivity Engineering and Management.

UNIT II  PRODUCTIVITY MEASUREMENT AND EVALUATION  9

UNIT III  PRODUCTIVITY PLANNING AND IMPLEMENTATION  9
Need for Productivity Planning – Short term and long term productivity planning – Productivity improvement approaches, Principles - Productivity Improvement techniques – Technology based, Material based, Employee based, Product based techniques – Managerial aspects of Productivity Implementation schedule, Productivity audit and control.

UNIT IV  REENGINEERING PROCESS  15

UNIT V  BPR TOOLS AND IMPLEMENTATION  9
Analytical and Process Tools and Techniques - Role of Information and Communication Technology in BPR – Requirements and steps in BPR Implementation – Case studies.

TOTAL : 45 PERIODS

OUTCOMES:
The Student must be able to:
• Measure and evaluate productivity
• Plan and implement various productivity techniques.
• Reengineer the process for improving the productivity
• Implement BPR tools for improving the productivity.

REFERENCES:
OBJECTIVES:
- To outline the need for Project Management
- To highlight different techniques of activity planning

UNIT I  INTRODUCTION TO PROJECT MANAGEMENT AND PROJECT SELECTION

UNIT II  PROJECT PLANNING AND IMPLEMENTATION

UNIT III  PROJECT MONITORING AND CONTROL

UNIT IV  PROJECT CLOSURE
Project evaluation- Project Auditing – Phases of project Audit- Project closure reports- Guidelines for closeout reports.

UNIT V  SPECIAL TOPICS IN PROJECT MANAGEMENT

TOTAL : 45 PERIODS

OUTCOMES:
- To apply project management principles in business situations to optimize time and resource utilization

REFERENCE BOOKS:
UNIT I RELIABILITY CONCEPT  9
Reliability definition – Reliability parameters - f(t), F(t) and R(t) functions - Measures of central tendency – Bath tub curve – A priori and posteriori probabilities of failure – Component mortality - Useful life.

UNIT II LIFE DATA ANALYSIS  9

UNIT III RELIABILITY ESTIMATION  9
Series parallel configurations – Parallel redundancy – m/n system – Complex systems: RBD approach – Baye’s method – Minimal path and cut sets - Fault Tree analysis – Standby system.

UNIT IV RELIABILITY MANAGEMENT  8

UNIT V RELIABILITY IMPROVEMENT  10

TOTAL: 45 PERIODS

OUTCOMES
• Students will be able to conduct reliability assessment and failure analysis on any complex systems.

REFERENCES:

PTIE8018 ROBOTICS ENGINEERING  L T P C
3 0 0 3

OBJECTIVES
To introduce the basic concepts, parts of robots and types of robots
To make the student familiar with the various drive systems for robot, sensors and their applications in robots and programming of robots
To discuss about the various applications of robots, justification and implementation of robot

UNIT I FUNDAMENTALS OF ROBOT  7
UNIT II  ROBOT DRIVE SYSTEMS AND END EFFECTORS  10

UNIT III  SENSORS AND MACHINE VISION  10
Sensory Devices- non optical- position sensors- optical position sensors- velocity sensors-proximity sensors- contact and noncontact type- touel and slip sensors- force and torque sensors- Al and Robotics

UNIT IV  ROBOT KINEMATICS AND ROBOT PROGRAMMING  10
Forward Kinematics and Reverse Kinematics of Manipulators with Two, Three Degrees of Freedom (In 2 Dimensional)-Teach Pendant Programming, Lead through programming, Robot programming Languages – VAL Programming – Motion Commands, Sensor Commands, End effector commands, and Simple programs

UNIT V  ROBOT CELL DESIGN, CONTROL AND ECONOMICS  8

TOTAL : 45 PERIODS  

OUTCOMES:
• Able to suggest a suitable robot drive, gripper and sensors required for particular application.
• Able to analyze robot arm kinematics and understand simple programs.
• Able to analyze the robot cycle time and economics of robot implementation

TEXT BOOK

REFERENCES;

PTIE8019  SAFETY ENGINEERING AND MANAGEMENT  L  T  P  C
3  0  0  3

OBJECTIVE:
To impart knowledge on safety engineering fundamentals and safety management practices.

UNIT I  INTRODUCTION  9
Evolution of modern safety concepts – Fire prevention – Mechanical hazards – Boilers, Pressure vessels, Electrical Exposure.

