ANNA UNIVERSITY: CHENNAI 600 025

UNIVERSITY DEPARTMENTS

R-2013

B.E. INDUSTRIAL ENGINEERING (PART-TIME)

I - VII SEMESTERS CURRICULUM & SYLLABUS

SEMESTER I

CODE	COURSE TITLE	L	T	P	C
PTMA8151	Applied Mathematics	3	0	0	3
PTPH8151	Engineering Physics	3	0	0	3
PTCY8152	Engineering Chemistry	3	0	0	3
PTGE8151	Computing Techniques	3	0	0	3
PTGE8153	Engineering Mechanics	3	0	0	3
	TOTAL	**15**	**0**	**0**	**15**

SEMESTER II

CODE	COURSE TITLE	L	T	P	C
PTCE8252	Strength of Materials	3	0	0	3
PTEC8251	Electronics Engineering	3	0	0	3
PTGE8251	Environmental Science and engineering	3	0	0	3
PTIE8201	Material Science	3	0	0	3
PTME8251	Mechanics of Machines	3	0	0	3
	TOTAL	**15**	**0**	**0**	**15**

SEMESTER III

CODE	COURSE TITLE	L	T	P	C
PTIE8301	Operations Research – 1	3	0	0	3
PTIE8302	Work System Design	3	0	0	3
PTMA8252	Probability and Statistics	3	0	0	3
PTME8351	Machine Design	3	0	0	3
PRACTICAL					
PTIE8311	Work system Design Laboratory	0	0	3	2
	TOTAL	**12**	**0**	**3**	**14**

SEMESTER IV

CODE	COURSE TITLE	L	T	P	C
PTIE8401	Applied Ergonomics	3	0	0	3
PTIE8402	Manufacturing Automation	3	0	0	3
PTIE8403	Operations Research – II	3	0	0	3
PTIE8404	Production and Operations Management	3	0	0	3
PRACTICAL					
PTIE8411	Optimization Lab	0	0	3	2
	TOTAL	**12**	**0**	**3**	**14**

SEMESTER V

CODE	COURSE TITLE	L	T	P	C
PTGE8551	Engineering Ethics & Human Values	3	0	0	3
PTIE8501	Engineering Economy and Cost Estimation	3	0	0	3
PTIE8502	Facility Layout and Materials Handling	3	0	0	3
PTIE8503	Quality Control and Assurance	3	0	0	3
PTIE8504	Supply Chain and Logistic Management	3	0	0	3
	TOTAL	**15**	**0**	**0**	**15**

SEMESTER VI

CODE	COURSE TITLE	L	T	P	C
PTIE8601	Simulation Modeling and Analysis	3	0	0	3
PTMG8651	Total Quality Management	3	0	0	3
	Elective – I	3	0	0	3
	Elective – II	3	0	0	3
PRACTICAL					
PTIE8611	Communication Skills and Production System Design Project	0	0	3	2
	TOTAL	**12**	**0**	**3**	**14**

SEMESTER VII

CODE	COURSE TITLE	L	T	P	C
PTIE8701	Design of Experiments	3	0	0	3
PTMG8551	Principles of Management	3	0	0	3
	Elective – III	3	0	0	3
PRACTICAL					
PTIE8711	Project work	0	0	9	6
	TOTAL	**9**	**0**	**9**	**15**

TOTAL NO. OF CREDITS 102

ELECTIVES

Sl.No.	Code	Course Title	L	T	P	C
1.	PTIE8001	Accounting And Finance For Management	3	0	0	3
2.	PTIE8002	Advanced Optimization Techniques	3	0	0	3
3.	PTIE8003	Applied Multi-Variate Statistical Analysis	3	0	0	3
4.	PTIE8004	Computational Methods and Algorithms	3	0	0	3
5.	PTIE8005	Computer Integrated Manufacturing Systems	3	0	0	3
6.	PTIE8006	Decision Support and Intelligent Systems	3	0	0	3
7.	PTIE8007	Evolutionary Optimization	3	0	0	3
8.	PTIE8008	Information Systems Analysis and Design	3	0	0	3
9.	PTIE8009	Maintenance Engineering & Management	3	0	0	3
10.	PTIE8010	Metrology and Inspection	3	0	0	3
11.	PTIE8011	Modeling of Manufacturing Systems	3	0	0	3
12.	PTIE8012	Operations Scheduling	3	0	0	3
13.	PTIE8013	Principles of Marketing Management	3	0	0	3
14.	PTIE8014	Product Design and Value Engineering	3	0	0	3
15.	PTIE8015	Productivity Management and Re-engineering	3	0	0	3
16.	PTIE8016	Project Management	3	0	0	3
17.	PTIE8017	Reliability Engineering	3	0	0	3
18.	PTIE8018	Robotics Engineering	3	0	0	3
19.	PTIE8019	Safety Engineering and Management	3	0	0	3
20.	PTIE8020	Systems Engineering	3	0	0	3
21.	PTIE8021	Technology Management	3	0	0	3
22.	PTIE8071	Human Resource Management	3	0	0	3

23.	PTMA8251	Numerical Methods	3	0	0	3
24.	PTME8074	Entrepreneurship Development	3	0	0	3
25.	PTMF8072	Electronics Manufacturing Technology	3	0	0	3
26.	PTMF8073	Flexible Manufacturing Systems	3	0	0	3
27.	PTGE8071	Disaster Management	3	0	0	3
28.	PTGE8072	Human Rights	3	0	0	3

PTMA8151 APPLIED MATHEMATICS L T P C
(Common to all branches of B.E / B.Tech (PT) Programmes) 3 0 0 3

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

Characteristic equation – Eigenvalues and Eigenvectors of a real matrix – Properties of eigen values and eigenvectors – Cayley-Hamilton Theorem – Diagonalization of matrices - Reduction of a quadratic form to canonical form by orthogonal transformation.

UNIT II FUNCTIONS OF SEVERAL VARIABLES 9

Partial derivatives – Homogeneous functions and Euler's theorem – Total derivative – Differentiation of implicit functions – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables - Maxima and minima of functions of two variables.

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

Existence conditions – Transforms of elementary functions – Basic properties – Transforms of derivatives and integrals –Inverse transforms – Convolution theorem – Transform of periodic functions – Application to solution of linear ordinary differential equations with constant coefficients.

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

1. Grewal B.S., Higher Engineering Mathematics, Khanna Publishers, Forty Second Edition, Delhi, 2012.
2. Ramana, B.V. Higher Engineering Mathematics" Tata McGraw Hill Publishing Company, 2008.

REFERENCES

1. Glyn James, Advanced Modern Engineering Mathematics, Prentice Hall of India, Fouth Edition, 2011.
2. Veerarajan, T., Engineering Mathematics (For First Year), Tata McGraw-Hill Pub. Pvt. Ltd., New Delhi, 2007.

PTPH8151 ENGINEERING PHYSICS L T P C
3 0 0 3

OBJECTIVE:

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

UNIT I PROPERTIES OF MATTER 9

Elasticity - Poisson's ratio and relationship between moduli (qualitative) - Stress-strain diagram - factors affecting elasticity - bending of beams - cantilever - bending moment - theory and experiment of Young's modulus determination - Uniform and non-uniform bending - I shaped girders - twisting couple - hollow cylinder - shaft - torsion pendulum - determination of rigidity modulus- moment of inertia of a body (regular and irregular).

UNIT II ACOUSTICS AND ULTRASONICS 9

Classification of sound - loudness and intensity - Weber-Fechner Law - standard intensity and intensity level - decibel - reverberation - reverberation time - rate of growth and decay of sound intensity - derivation of Sabine's formula - absorption coefficient and its determination - factors affecting acoustics of buildings : focussing, interference, echo, Echelon effect, resonance - noise and their remedies. Ultrasonics - production – magnetostriction and piezoelectric methods - detection of ultrasound - acoustic grating - industrial applications - NDT - Ultrasonic method: scan modes and practice.

UNIT III THERMAL PHYSICS 9

Thermal expansion - thermal stress - expansion joints - bimetallic strips - thermal conductivity - conductions in solids - Forbe's and Lees' disc methods - Rectilinear flow of heat through a rod - flow of heat through a compound materials - radical flow of heat through a spherical shell - thermal insulation of buildings – Laws of blackbody radiation: Kirchoffs law, Stephens law, Wiens law, Raleigh-Jean law and Planks law (derivation). Laws of thermodynamics - Otto and diesel engines and their efficiency - entropy - entropy of Carnot's cycle - reverse Carnot's cycle - refrigerator.

UNIT IV APPLIED OPTICS **9**

Interference - Michelson interferometer: construction, working, determination of wave length and thickness - anti-reflection coating - air wedge and its application - Lasers - Einstein's coefficients - CO2, Nd:YAG and semiconductor lasers - homo junction and hetro junction - construction and working - applications - Optical fibres - classification (index & mode based) - principle and propagation of light in optical fibres - acceptance angle and numerical aperture - fibre optic communication system - active and passive sensors.

UNIT V SOLID STATE PHYSICS **9**

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:

1. Gaur R.K., and Gupta, S.L., Engineering Physics, Dhanpat Raj Publications,2003.
2. Palanisamy, P.K., Engineering Physics, Scitech Publications (P) Ltd, 2006.
3. Arumugam, M., Engineering Physics, Anuradha Publications, 2000.