54
UNIT II  CHEMICAL HAZARDS  9
Chemical exposure – Toxic materials – Radiation Ionizing and Non-ionizing Radiation -
Industrial Hygiene – Industrial Toxicology.

UNIT III  ENVIRONMENTAL CONTROL  9
Industrial Health Hazards – Environmental Control –Industrial Noise - Noise measuring
instruments, Control of Noise, Vibration, - Personal Protection.

UNIT IV  HAZARD ANALYSIS  9
System Safety Analysis –Techniques – Fault Tree Analysis (FTA), Failure Modes and Effects
Analysis (FMEA), HAZOP analysis and Risk Assessment.

UNIT V  SAFETY REGULATIONS  9
Explosions – Disaster management – catastrophe control, hazard control , Factories Act, Safety
regulations Product safety – case studies.

TOTAL : 45 PERIODS

OUTCOMES:
• Students must be able to identify and prevent chemical, environmental mechanical, fire
hazard through analysis and apply proper safety techniques on safety engineering and
management.

REFERENCES:
3. David L.Goetsch, Occupational Safety and Health for Technologists, Engineers and
UNIT III  ANALYSIS OF ALTERNATIVES - I  9
Cross-impact analysis, Structural modeling tools, System Dynamics models with case studies, Economic models: present value analysis – NPV, Benefits and costs over time, ROI, IRR; Work and Cost breakdown structure,

UNIT IV  ANALYSIS OF ALTERNATIVES – II  9
Reliability, Availability, Maintainability, and Supportability models; Stochastic networks and Markov models, Queuing network optimization, Time series and Regression models, Evaluation of large scale models

UNIT V  DECISION ASSESSMENT  9
Decision assessment types, Five types of decision assessment efforts, Utility theory, Group decision making and Voting approaches, Social welfare function; Systems Engineering methods for Systems Engineering Management,

TOTAL : 45 PERIODS

OUTCOMES:
• The Student must be able to apply systems engineering principles ot make decision for optimization.
• Hence an understanding of the systems engineering discipline and be able to use the core principles and processes for designing effective system.

TEXT BOOK:

REFERENCES:

PTIE8021  TECHNOLOGY MANAGEMENT  L  T  P  C
3  0  0  3

OBJECTIVES:
Study of this subject provides an understanding of the Technology management principles to the various organizations.

UNIT I
Technology management - Scope, components, and overview. Technology and environment, Technology and society, Technology Impact analysis, environmental, social, legal, political aspects, techniques for analysis - steps involved. Technology policy strategy: Science and technology Policy of India, implications to industry.

UNIT II
UNIT III
Technology Choice and Evaluation - Methods of analysing alternate technologies, Techno-economic feasibility studies, Need for multi-criteria considerations such as, social, environmental, and political, Analytic hierarchy method, Fuzzy multi-criteria decision making, and other methods.

UNIT IV
Technology Transfer and Acquisition - Import regulations, Implications of agreements like Uruguay Round and WTO, Bargaining process, Transfer option, MOU - Technology Adoption and Productivity - Adopting technology-human interactions, Organisational redesign and re-engineering, Technology productivity.

UNIT V

TOTAL : 45 PERIODS

OUTCOMES:
Upon completion of the course, students will be able to
- Have clear understanding of managerial functions like planning, organizing, staffing, leading and controlling
- Have same basic knowledge on international aspect of management

REFERENCES:
5. Irvin M. Rubin, Organisational behavior an experimental approach, Prentice Hall, 1995

PTIE8071 HUMAN RESOURCE MANAGEMENT (Printing, Industrial) L T P C
3 0 0 3

OBJECTIVE:
To introduce the basic principles of group dynamics and associated concepts required for Human resource management in organizations

UNIT I INDIVIDUAL BEHAVIOR

UNIT II GROUP BEHAVIOR
Group Organization, Group Dynamics, Emergence of Informal Leader, Leadership Styles-theories, Group decision making, Inter personal Relations, Communication -Team.
UNIT III  DYNAMICS OF ORGANIZATIONAL BEHAVIOR  9
Organizational Climate, the Satisfactory –Organizational change –the Change Process & Change Management.