REFERENCES:

1. Sankar, B.N., Pillai.S.O., Engineering Physics, New Age International (P) Ltd., 2007.
2. Rajendran.V Engineering Physics, Tata McGraw-Hill, 2009.

PTCY8152	ENGINEERING CHEMISTRY	L	T	P	C
		3	0	0	3

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 9

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 9

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 9

Introduction-reaction velocity, factors affecting reaction velocity, rate constant, order of reaction, molecularity, pseudo molecular reactions, zero, first, second, and third order reactions, reactions of fractional orders, determination of order of reactions. Catalysis: Auto catalysis - Enzyme Catalysis: Michaelis-Menton equation; factors affecting enzyme catalysis. Heterogeneous Catalysis: Types of adsorption isotherms: Langmuir–Hinselwood and Rideal–Eley Mechanism.

UNIT IV PHOTOCHEMISTRY AND SPECTROSCOPY 9

Photochemistry: Laws of photochemistry - Grotthuss–Draper law, Stark–Einstein law and Lambert-Beer Law. Photoprocesses - Internal Conversion, Inter-system crossing, Fluorescence, Phosphorescence, Chemiluminescence and Photo-sensitisation. Spectroscopy: Electromagnetic spectrum - Absorption of radiation – Electronic, Vibrational and rotational transitions. Width and intensities of spectral lines. Spectrophotometric estimation of iron. UV-visible and IR spectroscopy – principles, instrumentation (Block diagram) and applications.

UNIT V NANOCHEMISTRY 9

Basics - distinction between molecules, nanoparticles and bulk materials; size-dependent properties. Nanoparticles: Nanocluster, nanorod, nanotube and nanowire. Synthesis: Precipitation, thermolysis, hydrothermal, solvothermal, electrodeposition, chemical vapour deposition, laser ablation; Properties and Applications. Risk discussion and Future perspectives.

TOTAL 45 PERIODS

OUTCOMES:

- The knowledge gained on polymer chemistry, thermodynamics. spectroscopy, phase rule and nano materials will provide a strong platform to understand the concepts on these subjects for further learning.

TEXT BOOKS

1 P. Kannan and A. Ravikrishnan, “Engineering Chemistry”, Sri Krishna Hitech Publishing Company Pvt. Ltd. Chennai, 2009.

2 S. Vairam, P. Kalyani and Suba Ramesh, “Engineering Chemistry”, Wiley India, 2011

REFERENCE BOOKS

1 P.W. Atkins and de Paula Julio, “Physical Chemistry”, Oxford University Press, 8th Ed., (Indian Student Edition) (2009).

2 K. K. Rohatgi-Mukherjee, “Fundamental of Photochemistry” New Age International (P) Ltd., New Delhi, 1986.

3 G.A. Ozin and A.C. Arsenault, “Nanochemistry: A Chemical Approach to Nanomaterials”, RSC Publishing, 2005.

4 V.R.Gowariker, N.V.Viswanathan and JayadevSreedhar, “Polymer Science”, New Age International P (Ltd.,), Chennai, 2006.

PTGE8151 COMPUTING TECHNIQUES L T P C
3 0 0 3

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

Generation and Classification of Computers- Basic Organization of a Computer –Number System – Binary – Decimal – Conversion – Problems. Need for logical analysis and thinking – Algorithm – Pseudo code – Flow Chart.

UNIT II C PROGRAMMING BASICS 10

Problem formulation – Problem Solving - Introduction to ‘ C’ programming –fundamentals – structure of a ‘C’ program – compilation and linking processes – Constants, Variables – Data Types – Expressions using operators in ‘C’ – Managing Input and Output operations – Decision Making and Branching – Looping statements – solving simple scientific and statistical problems.

UNIT III ARRAYS AND STRINGS 9

Arrays – Initialization – Declaration – One dimensional and Two dimensional arrays. String- String operations – String Arrays. Simple programs- sorting- searching – matrix operations.

UNIT IV FUNCTIONS AND POINTERS 9

Function – definition of function – Declaration of function – Pass by value – Pass by reference – Recursion – Pointers - Definition – Initialization – Pointers arithmetic – Pointers and arrays- Example Problems.

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.

TOTAL : 45 PERIODS

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

1. Pradip Dey, Manas Ghosh, "Fundamentals of Computing and Programming in C", First Edition, Oxford University Press, 2009
2. Ashok N. Kamthane, "Computer programming", Pearson Education, 2007.
3. Yashavant P. Kanetkar. " Let Us C", BPB Publications, 2011.

REFERENCES

1. Kernighan,B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2006
2. Byron S Gottfried, " Programming with C", Schaum's Outlines, Second Edition, Tata McGraw-Hill, 2006.
3. R.G. Dromey, "How to Solve it by Computer", Pearson Education, Fourth Reprint, 2007

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

Introduction – Units and Dimensions – Laws of Mechanics – Lami's theorem, Parallelogram and triangular Law of forces –– Vectorial representation of forces – Vector operations of forces - additions, subtraction, dot product, cross product – Coplanar Forces – rectangular components – Equilibrium of a particle – Forces in space – Equilibrium of a particle in space – Equivalent systems of forces – Principle of transmissibility .

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 9

Centroids and centre of mass– Centroids of lines and areas - Rectangular, circular, triangular areas by integration – T section, I section, - Angle section, Hollow section by using standard formula –Theorems of Pappus - Area moments of inertia of plane areas – Rectangular, circular, triangular areas by integration – T section, I section, Angle section, Hollow section by using standard formula – Parallel axis theorem and perpendicular axis theorem –Principal moments of inertia of plane areas – Principal axes of inertia-Mass moment of inertia –mass moment of inertia for prismatic, cylindrical and spherical solids from first principle – Relation to area moments of inertia.

UNIT IV DYNAMICS OF PARTICLES 9

Displacements, Velocity and acceleration, their relationship – Relative motion – Curvilinear motion -Newton's laws of motion – Work Energy Equation– Impulse and Momentum – Impact of elastic bodies.

UNIT V FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS 9

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.

TOTAL: 45 PERIODS

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:

1. Beer, F.P and Johnston Jr. E.R. "Vector Mechanics for Engineers (In SI Units): Statics and Dynamics", 8th Edition, Tata McGraw-Hill Publishing company, New Delhi (2004)
2. Vela Murali, "Engineering Mechanics", Oxford University Press (2010)

REFERENCES:

1. Hibbeller, R.C and Ashok Gupta, "Engineering Mechanics: Statics and Dynamics", 11th Edition, Pearson Education (2010).
2. Irving H. Shames and Krishna Mohana Rao. G., "Engineering Mechanics – Statics and Dynamics", 4th Edition, Pearson Education (2006)
3. J.L.Meriam and L.G.Kraige, " Engineering Mechanics- Statics - Volume 1, Dynamics- Volume 2,Third Edition, John Wiley & Sons,(1993)
4. Rajasekaran, S and Sankarasubramanian, G., "Engineering Mechanics Statics and Dynamics",3rd Edition, Vikas Publishing House Pvt. Ltd., (2005).
5. Bhavikatti, S.S and Rajashekarappa, K.G., "Engineering Mechanics", New Age International (P) Limited Publishers, (1998).
6. Kumar, K.L., "Engineering Mechanics", 3rd Revised Edition, Tata McGraw-Hill Publishing company, New Delhi (2008)

PTCE8252	STRENGTH OF MATERIALS	L	T	P	C
	(Industrial, Mechanical Printing, Manufacturing)	3	0	0	3

OBJECTIVE:

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

UNIT I STRESS, STRAIN AND DEFORMATION OF SOLIDS 9

Rigid bodies and deformable solids – Tension, Compression and Shear Stresses – Deformation of simple and compound bars – Thermal stresses – Elastic constants – Volumertric strains – Stresses on inclined planes – principal stresses and principal planes – Mohr's circle of stress.

UNIT II TRANSVERSE LOADING ON BEAMS AND STRESSES IN BEAM 9

Beams – types transverse loading on beams – Shear force and bending moment in beams – Cantilevers – Simply supported beams and over – hanging beams. Theory of simple bending – bending stress distribution – Load carrying capacity – Proportioning of sections – Flitched beams – Shear stress distribution.

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:

1. Bansal, R.K., Strength of Materials, Laxmi Publications (P) Ltd., 2007
2. Jindal U.C., Strength of Materials, Asian Books Pvt. Ltd., New Delhi, 2007

REFERENCES:

1. Egor. P.Popov " Engineering Mechanics of Solids" Prentice Hall of India, New Delhi, 2001
2. Subramanian R., Strength of Materials, oxford University Press, Oxford Higher Education Series, 2007.
3. Hibbeler, R.C., Mechanics of Materials, Pearson Education, Low Price Edition, 2007
4. Ferdinand P. Been, Russell Johnson, J.r. and John J. Dewole Mechanics of Materials, Tata Mcgraw Hill publishing 'co. Ltd., New Delhi.

PTEC8251	ELECTRONICS ENGINEERING	L	T	P	C
	(Industrial, Mechanical Printing,Manufacturing)	3	0	0	3

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

Positive feedback, Sinusoidal oscillators – RC phase shift, Hartley, Colpitts, Wein bridge oscillators, Operational amplifier – Adder, Inverting and Non-inverting amplifiers, integrator and differentiator, IC 555 based Astable and Monostable Multivibrators.

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:

1. Malvino, ‘Electronic Principles’, McGraw Book Co., 1993.

REFERENCES:

1. Grob. B and Schultz. M.E. ‘Basic Electronics’, Tata Mcgraw Hill, 2003.
2. Thomas L. Floyd, ‘Electronics Devices’, Pearson Education, 2002.
3. Thomas L. Floyd, ‘Digital Fundamentals’, Pearson Education, 2003.
4. Millman, Halkias Jacob, Jit Christos and Satyabrata, ‘Electronic devices and Circuits’, Tata McGraw Hill, 2nd Edition.

PTGE8251 ENVIRONMENTAL SCIENCE AND ENGINEERING L T P C
(EEE, Civil, Printing, Industrial, Mechanical, Manufacturing, Production, CSE, IT, Chemical, Textile) 3 0 0 3

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 7

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization- environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment production act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – enforcement machinery involved in environmental legislation- central and state pollution control boards- Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health – Case studies.

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:

1. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education (2004).
2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, (2006).

REFERENCE BOOKS

1. R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media.
2. Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia',Jaico Publ., House, Mumbai, 2001.
3. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT LTD,New Delhi, 2007.
4. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press 2005

PTIE8201 **MATERIALS SCIENCE** **L T P C**

(Common to Manufacturing, Industrial, Mechanical, Automobile and Production Engineering) **3 0 0 3**

OBJECTIVE:

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

UNIT I MECHANICAL PROPERTIES 9

Introduction to mechanical properties - tensile test - plastic deformation mechanisms - slip and twinning - role of dislocations in slip - strengthening methods - strain hardening - refinement of the grain size - solid solution strengthening - precipitation hardening - creep resistance - creep curves - mechanisms of creep - creep-resistant materials - fracture - the Griffith criterion - critical stress intensity factor and its determination - fatigue failure - fatigue tests - methods of increasing fatigue life - hardness - Rockwell and Brinell hardness - Knoop and Vickers microhardness.

UNIT II PHASE DIAGRAMS 9

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 9

The iron-carbon equilibrium diagram - phases, invariant reactions - microstructue of slowly cooled steels - eutectoid steel, hypo and hypereutectoid steels - effect of alloying elements on the Fe-C system - diffusion in solids - Fick's law - phase transformations - pearlitic transformations - T-T-T-diagram for eutectoid steel - baintic and martensitic transformations - tempering of martensite - heat treatment of steels - annealing - normalizing - quenching and tempering - case hardening - induction, flame and laser hardening - carburizing, cyaniding, carbonitriding and nitriding.

UNIT IV ELECTRONIC MATERIALS 9

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 9

Introduction to Ceramics and its applications - Ceramic Fibres - Fibre reinforced Plastics – Fibre reinforced Metal – Metallic glasses – Shape memory alloys – Copper base alloys – Nickel – Titanium alloys – Relaxor- Ferroelectric materials – Electro and magneto rheological fluids - Sensors and Actuators – polymer semiconductos – photoconducting polymers – liquid crystals - Bio-sensors - Scintillation detectors (Position sensitive) –Bio materials – hydroxyapatite – PMMA – Silicone.

TOTAL : 45 PERIODS

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

1. Raghavan, V., Materials Science and Engineering, Prentice Hall of India, 2007.
2. Palanisamy, P.K., Applied Materials Science, Scitech, 2003.
3. Raghavan, V., Physical Metallurgy, Prentice Hall of India, 2002.

REFERENCE BOOKS:

1. Calister, W.D., Materials Science and Engineering an Introduction, John Wiley, 2003.
2. Rajendarn V and Marikani A, Materials Science, Tata McGraw Hill, 2006

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

Mechanisms – Terminology and definitions – kinematics inversions of 4 bar and slide crank chain – kinematics analysis in simple mechanisms – velocity and acceleration polygons – Analytical methods – computer approach – cams – classifications – displacement diagrams - layout of plate cam profiles – derivatives of followers motion – circular arc and tangent cams.

UNIT II GEARS AND GEAR TRAINS 9

Spur gear – law of toothed gearing – involute gearing – Interchangeable gears – Gear tooth action interference and undercutting – nonstandard teeth – gear trains – parallel axis gears trains – epicyclic gear trains – automotive transmission gear trains.

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

Applied and Constrained Forces – Free body diagrams – static Equilibrium conditions – Two, Three and four members – Static Force analysis in simple machine members – Dynamic Force Analysis – Inertia Forces and Inertia Torque – D'Alembert's principle – superposition principle – dynamic Force Analysis in simple machine members.

UNIT V BALANCING AND VIBRATION 9

Static and Dynamic balancing – Balancing of revolving and reciprocating masses – Balancing machines – free vibrations – Equations of motion – natural Frequency – Damped Vibration –

bending critical speed of simple shaft – Torsional vibration – Forced vibration – harmonic Forcing – Vibration isolation.

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:

1. Uicker J.J, Pennock G.R and Shigley J.E., "Theory of Machines and Mechanisms", 3rd Edition, Oxford University Press, 2009.

REFERENCES:

1. Rattan S.S., "Theory of Machines", 3rd Edition, Tata McGraw-Hill, 2009.
2. Bevan T., "Theory of Machines', 3rd Edition, CBS Publishers and Distributors, 2005.
3. Cleghorn W. L, "Mechanisms of Machines", Oxford University Press, 2005
4. Benson H.T., "Principles of Vibrations", Oxford University Press, 2nd Edition, 2007
5. Robert L.N, "Kinematics and Dynamics of Machinery", Tata McGraw-Hill, 2009.
6. Allen S.H Jr., "Kinematics and Linkage Design", Prentice Hall, 1961
7. Ghosh A. and Mallick A.K., "Theory of Mechanisms and Machines', Affiliated East-West Pvt. Ltd., New Delhi, 1988.
8. Rao J.S. and Dukkipati R.V. "Mechanisms and Machine Theory", Wiley-Eastern Ltd., New Delhi, 1992.
9. Hannah J. and Stephens R.C., "Mechanics of Machines", Viva Low-Prices Student Edition, 1999.
10. Grover. G.T., "Mechanical Vibrations", Nem Chand and Bros., 1996
11. Thomson W.T., Dahleh M.D. and Padmanabhan C., **"**Theory of Vibration with Application", 5th edition Pearson Education, 2011
12. V.Ramamurthi, "Mechanics of Machines", Narosa Publishing House, 2002.
13. Khurmi. R.S., "Theory of Machines", 14th Edition, S Chand Publications.

STANDARDS:

IS 2458: 2001, Vocabulary of Gear Terms – Definitions related to Geometry.
IS 3756: 2002, Method of Gear Correction – Addendum modification for External cylindrical gears with parallel axes.
IS 5267: 2002 Vocabulary of Gear Terms – Definitions Related to Worm Gear Geometry.
IS 12328: Part 1: 1988 Bevel Gear Systems Part – 1 Straight Bevel Gears.
IS 12328: 1988 Bevel Systems Part – 2 Spiral Bevel Gears.

PTIE8301	OPERATIONS RESEARCH-I	L	T	P	C
		3	0	0	3

OBJECTIVE

To learn the basics of deterministic optimization tools

UNIT I LINEAR PROGRAMMING 9

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

UNIT II ADVANCES IN LPP –I 9

Duality theory - Dual simplex method - Sensitivity analysis – Transportation problems – Assignment problems- Traveling sales man problem

UNIT III ADVANCES IN LPP –II 9

Integer programming – Multi objective optimization: Goal programming–Introduction to Data Envelopment Analysis

UNIT IV NETWORK MODELS 9

Maximal flow problems – Shortest route problem – Minimal spanning tree -. Project network - CPM – PERT – Crashing.

UNIT V DYNAMIC PROGRAMMING 9

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:

1. G.Srinivasan., “Operations Research, Principles and Applications”, PHI, 2008.
2. R.Panneerselvam, Operations Research,PHI,2006

REFERENCES:

1. Philips, Ravindran and Solberg, Operations Research, John Wiley,2002
2. Hamdy A Taha, Operations Research – An Introduction, Prentice Hall India,2003
3. Ronald L Rardin, Optimisation in Operations Research, Pearson, 2003
4. David R. Anderson, et al , An Introduction to Management Science – Quantitative approaches to Decision Making, Thomson,2003
5. Hillier and Lieberman Introduction to Operations Research, TMH, 2000.

PTIE8302	WORK SYSTEM DESIGN	L	T	P	C
		3	0	0	3

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 9

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 9

Methods Engineering-Steps -Tools and techniques, Motion study.

UNIT III WORK MEASUREMENT 9

Stop watch time study, performance rating, allowances, Development of Standard data, learning effect. Work measurement in Automated Processes. Computerised Labour standards.

UNIT IV APPLIED WORK MEASUREMENT 9

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 9

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

TOTAL: 45 PERIODS

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

1. Barnes, R.M. Motion and Time Study, Design and measurement of work, John Wiley sons(Asia), Seventh edition,2003.

REFERENCES

1. Benjamin W.Niebel, Andris Freivalds, Methods, standards & Work Design, McGraw hill, Eleventh edition, 2002.
2. ILO, Introduction to Work Study, Oxford and IBH publishing , 2008
3. Maynard H.B, Industrial Engineering Hand book,McGraw-Hill,2008
4. Prem Vrat, G.D. Sardana, B.S. Sahay,Productivity Management – A Systems Approach, Narosa Publishing House, 1998

PTMA8252	PROBABILITY AND STATISTICS (Industrial, Mechanical Printing, Manufacturing EEE,Textile)	L	T	P	C
		3	0	0	3

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 9

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 9

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 9

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

UNIT IV DESIGN OF EXPERIMENTS 9

Completely randomized design – Randomized block design – Latin square design - 22- factorial design - Taguchi's robust parameter design.