UNIT IV  HUMAN RESOURCES PLANNING  9
Requirements of Human Resources –HR audit, Recruitment-Selection-Interviews

UNIT V  HUMAN RESOURCES DEVELOPMENT  9

TOTAL: 45 PERIODS

OUTCOMES:
- To understand the process of effective Human Resource Management

TEXT BOOK:

REFERENCES:

PTMA8251  NUMERICAL METHODS  L  T  P  C
(EEE, IT, Printing, Automobile, Industrial, Manufacturing)  3  0  0  3

OBJECTIVES:
To provide the mathematical foundations of numerical techniques for solving linear system, eigenvalue problems, interpolation, numerical differentiation and integration and the errors associated with them; To demonstrate the utility of numerical techniques of ordinary and partial differential equations in solving engineering problems where analytical solutions are not readily available.

UNIT I  SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS  9

UNIT II  INTERPOLATION AND APPROXIMATION  9
Interpolation with unequal intervals - Lagrange interpolation –Newton’s divided difference interpolation – Cubic Splines - Interpolation with equal intervals - Newton’s forward and backward difference formulae – Least square method -Linear curve fitting.
UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 9

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 9

UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 9
Finite difference methods for solving two-point linear boundary value problems. Finite difference techniques for the solution of two dimensional Laplace’s and Poisson’s equations on rectangular domain – One dimensional heat-flow equation by explicit and implicit (Crank-Nicholson) methods - One dimensional wave equation by explicit method.

TOTAL: 45 PERIODS

OUTCOMES:
- The students will have a clear perception of the power of numerical techniques, ideas and would be able to demonstrate the applications of these techniques to problems drawn from industry, management and other engineering fields.

TEXT BOOKS:

REFERENCES:

PTME8074 ENTREPRENEURSHIP DEVELOPMENT (Industrial, Manufacturing) L T P C 3 0 0 3

OBJECTIVES:
Study of this subject provides an understanding of the scope of an entrepreneur, key areas of development, financial assistance by the institutions, methods of taxation and tax benefits, etc.
UNIT I  ENTREPRENEURSHIP  9
Entrepreneur – Types of Entrepreneurs – Difference between Entrepreneur and Intrapreneur
Entrepreneurship in Economic Growth, Factors Affecting Entrepreneurial Growth.

UNIT II  MOTIVATION  9
Major Motives Influencing an Entrepreneur – Achievement Motivation Training, Self Rating,
Business Game, Thematic Apperception Test – Stress Management, Entrepreneurship
Development Programs – Need, Objectives.

UNIT III  BUSINESS  9
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.

UNIT IV  FINANCING AND ACCOUNTING  9
Need – Sources of Finance, Term Loans, Capital Structure, Financial Institution, Management
of working Capital, Costing, Break Even Analysis, Network Analysis Techniques of PERT / CPM

UNIT V  SUPPORT TO ENTREPRENEURS  9
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 Sub Contracting.

TOTAL: 45 PERIODS

OUTCOMES:
• Upon completion of the course, students will be able to gain knowledge and skills needed to
run a business successfully.

TEXT BOOKS

REFERENCES
3. Rabindra N. Kanungo “Entrepreneurship and innovation”, Sage Publications, New Delhi,
1998.
4. EDII “Faulty and External Experts – A Hand Book for New Entrepreneurs Publishers:
Entrepreneurship Development” Institute of India, Ahmadabad, 1986.
OBJECTIVES:

- To understand wafer preparation and PCB fabrication, the types of Mounting Technologies and components for electronics assembly & SMT process in detail.
- To know various Defects, Inspection Equipments SMT assembly process and repair, rework and quality aspects of Electronics assemblies.

UNIT I  INTRODUCTION TO ELECTRONICS MANUFACTURING  8
History, definition, wafer preparation by growing, machining, and polishing, diffusion, microlithography, etching and cleaning, Printed circuit boards, types- single sided, double sided, multi layer and flexible printed circuit board, design, materials, manufacturing, inspection.

UNIT II  COMPONENTS AND PACKAGING  9
Introduction to packaging, types-Through hole technology(THT) and Surface mount technology(SMT), Through hole components – axial, radial, multi leaded, odd form. Surface-mount components- active, passive. Interconnections - chip to lead interconnection, die bonding, wire bonding, TAB, flip chip, chip on board, multi chip module, direct chip array module, leaded, leadless, area array and embedded packaging, miniaturization and trends.