UNIT V STATISTICAL QUALITY CONTROL 9

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:

1. Milton, J. S. and Arnold, J.C., "Introduction to Probability and Statistics", Tata McGraw Hill, New Delhi, 4th Edition, 3rdReprint, 2008.
2. Johnson, R.A. and Gupta, C.B., "Miller and Freund's Probability and Statistics for Engineers", pearson Education, Asia, 8th Edition, 2011

REFERENCES

1. Devore, J.L., "Probability and Statistics for Engineering and the Sciences", Thomson Brooks/Cole, International Student Edition, New Delhi, 7th Edition, 2008.
2. Walpole, R.E., Myers, R.H., Myers, S.L. and Ye, K., "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia, 8th Edition, 2007.
3. Ross, S.M., "Introduction to Probability and Statistics for Engineers and Scientists", Elsevier, New Delhi, 3rd Edition, 2004.
4. Spiegel, M.R., Schiller, J. and Srinivasan, R.A., "Schaum's Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill, New Delhi, 2004.

PTME8351	MACHINE DESIGN (Industrial, Manufacturing)	L	T	P	C
		3	0	0	3

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 STEADY STRESSES IN MACHINE MEMBERS 10

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 8

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 9

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 9

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 9

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:

1. Bhandari V, "Design of Machine Elements", 3rd Edition, Tata McGraw-Hill Book Co, 2010.

REFERENCES:

1. Sundararajamoorthy T. V, Shanmugam. N, "Machine Design", Anuradha Publications, Chennai, 2003.
2. Joseph Shigley,Charles Mischke,Richard Budynas and Keith Nisbett "Mechanical Engineering Design", 8th Edition, Tata McGraw-Hill , 2008.
3. Robert C. Juvinall and Kurt M. Marshek, "Fundamentals of Machine Design",4th Edition, Wiley, 2005
4. Alfred Hall, Halowenko, A and Laughlin, H., "Machine Design", Tata McGraw-Hill Book Co.(Schaum's Outline), 2010
5. Bernard Hamrock, Steven Schmid, Bo Jacobson, "Fundamentals of Machine Elements", 2nd Edition, Tata McGraw-Hill Book Co., 2006.
6. Orthwein W, "Machine Component Design", Jaico Publishing Co, 2003.
7. Ansel Ugural, "Mechanical Design – An Integral Approach, 1st Edition, Tata McGraw-Hill Book Co, 2003.
8. Merhyle F. Spotts, Terry E. Shoup and Lee E. Hornberger, "Design of Machine Elements" 8th Edition, Printice Hall, 2003.

STANDARDS:

1. IS 10260 : Part 1 : 1982 Terms, definitions and classification of Plain bearings Part 1 : Construction.
2. IS 10260 : Part 1 : 1982 Terms, definitions and classification of Plain bearings Part 2 : Friction and Wear.
3. IS 10260: Part 1: 1982 Terms, definitions and classification of Plain bearings Part 3: Lubrication.

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 9

Brief history of human factors Engineering/Ergonomics – Interdisciplinary nature- Principles of Human factors Engineering- Biostatic and Biodynamic Mechanics.

UNIT II HUMAN PERFORMANCE 9

Factors influencing performance – Information receiving and processing – Information theory and its application – Human response and errors – Signal detection theory.

UNIT III PHYSIOLOGICAL ASPECTS OF HUMAN AT WORK 9

Metabolism – Physiological factors involved in muscular activity – Measurement of energy expenditure – Quantitative work load analysis – Physical work capacity and its evaluation – Physiological fatigue – Work and rest schedules – Physical fitness tests.

UNIT IV WORK PLACE DESIGN 9

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 9

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:

1. Bridger, R.S., Introduction to Ergonomics, McGraw Hill, 1995.
2. Martin Helander, A guide to Ergonomics of Manufacturing, TMH, 2006.

REFERENCES:

1. Mecormik, T.J., Human Factors Engineering, TMH, 1990.
2. John Grimaldi, Safety Management, A.I.B.S., 5th Edition, Hazard Control Technology 2003
3. Philips, Chandler A, Human Factors Engineering, John Wiley and Sons, Inc. 2000

PTIE8402	MANUFACTURING AUTOMATION	L	T	P	C
		3	0	0	3

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

NC - CNC – Part programming – DNC – Adaptive control – Robot anatomy – Specifications – End effectors – Industrial applications.

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:

1. Mikell P.Groover, Automation, “Production Systems and Computer Integrated Manufacturing” PHI, 2008.
2. Mikell P.Groover, Emory W. Zimmers, Jr., “CAD/CAM: Computer - Aided Design and Manufacturing”, PHI, 2007.

PTIE8403 OPERATIONS RESEARCH - II

L	T	P	C
3	0	0	3

OBJECTIVE

To impart knowledge on some probabilistic optimization techniques

UNIT I DETERMINISTIC INVENTORY MODELS 9

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 9

Probabilistic inventory model – Reorder point model – Multiproduct-selective inventory control

UNIT III QUEUING THEORY 9

Queuing therory terminology – Single server, multi server, limited queue capaticity, limited population capacity – applications – Markov chains.

UNIT IV DECISION THEORY 9

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 9

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:

1. Ravindran A. ,Don T. Phillips,James J. Solberg “Operations Research: Principles And Practice”, Wiley India,2007
2 R.Panneerselvam, Operations Research,PHI,2006

REFERENCES:

1. Hamdy A Taha, Operations Research – An Introduction, Prentice Hall India,2003
2. Ronald L Rardin, Optimisation in Operations Research, Pearson, 2003
3. Hillier and Lieberman Introduction to Operations Research, TMH, 2000

PTIE8404 PRODUCTION AND OPERATIONS MANAGEMENT

L	T	P	C
3	0	0	3

OBJECTIVE:

- To impart knowledge in the areas of production planning and control applicable to various types of manufacturing systems.

UNIT I INTRODUCTION 5

Overview of Production System, Objectives of Operation Management, Scope of Operations Management, Operations Management Frame work, Relationship of operations with other Functional areas, Manufacturing Vs Service sector, Operations Decision making, Production Design Process and Process choices

UNIT II FORECASTING 12

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 10

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 Rues, Master Production Schedule(MPS), Procedure for developing MPS, MRP, Lot sizing methods of MRP, MRP Implementation issues, MRP – II.

UNIT IV CAPACITY MANAGEMENT 8

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 10

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:

1. Seetharama L.Narasimhan, Dennis W.McLeavey, Peter J.Billington,"Production Planning And Inventory Control" , PHI, 2nd Edition, 2002.
2. Norman Gaither, Greg Frazier, Operations Management, Thomson Learning, 9th Edition, 2002.
3. Monks J.G.Operations Management, McGraw Hill, 1997
4. Panneerselvam,R. Production & operations Management,PHI,2005
5. Lee J.Krajewski, Larry P.Ritzman, Operations Management Strategy and Analysis, PHI, 6th Edition, 2003.

PTIE8411 **OPTIMIZATION LAB** **L T P C**
0 0 3 2

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** **L T P C**
(Industrial, Mechanical Printing,Automobile, EEE CSE, ECE, Civil, Textile) **3 0 0 3**

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 **10**
Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality.

UNIT II ENGINEERING ETHICS **9**
Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION **9**
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 **9**
Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk – The Three Mile Island and Chernobyl Case Studies

Collegiality and Loyalty – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination

UNIT V GLOBAL ISSUES 8

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership – Sample Code of Conduct

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

1. Mike W. Martin and Roland Schinzinger, “Ethics in Engineering”, Tata McGraw Hill, New Delhi, 2003.

REFERENCES:

1. Charles B. Fleddermann, “Engineering Ethics”, Pearson Prentice Hall, New Jersey, 2004.
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, “Engineering Ethics – Concepts and Cases”, Thompson Wadsworth, A Division of Thomson Learning Inc., United States, 2000
3. John R Boatright, “Ethics and the Conduct of Business”, Pearson Education, New Delhi, 2003
4. Edmund G Seebauer and Robert L Barry, “Fundametals of Ethics for Scientists and Engineers”, Oxford University Press, Oxford, 2001

WEB SOURCES:

1. www.onlineethics.org
2. www.nspe.org
3. www.globalethics.org
4. www.ethics.org

PTIE8501 ENGINEERING ECONOMY AND COST ESTIMATION L T P C
3 0 0 3

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

Definition of Managerial Economics - Nature and scope of Managerial Economics - Managerial Economics and other disciplines. Objectives of the firm - Factors influencing Managerial decisions - Basic concepts of Managerial Economics. Demand Analysis – Defining demand, Types of demand and Determinants of demand, Elasticity of demand and demand forecasting.

UNIT II PRODUCTION AND COST ANALYSIS 9

Production Analysis – Production function, Returns to a factor, Returns to scale, ISO quants and Least cost combination of inputs. Cost Analysis – cost concepts, Determinants of cost, Short-run cost-output Relationship, Long-run cost output relationship, Economies and Diseconomies of scale and Estimating cost – output Relationship.

UNIT III PRICING 9

Determinants of price – Pricing under different objectives – Pricing under different market structures – Price discrimination – Pricing of Joint products – Pricing methods in practice.

UNIT IV ESTIMATION OF MATERIAL AND LABOUR COSTS 9

Introduction to Estimation and Costing – Elements of costs – Allocation of overheads – Estimation of Material cost – Estimation of Labour cost.

UNIT V ESTIMATION OF OPERATIONAL COST 9

Estimation in Machine shop – Estimation in Sheet metal shop – Estimation in Forging shop – Estimation in welding shop – Estimation in Foundry shops.

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:

1. Yogesh Maheshwari, Managerial Economics, second edition, PHI 2005.
2. T.R.Banga & S.C.Sharma, Mechanical Estimating and Costing, Khanna Publishers, 1988.

REFERENCES:

1. V.L.Mote, Samuel Paul, G.S.Gupta, Managerial Economics – concepts & cases,TMH,1977,40th Reprint 2007.
2. A.Ramachandra Aryasri & V.V.Ramana Murthy, Engg. Economics and Financial Accounting, TMH, New Delhi, 2004.

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 9

Introduction , Factors affecting location decisions , Location theory , Qualitative models , Semi-Quantitative models -Composite measure , Brown & Gibbs model , Break-Even analysis model, Single facility location problems – Median model, Gravity location model, Mini-Max model, Multi-facility location problems, Network and warehouse location problems.

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

Concepts, Designing process layout – CRAFT, ALDEP, CORELAP – Trends in computerized layout, Algorithms and models for Group Technology

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

1. Francis, R.L., and White, J.A.Facilities layout and Location, Prentice Hall of India, 2002.

REFERENCES

1. Tompkins, White et al., Facilities planning, John Wiley & Sons, inc. 2003.
2. James, Apple, Material Handling System design, Ronald Press, 1980.
3. Krajewski, J. and Ritzman, Operations Management – Strategy and Analysis, Addison – Wesley publishing company inc. 5th Edition, 1999.
4. Pannerselvam,R.Production & operations Management, PHI, 2nd Edition, 2005

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 9

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 9

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 9

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 9

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:

1. Douglus C. Montgomery, Introduction to Statistical Quality Control, John Wiley & Sons, 2004.

REFERENCES:

1. Eugene L. Grant and Richard S. Leaven Worth, TMH, Seventh Edition, 2000.
2. Dale H. Besterfield, Quality Control, Pearson Education Asia, Seventh Edition, 2004.

PTIE8504 SUPPLY CHAIN AND LOGISTICS MANAGEMENT

L	T	P	C
3	0	0	3

OBJECTIVE:

To teach the basic principles of supply chains and associated logistics management

UNIT I INTRODUCTION 5

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 10

Role of Distribution in Supply Chain – Factors influencing Distribution network design –Design options for Distribution Network Distribution Network in Practice-Role of network Design in Supply Chain – Framework for network Decisions

UNIT III LOGISTICS IN SUPPLY CHAIN 10

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 10

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 10

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

1. Sunil Chopra, Peter meindl and Kalra, “Supply Chain Management , Strategy, Planning, and operation”, Pearson Education, 2010
2. Srinivasan G.S, “Quantitative models in Operations and Supply Chain Management, PHI, 2010.

REFERENCES

1. Jeremy F.Shapiro, “Modeling the supply chain”, Thomson Duxbury ,2002
2. David J.Bloomberg , Stephen Lemay and Joe B.Hanna, “Logistics”, PHI 2002
3. James B.Ayers, “Handbook of Supply chain management”, St.Lucle press, 2000

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

Random numbers – methods of generation – random variates for standard distributions like uniform, exponential, poisson, binomial, normal etc – Testing of Random variates – Input Data Modeling - Monte Carlo Simulation

UNIT III DESIGN OF SIMULATION EXPERIMENTS 12

Steps on Design of Simulation Experiments – Development of models using of 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:

1. Jerry Banks, John S Corson, Barry.L. Nelson, David M.Nicol and P.Shahabudeen, Discrete Event Systems Simulation, Pearson education, Fourth edition, 2007.
2. Geoffrey Gordon, Systems Simulation, Prentice Hall, 2002
3. Law A M & Kelton W D, Simulation Modelling and analysis, Tata McGraw Hill, 2003.
4. David Kelton, Rondall P Sadowski, David T Sturrock, Sinulation with Arena, Mc Graw Hill, 2004
5. Thomas J Schriber, Simulation Using GPSS, John Wiley, 2002.
6. http://www.bcnn.net

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 9

Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of product and service quality - Basic concepts of TQM – TQM Framework - Contributions of Quality Gurus – Barriers to TQM – Cost of Quality.

UNIT II TQM PRINCIPLES 9

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 9

The seven traditional tools of quality – New management tools – Six-sigma: Concepts, methodology, applications to manufacturing, service sector including IT – Bench marking – Reason to bench mark, Bench marking process – FMEA – Stages, Types.

UNIT IV TQM TOOLS & TECHNIQUES II 9

Quality circles – Quality Function Deployment (QFD) – Taguchi quality loss function – TPM – Concepts, improvement needs – Performance measures - BPR.

UNIT V QUALITY SYSTEMS 9

Need for ISO 9000- ISO 9000-2000 Quality System – Elements, Documentation, Quality auditing- QS 9000 – ISO 14000 – Concepts, Requirements and Benefits –Quality Council – Leadership, Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition and Reward.

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:

1. Dale H.Besterfiled, et al., “Total Quality Management”, Pearson Education Asia, Third Edition, Indian Reprint , 2006.

REFERENCE BOOKS:

1. James R. Evans and William M. Lindsay, “The Management and Control of Quality”, (6th Edition), South-Western (Thomson Learning), 2005.
2. Oakland, J.S. “TQM – Text with Cases”, Butterworth – Heinemann Ltd., Oxford, Third Edition , 2003.
3. Suganthi,L and Anand Samuel, “Total Quality Management”, Prentice Hall (India) Pvt. Ltd., 2006 .
4. Janakiraman,B and Gopal, R.K, “Total Quality Management – Text and Cases”,Prentice Hall (India) Pvt. Ltd., 2006.

PTIE8611 COMMUNICATION SKILLS AND PRODUCTION L T P C

SYSTEM DESIGN PROJECT 0 0 3 2

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

PTIE8701 DESIGN OF EXPERIMENTS L T P C

3 0 0 3

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

Completely Randomized Design- effect of coding the observations- model adequacy checking - estimation of model parameters, residuals analysis- treatment comparison methods- Duncan's multiple range test, Newman-Keuel's test, Fisher's LSD test, Tukey's test- testing using contrasts- Randomized Block Design –Latin Square Design- Graeco Latin Square Design – applications.

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 9

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 9

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.

TOTAL: 45 PERIODS

OUTCOMES:

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

TEXT BOOKS:

1. Krishnaiah K, and Shahabudeen P, Applied Design of Experiments and Taguchi Methods, PHI Learning Private Ltd., India, 2011
2. Douglas C. Montgomery, Design and Analysis of Experiments, John Wiley & sons, 2005.

REFERENCES:

1. Phillip J. Ross, Taguchi Techniques for Quality Engineering, Tata McGraw-Hill, India, 2005

PTMG8551 PRINCIPLES OF MANAGEMENT L T P C

(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 9

Definition of Management –Science or Art – Manager Vs Entrepreneur- types of managers- managerial roles and skills – Evolution of Management –Scientific, human relations , system and contingency approaches– Types of Business organization- Sole proprietorship, partnership, company-public and private sector enterprises- Organization culture and Environment – Current trends and issues in Management.

UNIT II PLANNING 9

Nature and purpose of planning – planning process – types of planning – objectives – setting objectives – policies – Planning premises – Strategic Management – Planning Tools and Techniques – Decision making steps and process.

UNIT III ORGANISING 9

Nature and purpose – Formal and informal organization – organization chart–organization structure – types – Line and staff authority – departmentalization – delegation of authority – centralization and decentralization –Job Design - Human Resource Management –HR Planning, Recruitment, selection, Training and Development, Performance Management , Career planning and management.

UNIT IV DIRECTING 9

Foundations of individual and group behaviour– motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – leadership – types and theories of leadership – communication – process of communication – barrier in communication – effective communication –communication and IT.

UNIT V CONTROLLING 9

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:

1. Stephen P. Robbins & Mary Coulter, " Management", Prentice Hall (India)Pvt. Ltd., 10th Edition, 2009.
2. JAF Stoner, Freeman R.E and Daniel R Gilbert "Management", Pearson Education, 6th Edition, 2004.

REFERENCES:

1. Stephen A. Robbins & David A. Decenzo & Mary Coulter, "Fundamentals of Management" Pearson Education, 7th Edition, 2011.
2. Robert Kreitner & Mamata Mohapatra, " Management", Biztantra, 2008.
3. Harold Koontz & Heinz Weihrich "Essentials of management" Tata McGraw Hill,1998.
4. Tripathy PC & Reddy PN, "Principles of Management", Tata Mcgraw Hill, 1999

PTIE8001	ACCOUNTING AND FINANCE FOR MANAGEMENT	L	T	P	C
		3	0	0	3

AIM

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

UNIT I INTRODUCTION 9

Basics of accounting – Management Accounting – Financial accounting – cost accounting – comparison of Financial accounting, cost accounting and management Accounting – generally accepted Accounting principles – Accounting standards – Accounting cycle.