UNIT III  SURFACE MOUNT TECHNOLOGY PROCESS  12
Introduction to the SMT Process, SMT equipment and material handling systems, handling of components and assemblies - moisture sensitivity and ESD, safety and precautions needed, IPC and other standards, stencil printing process - solder paste material, storage and handling, stencils and squeegees, process parameters, quality control. Component placement- equipment type, flexibility, accuracy of placement, throughput, packaging of components for automated assembly, Cp and Cpk and process control. soldering- reflow process, process parameters, profile generation and control, solder joint metallurgy, adhesive, underfill and encapsulation process - applications, materials, storage and handling, process and parameters.

UNIT IV  INSPECTION AND TESTING  9
Inspection techniques, equipment and principle - AOI, X-ray. Defects and Corrective action - stencil printing process, component placement process, reflow soldering process, underfill and encapsulation process, electrical testing of PCB assemblies- In circuit test, functional testing, fixtures and jigs.

UNIT V  REPAIR, REWORK, QUALITY AND RELIABILITY OF ELECTRONICS ASSEMBLIES  7
Repair tools, methods, rework criteria and process, thermo-mechanical effects and thermal management, Reliability fundamentals, reliability testing, failure analysis, design for manufacturability, assembly, reworkability, testing, reliability, and environment.

TOTAL: 45 PERIODS

OUTCOMES:

- Perform fabrication of PCBs and use of mounting technology for electronic assemblies.
- Perform quality inspection on the PCBs

TEXT BOOKS:

REFERENCE BOOKS:

PTMF8073 FLEXIBLE MANUFACTURING SYSTEMS  L T P C
(Industrial, Manufacturing)  3 0 0 3

OBJECTIVES:
- To understand the Modern manufacturing systems
- To understand the concepts and applications of flexible manufacturing systems

UNIT I PLANNING, SCHEDULING AND CONTROL OF FLEXIBLE MANUFACTURING SYSTEMS 9

UNIT II COMPUTER CONTROL AND SOFTWARE FOR FLEXIBLE MANUFACTURING SYSTEMS 9

UNIT III FMS SIMULATION AND DATA BASE 9
UNIT IV  
GROUP TECHNOLOGY AND JUSTIFICATION OF FMS  

UNIT V  
APPLICATIONS OF FMS AND FACTORY OF THE FUTURE  

TOTAL: 45 PERIODS

OUTCOMES:
- Ability to perform Planning, Scheduling and control of Flexible Manufacturing systems
- Perform simulation on software’s use of group technology to product classification

TEXT BOOK:

REFERENCE BOOKS:

PTGE8071  
DISASTER MANAGEMENT  
L T P C  
3 0 0 3

OBJECTIVES:
- To provide students an exposure to disasters, their significance and types.
- To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
- To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
- To enhance awareness of institutional processes in the country and
- To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity

UNIT I  
INTRODUCTION TO DISASTERS  
Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc – Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don’ts during various types of Disasters.
UNIT II APPROACHES TO DISASTER RISK REDUCTION (DRR) 9
Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders- Institutional Processess and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.

UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT 9
Factors affecting vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources.

UNIT IV DISASTER RISK MANAGEMENT IN INDIA 9
Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

UNIT V DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS 9
Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

OUTCOMES:
The students will be able to
- Differentiate the types of disasters, causes and their impact on environment and society
- Assess vulnerability and various methods of risk reduction measures as well as mitigation.
- Draw the hazard and vulnerability profile of India, Scenarios in the Indian context, Disaster damage assessment and management.

TEXTBOOK:

REFERENCES
1. Govt. of India: Disaster Management Act, Government of India, New Delhi, 2005
OBJECTIVES:
- To sensitize the Engineering students to various aspects of Human Rights.

UNIT I
Human Rights – Meaning, origin and Development. Notion and classification of Rights –
Natural, Moral and Legal Rights. Civil and Political Rights, Economic, Social and Cultural
Rights; collective / Solidarity Rights.

UNIT II

UNIT III
Theories and perspectives of UN Laws – UN Agencies to monitor and compliance.

UNIT IV
Human Rights in India – Constitutional Provisions / Guarantees.

UNIT V
Human Rights of Disadvantaged People – Women, Children, Displaced persons and Disabled
persons, including Aged and HIV Infected People. Implementation of Human Rights – National
and State Human Rights Commission – Judiciary – Role of NGO’s, Media, Educational
Institutions, Social Movements.

TOTAL : 45 PERIODS

OUTCOME:
- Engineering students will acquire the basic knowledge of human rights.

REFERENCES:
   Allahabad, 2014.