UNIT II FINANCIAL ACCOUNTING 9

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

UNTIII COST ACCOUNTING 9

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

UNTI IV BUDGETING 9

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 9

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 :

1. Bhattacharya. S.K. and John Deardon, "Accounting for Management – Text and cases", Vikas publishing House, New Delhi, 1996.
2. James, C.Van Horne, "Fundamental of Financial Management" Dearson Education, 12th Edition, 2002
3. V.R.Palanivelu, "Accounting for Management", Lexmi Publication (P) Ltd., 2007.

PTIE8002 ADVANCED OPTIMIZATION TECHNIQUES L T P C
3 0 0 3

OBJECTIVES :

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

UNIT I DECISION ANALYSIS 9

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

UNIT II NON-LINEAR OPTIMIZATION - I 9

Types of Non-linear programming problems, Unconstrained optimization, KKT conditions for constrained optimization, Quadratic programming

UNIT III NON-LINEAR OPTIMIZATION - II 9

Separable programming, Convex programming, Non-convex programming, Geometric programming, Stochastic programming

UNIT IV NON-TRADITIONAL OPTIMIZATION - I 9

An over view 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

TOTAL : 45 PERIODS

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

1. Hillier and Liberman, Introduction to Operations Research, TMH (2000)
2. Singiresu S Rao, Engineering Optimization, Wiley (1998)
3. Kalyanmoy Deb, Optimization for Engineering Design, PHI (2000)

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, discriminent and cluster analysis techniques for statistical analysis.

TEXT BOOK:

1. Dallas E Johnson, Applied multi variate methods for data analysis, Duxbury Press (1998)

REFERENCES

1. Richard I Levin, Statistics for Management, PHI, 2000.

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**

Greedy – divide and conquer – backtracking – branch & bound – heuristics- Meta heuristics

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**

Sorting – searching - networks – scheduling – optimization models – IE applications

TOTAL: 45 PERIODS

OUTCOMES:

- Student must be able to design algorithm computational tools used in manufacturing process.

REFERENCES:

1. Goodman S F & Headtruemu ST , Introduction to design of algorithms, McGraw Hill,2002
2. Sahni, Data Structures, algorithms and applications in C++, McGraw Hill, 2003
3. Dromey,R.G.,How to solve it with computers?,PHI,2002
4. Alfred V.Aho,k Jeffrey D. Ullman and John E. Hopcroft, Data Structures and Algorithms, Addison-Wesley, 1993.

PTIE8005 COMPUTER INTEGRATED MANUFACTURING SYSTEMS L T P C
3 0 0 3

OBJECTIVE:
To provide some aspects of Fixed, Flexible and integrated automation along with their applications

UNIT I GT AND FMS 9
Part families, production flow analysis, cellular manufacturing, ROC, Flexible manufacturing systems- components, FMS applications, FMS analysis – bottleneck model.

UNIT II COMPUTER-AIDED DESIGN 9
Fundamentals of CAD – design process, manufacturing database – Computer graphics – functions, constructing the geometry, transformation, wire frame Vs solid modelling.

UNIT III MANUFACTURING SUPPORT SYSTEMS 9
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 9
Information, Communications matrix, Computer communications, Network architecture, Tools and techniques.

UNIT V DATABASE AND CIM MANAGEMENT 9
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:

1. Mickel P Groover, Automation production systems and computer integrated manufacturing, PHI, second edition, 2008.
2. S.Kant Vajpayee, Principles of Computer-Integrated Manufacturing, PHI, 2005

PTIE8006 DECISION SUPPORT AND INTELLIGENT SYSTEMS L T P C
3 0 0 3

OBJECTIVE:
To impart knowledge on basics of DSS and Knowledge based systems

UNIT I INTRODUCTION 5
Managerial decision making, system modeling and support-preview of the modeling process-phases of decision making process.

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

1. Efraim Turban and Jay E Aronson, Decision Support and Business Intelligent Systems, PHI, Eighth edition, 2010.
2. S S Mitra, Decision support systems, tools and techniques, John Wiley, 1996.
3. Elain Rich and Kevin Knight, Artificial intelligence, TMH,1993.

PTIE8007	EVOLUTIONARY OPTIMIZATION	L	T	P	C
		3	0	0	3

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 **9**

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

1. W Banzhaf et al , “Genetic Programming – An introduction”, Morgan Kanfmann Publications 1999
2. X Yao, “Evolutionary computations – Theory and Applications”, World Scientific Publications 1999
3. J Baeck, “Handbook of Evolutionary computation”, IOS Press, 1997.
4. Goldberg D E , Genetic Algorithms in search, optimization, Addison Wesley 1989
5. Ruhul sarker, Masoud Mohammadian, Yao, Evolutionary Optimization, Kluwers’s Academic Publishers, 2002.

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 **6**

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

UNIT II DATA FLOW DIAGRAMS and ER DIAGRAMS **10**

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 **10**

Development of MIS, Choice of Information technology, Applications in manufacturing and service sector, Enterprise management systems

UNIT IV TECHNOLOGY and INFORMATION SYSTEMS **10**

Database management systems, Object oriented technology, Client-server architecture, Local area network, network topology

UNIT V APPLICATIONS **9**

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:

1. V. Rajaraman, “Analysis and Design of Information Systems”, PHI, 2004
2. Jeffrey L Whitten et al, “Systems Analysis and Design Methods”, McGraHill,2003

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**

Maintenance definition – Maintenance objectives – Maintenance challenges – Tero Technology –Maintenance costs - Scope of maintenance department.

UNIT II MAINTENANCE MODELS **11**

Proactive/reactive maintenance – Maintenance policies – Imperfect maintenance – PM versus b/d maintenance – Optimal PM schedule and product characteristics – Inspection decisions: Maximizing profit - Minimizing downtime – Replacement decisions.

UNIT III MAINTENANCE QUALITY **8**

Five zero concept – FMECA – Root cause analysis – Repair time distribution – Analysis of downtime – Maintainability prediction – Design for maintainability – RCM.

UNIT I V MAINTENANCE MANAGEMENT **11**

Human factors – Maintenance staffing: Learning curves – Simulation – Optimal size of service facility – Optimal repair effort – Spare parts management – Maintenance planning – Maintenance scheduling.

UNIT V TOTAL PRODUCTIVE MAINTENANCE **8**

TPM philosophy – Chronic and sporadic losses – Equipment defects – Six major losses – Overall equipment effectiveness – TPM pillars – Autonomous maintenance.

TOTAL : 45 PERIODS

OUTCOMES:

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

REFERENCES:

1. Andrew K.S.Jardine & Albert H.C. Tsang, “Maintenance, Replacement and Reliability”. Taylor and Francis, 2006.
2. Bikas Badhury & S.K.Basu, “Tero Technology: Reliability Engineering and Maintenance Management”, Asian Books, 2003.
3. Seichi Nakajima, “Total Productive Maintenance”, Productivity Press, 1993.

PTIE8010	METROLOGY AND INSPECTION	L	T	P	C
		3	0	0	3

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 protrctor-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:
1.Galyer J.F. and Shotbolt C.R.”Metrology for Engineers” ELBS, 1992.

REFERENCES:
1. Hune, K.J.Engineering Metrology, Kalyani Publishers, India, 1980.
2. Robinson, S.L. and Miller R.K. Automated Inspection and Quality Assurance, Marcel Dekker Inc.1989.
3. Stout, K.”Quality Control in Automation, Prentice Hall, 1986.

PTIE8011 MODELING OF MANUFACTURING SYSTEMS

L	T	P	C
3	0	0	3

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 **9**

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

UNIT II FOCUSSED FACTORIES **9**

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 **9**

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 **9**

Basic queuing models, Queuing networks in manufacturing – Jackson and Gordon Newell, product form solution

UNIT V LEAN SYSTEMS **9**

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:

1. Ronald G Askin, “Modeling and Analysis of Manufacturing systems”, Wiley & sons, 1993.
2. Viswanadham and Narahari, “Performance modeling of automated manufacturing systems”, PHI, 1998
3. Nicholas J M, “Competitive Manufacturing Management”, TMH, 2001.
4. Buzacot and Shantikumar, “Queueing networks in Manufacturing”, Wiley Sons, 2000.
5. Reisig W, “System Design Using Petrinets”, Springer, 2000.

PTIE8012 OPERATIONS SCHEDULING

L	T	P	C
3	0	0	3

OBJECTIVE:

To impart knowledge on various scheduling algorithms applicable to single machine, parallel machines, flow shop and job shop models.

UNIT I SCHEDULING THEORY 8

Scheduling background - Scheduling function – Sequencing – Measures of performance – Scheduling theorems – Pure sequencing model assumptions.

UNIT II SINGLE MACHINE SCHEDULING 10

Hogdson's algorithm – Smith's application – Wilkerson-Irwin algorithm – Neighborhood search technique – Dynamic programming approach – Branch and Bound algorithm – Non simultaneous arrivals – Dependent job problems – Sequence dependent set up times.

UNIT III PARALLEL MACHINE SCHEDULING 9

Preemptive jobs: McNaughton's algorithm – Non preemptive jobs – Heuristic procedures – Minimizing weighted mean flow time: H_1 &H_m heuristics – Dependent jobs: Hu's algorithm – Muntz Coffman algorithm.

UNIT IV FLOW SHOP SCHEDULING 9

Characteristics – Johnson's algorithm – Extension of Johnson's rule – Campbell Dudek Smith algorithm – Palmer's method – Start lag, Sop lag – Mitten's algorithm –Ignall Schrage algorithm – Despatch index heuristic.

UNIT V JOB SHOP SCHEDULING 9

Characteristics – Graphical tools – Jackson's algorithm – Feasible, Semi-active and active schedules – Single pass approach – Non delay schedule – Priority dispatching rules – Heuristic schedule generation – Open shop scheduling- Scheduling in services.

TOTAL: 45 PERODS

OUTCOMES:

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

REFERENCES:

1. Kenneth R.Baker, "Introduction to Sequencing and Scheduling", John Wiley & Sons, New York, 2000.
2. Dilip R. Sule, "Industrial Scheduling", PWS Publishing company, Boston, 1997.

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

1. Philip Kotler & Keller, “Marketing Management”, Prentice Hall of India, XIII Edition, 2009.
2. Govindarajan, M., “Marketing Management - Concepts, Cases, Challenges and Trends”, Prentice Hall of India, Second edition, 2007.

REFERENCES

1. Donald S. Tull and Hawkins, “Marketing Research”, Prentice Hall of India-1997.
2. Philip Kotler and Gary Armstrong “Principles of Marketing” Prentice Hall of India, XII Edition, 2000.
3. Ramasamy and Nama Kumari, “Marketing Environment: Planning, implementation and control - the Indian Context”, 1990.
4. Czinkota & Kotabe, “Marketing Management”, Thomson Learning, Indian edition 2007.
5. Adrain Palmer, “Introduction to Marketing Theory and Practice”, Oxford University Press,IE 2004.
6. Steven J. Skinner, “Marketing”, All India Publishers and Distributers Ltd., 1998.

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

Product Development process – Product development organizations.Gather raw data – Interpret raw data- organize the needs into a hierarchy – Relative importance of the needs. specifications – Refining specifications.

UNIT IV CONCEPT GENERATION, SELECTION AND PRODUCT ARCHITECTURE 9

Clarify the problem – Search internally – Search externally – Explore systematically. Concept Screening – Concept scoring. Product architecture – Implication of architecture – Establishing the architecture – Related system level design issues.

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

Need for industrial design – Impact of industrial design – Industrial design process – Management of industrial design process – Assessing the quality of industrial design. Estimate the manufacturing cost – Reduce the component cost – Reduce the assembly cost – Reduce the support cost – Impact of DFM decisions on other factors. Principles of prototyping – Planning for prototypes. Elements of economic analysis – Base – Case financial model – Sensitivity analysis – Influence of the quantitative factors.

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:

1. Karal, T.Ulrich Steven D.Eppinger, Prodcut Design and Development, McGraw Hill, International Editions, 2003.
2. Mudge, Arthur E. “Value Engineering”- A systematic approach, McGraw Hill, New York, 2000.

REFERENCES:

1. S.Rosenthal, Effective Product Design and Development, Irwin, 1992.
2. Charles Gevirtz Developing New products with TQM, McGraw Hill, International Editions, 1994.

PTIE8015 PRODUCTIVITY MANAGEMENT AND RE-ENGINEERING

L	T	P	C
3	0	0	3

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**

Productivity measurement in International, National and Industrial level – Total Productivity Model – Productivity measurement in Manufacturing and Service sectors – Performance Objective Productivity (POP) model – Need for Productivity Evaluation – Evaluation Methodology.

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**

Definition, Fundamentals of process reengineering – Principles, Methodology and guidelines for Organization Transformation, DSMCQ and PMP organization Transformation models – Process Improvement Models like PMI, Edosomwan, LMICIP and NPRDC Models.

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:

1. Sumanth, D.J.Productivity Engineering and Management, TMH, New Delhi, 1990.
2. Edosomwan, J.A. Organizational Transformation and Process re- Engineering, British Cataloging in publications, 1996.
3. Premvrat, Sardana, G.D. and Sahay, B.S. Productivity Management - A systems approach, Narosa Publications, New Delhi, 1998.

PTIE8016 **PROJECT MANAGEMENT** **L T P C**
3 0 0 3

OBJECTIVES:

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

UNIT I INTRODUCTION TO PROJECT MANAGEMENT AND PROJECT SELECTION 9

Objectives of Project Management- Importance of Project Management- Types of Projects- Project Management Life Cycle- Project Selection – Feasibility study: Types of feasibility- Steps in feasibility study.

UNIT II PROJECT PLANNING AND IMPLEMENTATION 9

Project Scope- Estimation of Project cost – Cost of Capital – Project Representation and Preliminary Manipulations- Basic Scheduling Concepts-Resource Levelling – Resource Allocation.

UNIT III PROJECT MONITORING AND CONTROL 9

Setting a base line- Project management Information System – Indices to monitor progress.Importance of Contracts in projects- Teamwork in Project Management- Attributes of a good project team – Formation of effective teams – stages of team formation.

UNIT IV PROJECT CLOSURE 9

Project evaluation- Project Auditing – Phases of project Audit- Project closure reports- Guidelines for closeout reports.

UNIT V SPECIAL TOPICS IN PROJECT MANAGEMENT 9

Computers, e- markets and their role in Project management- Risk management- Environmental Impact Assessment. Case studies in Project management.

TOTAL : 45 PERIODS

OUTCOMES:

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

REFERENCE BOOKS:

1. Arun Kanda, Project Management A Life Cycle Approach, Prentice Hall of India, 2011.
2. R.Panneerselvam and P.Senthilkumar, Project Management, Prentice Hall of India,2009
3. R.B.Khanna, Project Management, Prentice Hall of India, 2011.

PTIE8017 **RELIABILITY ENGINEERING** **L T P C**
3 0 0 3

OBJECTIVE:

- To impart knowledge in reliability concepts, reliability estimation methods and reliability improvement methods

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

Data classification – Non parametric methods: Ungrouped, Grouped, Complete, Censored data – Time to failure distributions – Probability plotting: Exponential, Weibull - Goodness of fit tests – Survival graphs.

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

Reliability testing: Failure terminated test – Time terminated test – Upper and lower MTBFs – Sequential Testing – Reliability growth monitoring – Reliability allocation.

UNIT V RELIABILITY IMPROVEMENT 10

Analysis of downtime – Repair time distribution – Maintainability prediction – Measures of maintainability – Availability definitions – System Availability – Replacement decisions – Economic life.

TOTAL: 45 PERIODS

OUTCOMES

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

REFERENCES:

1. Charles E.Ebeling, "An Introduction to Reliability and Maintainability Engineering", TMH, 2000.
2. Roy Billington and Ronald N. Allan, "Reliability Evaluation of Engineering Systems", Springer, 2007.

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

Robot Definition – Robot Anatomy – Co-ordinate Systems, Work Envelope, types and classification – Specifications – Pitch, Yaw, Roll, Joint Notations, Speed of Motion, Pay Load – Robot Parts and Their Functions – Need for Robots – Different Applications

UNIT II ROBOT DRIVE SYSTEMS AND END EFFECTORS 10

Pneumatic Drives – Hydraulic Drives – Mechanical Drives – Electrical Drives – D.C. Servo Motors, Stepper Motor, A.C. Servo Motors – Salient Features, Applications and Comparison of all these Drives. End Effectors – Grippers – Mechanical Grippers, Pneumatic and Hydraulic Grippers, Magnetic Grippers, Vacuum Grippers; Two Fingered and Three Fingered Grippers; Internal Grippers and External Grippers; Selection and Design Considerations

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- AI 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 effecter commands, and Simple programs

UNIT V ROBOT CELL DESIGN, CONTROL AND ECONOMICS 8

Work cell Control- Robot and machine Interface -Robot cycle time Analysis-Economic Analysis of Robots – Pay back Method, EUAC Method, Rate of Return Method.

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

1. M.P.Groover, “Industrial Robotics – Technology, Programming and Applications”, McGraw-Hill, 2001

REFERENCES;

1. Fu.K.S. Gonzalz.R.C., and Lee C.S.G., “Robotics Control, Sensing, Vision and Intelligence”, McGraw-Hill Book Co., 1987
2. Yoram Koren, “Robotics for Engineers”, McGraw-Hill Book Co., 1992
3. Janakiraman.P.A., “Robotics and Image Processing”, Tata McGraw-Hill, 1995
4 Richard D. Klafter., Thomas A. Chmielewski, Michael Negin, “Robotic Engineering: An Integrated Approach”, PHI.,1989.

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.

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:

1. John V.Grimaldi, Safety Management, AITB S Publishers, 2003.
2. Safety Manual, EDEL Engineering Consultancy, 2000.
3. David L.Goetsch, Occupational Safety and Health for Technologists, Engineers and Managers, Pearson Education Ltd. 5th Edition 2005.

PTIE8020	SYSTEMS ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To introduce system engineering concepts to design the manufacturing system for optimum utilization of source for effective functioning.

UNIT I INTRODUCTION 9

Definitions of Systems Engineering, Systems Engineering Knowledge, Life cycles, Life-cycle phases, logical steps of systems engineering, Frame works for systems engineering.

UNIT II SYSTEMS ENGINEERING PROCESSES 9

Formulation of issues with a case study, Value system design, Functional analysis, Business Process Reengineering, Quality function deployment, System synthesis, Approaches for generation of alternatives.

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:

1. Andrew P. Sage, James E. Armstrong Jr. “Introduction to Systems Engineering”, John Wiley and Sons, Inc. 2000.

REFERENCES:

1. Andrew P.Sage, “Systems Engineering”, John Wiley & Sons, 1992.
2. Andrew P.Sage, William B.Rouse, “Hand book of Systems Engineering and Management”, John Wiley & Sons, 1999.

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 9

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 9

Technology forecasting - need, methodology and methods - trend Analysis, Analogy, Delphi, Soft System Methodology, Mathematical Models, Simulation, and System Dynamics.

UNIT III **9**

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 **9**

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 **9**

Technology Absorption and Innovation - present status in India, Need for new outlook, Absorption strategies for acquired technology, creating new/improved technologies, Innovations. Technology Measurement- Technology Audit.

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:

1. Joseph M. Putti, Management – A Functional Approach, McGraw Hill, 1997
2. Kenneth C. Lauden , MIS: Organisation and Technology, Prentice Hall, 1995
3. James A.Senn, Information technology in Business, Prentice Hall, 1995
4. Ronald J. Jordan, Security analysis and Portfolio Management, Prentice Hall, 1995
5 .Irvin M. Rubin, Organisational behavior an experimental approach, Prentice Hall, 1995
6. Gerard H. Gaynor, Handbook of Technology Management, McGraw-Hill Professional, 1996
7.Richard C. Dorf, Technology Management Handbook, CRC,1999

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 **9**

Personality –Types –Influencing Personality – Learning Process, Attribute – Perception – Motivation Theories

UNIT II GROUP BEHAVIOR **9**

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

Employee Training-Career Development-Performance Appraisal-Compensation-safety and Health-Employee Relation-Management Development – Employee retention.

TOTAL: 45 PERIODS

OUTCOMES:

- To understand the process of effective Human Resource Management

TEXT BOOK:

1. Stephen R. Robbins, "Organizational Behavior", PHI, 1998.

REFERENCES:

1. David A. Decenzo & Stephen R. Robbins, "Personnel/Human Resources Management", PHI, 1997.
2. Fred Lutherans, "Organizational Behavior", Oxford University Press, 2000.

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

Solution of algebraic and transcendental equations - Fixed point iteration method – Newton-Raphson method- Solution of linear system of equations - Gauss Elimination method – Pivoting - Gauss-Jordan methods – Iterative methods of Gauss-Jacobi and Gauss-Seidel - Matrix Inversion by Gauss-Jordan method - Eigenvalues of a matrix by Power method and by Jacobi's method.

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 DIFFERENTATION AND INTEGRATION 9

Approximation of derivatives using interpolation polynomials - Numerical integration using Trapezoidal, Simpson's 1/3 and Simpson's 3/8 rules – Romberg's method - Two point and three point Gaussian quadrature formulae – Evaluation of double integrals by Trapezoidal and Simpson's rules.

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 9

Single step-methods - Taylor's series method - Euler's method -Modified Euler's method - Fourth order Runge-Kutta method for solving first and second order equations - Multi-step methods - Milne's and Adams-Bashforth predictor-corrector methods for solving first order equations.

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:

1. Grewal, B.S. and Grewal,J.S., "Numerical methods in Engineering and Science", Khanna Publishers, New Delhi, 9th Edition, 2007.
2. Sankara Rao, K. "Numerical methods for Scientists and Engineers', Prentice Hall of India Private Ltd., New Delhi, 3rd Edition,2007.

REFERENCES:

1. Brian Bradie, "A Friendly Introduction to Numerical Analysis", Pearson Education Asia, New Delhi, 1st Edition, 2007.
2. Gerald, C.F. and Wheatley, P.O., "Applied Numerical Analysis", Pearson Education Asia, New Delhi, 6th Edition, 2006.
3. Laurene V. Fausett, "Applied Numerical Analysis using MATLAB", Pearson Education, New Delhi, 1st print, 2nd Edition, 2009.

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 – Taxation – Income Tax, Excise Duty – Sales Tax.

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

1. S.S.Khanka “Entrepreneurial Development” S.Chand & Co. Ltd. Ram Nagar New Delhi, 1999.
2. Kurahko & Hodgetts, “ Enterprenuership – Theory, process and practices”, Thomson learning 6th edition.

REFERENCES

1. Hisrich R D and Peters M P, “Entrepreneurship” 5th Edition Tata McGraw-Hill, 2002.
2. Mathew J Manimala,” Enterprenuership theory at cross roads: paradigms and praxis” Dream tech 2nd edition 2006.
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.

PTMF8072 ELECTRONICS MANUFACTURING TECHNOLOGY (Industrial, Manufacturing)

L	T	P	C
3	0	0	3

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:

1. Prasad R., “Surface Mount Technology –Principles and practice”, second Edition, Chapman and Hall, 1997, New York, ISBN 0-41-12921-3.

2. Tummala R.R., “Fundamentals of microsystem packaging”, Mc -Graw Hill, 2001, ISBN 00-71-37169-9.

REFERENCE BOOKS:

1. Puligandla Viswanadham and Pratap Singh, “Failure Modes and Mechanisms in Electronic Packages”, Chapman and Hall, New York, 1997, N.Y. ISBN 0-412-105591-8.
2. Totta P., Puttlitz K. and Stalter K., “Area Array Interconnection Handbook”, Kluwer Academic Publishers, Norwell, MA, USA, 2001.
   ISBN 0-7923-7919-5.
3. Lee N.C., “Reflow Soldering Process and Trouble Shooting SMT,BGA,CSP and Flip Chip Technologies”, 2001, Elsevier Science,
4. Zarrow P. and Kopp D. “Surface Mount Technology Terms and Concepts”, 1997, Elsevier Science and Technology,.ISBN 0750698756.
5. Harper C.A., “Electronic Packaging and Interconnection Handbook” Second Edition, McGraw Hill Inc., New York, N.Y., 1997, ISBN 0-07-026694-8.
6. Martin B. and Jawitz W., “Printed Circuit board materials handbook”, McGraw-Hill Professional, 1997.
7. Lau J.H., “Ball Grid Array Technology, McGraw-Hill Professional, 1997.
8. www.ipc.org.

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

Introduction to FMS– development of manufacturing systems – benefits – major elements – types of flexibility – FMS application and flexibility –single product, single batch, n – batch scheduling problem – knowledge based scheduling system.

UNIT II COMPUTER CONTROL AND SOFTWARE FOR FLEXIBLE MANUFACTURINGSYSTEMS 9

Introduction – composition of FMS– hierarchy of computer control –computer control of work center and assembly lines – FMS supervisory computer control – types of software specification and selection – trends.

UNIT III FMS SIMULATION AND DATA BASE 9

Application of simulation – model of FMS– simulation software – limitation – manufacturing data systems – data flow – FMS database systems – planning for FMS database.

UNIT IV GROUP TECHNOLOGY AND JUSTIFICATION OF FMS 9

Introduction – matrix formulation – mathematical programming formulation –graph formulation – knowledge based system for group technology – economic justification of FMS- application of possibility distributions in FMS systems justification.

UNIT V APPLICATIONS OF FMS AND FACTORY OF THE FUTURE 9

FMS application in machining, sheet metal fabrication, prismatic component production – aerospace application – FMS development towards factories of the future – artificial intelligence and expert systems in FMS – design philosophy and characteristics for 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:

1. Jha.N.K., “Handbook of flexible manufacturing systems”, Academic Press Inc., 1991.

REFERENCE BOOKS:

1. Radhakrishnan P. and Subramanyan S., “CAD/CAM/CIM”, Wiley Eastern Ltd., New Age International Ltd., 1994.
2. Raouf A. and Daya B.M., “Flexible manufacturing systems: recent development”, Elsevier Science, 1995.
3. Groover M.P., “Automation, production systems and computer integrated manufacturing”, Prentice Hall of India Pvt., New Delhi, 1996.
4. Kalpakjian S., “Manufacturing Engineering and Technology”, Addison-Wesley Publishsing Co., 1995.
5. Ohno T., “Toyota production system: beyond large-scale production”, Productivity Press (India) Pvt. Ltd., 1992.

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 9

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 stake-holders- 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.

TOTAL: 45 PERIODS

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, Scenarious in the Indian context, Disaster damage assessment and management.

TEXTBOOK:

1. Singhal J.P. “Disaster Management”, Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
2. Tushar Bhattacharya, “Disaster Science and Management”, McGraw Hill India Education Pvt. Ltd., 2012. **ISBN-10:** 1259007367, **ISBN-13:** 978-1259007361]
3. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011
4. Kapur Anu Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers, New Delhi, 2010.

REFERENCES

1. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
2. Government of India, National Disaster Management Policy,2009.

PTGE8072 **HUMAN RIGHTS** **L T P C**
3 0 0 3

OBJECTIVES :

- To sensitize the Engineering students to various aspects of Human Rights.

UNIT I **9**

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 **9**

Evolution of the concept of Human Rights Magana carta – Geneva convention of 1864. Universal Declaration of Human Rights, 1948. Theories of Human Rights.

UNIT III **9**

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

UNIT IV **9**

Human Rights in India – Constitutional Provisions / Guarantees.

UNIT V **9**

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:

1. Kapoor S.K., "Human Rights under International law and Indian Laws", Central Law Agency, Allahabad, 2014.
2. Chandra U., "Human Rights", Allahabad Law Agency, Allahabad, 2014.
3. Upendra Baxi, The Future of Human Rights, Oxford University Press, New Delhi.