UNIVERSITY OF KERALA

BTECH DEGREE

SCHEME AND SYLLABUS

(2003 ADMISSIONS)

BRANCH: INDUSTRIAL ENGINEERING

B. Tech Programme, Mechanical (Industrial Engg. stream) Engineering
Scheme of Studies and Examination
2003 admission

Semester I and II (Common for all branches)

Course No	Name of subject	Weekly load, hours			Max sessional marks	Exam Dur Hrs	Exam max marks	Credits
		L	T	D/P				
03.101	Engineering Mathematics - I	2	1	0	50	3	100	6
03.102	Engineering Physics	2	1	0	50	3	100	6
03.103	Engineering Chemistry	2	1	0	50	3	100	6
03.104	Engineering Graphics	1	0	2	50	3	100	6
03.105	Engineering Mechanics	2	1	0	50	3	100	6
03.106	Basic Civil Engineering	2	1	0	50	3	100	6
03.107	Basic Mechanical Engineering	2	1	0	50	3	100	6
03.108	Basic Electrical Engineering	2	1	0	50	3	100	6
03.109	Basic Electronics Engineering	2	1	0	50	3	100	6
03.110	Engineering Workshops	0	0	2	50	3	100	4
	Total	17	8	4	500		1000	58

Semester III

Course No	Name of subject	Weekly load, hours			Max. sessional marks	Exam Dur Hrs	Exam max marks	Credits
		L	T	D/P				
03.301	Engineering Mathematics II	3	1	-	50	3	100	4
03.302	Humanities(MNPU)	3	0	-	50	3	100	3
03.303	Machine Drawing	0	0	4	50	3	100	4
03.304	Mechanics of Solids (MNPU)	3	1	-	50	3	100	4
03.305	Computer Programming & Applications(MN)	3	2	-	50	3	100	5
03.306	Fluid Mechanics and Machines	3	1		50	3	100	4
03.307	Civil Engg. Drawing & Estimation(MN)	0	0	3	50	3	100	3
03.308	Civil Engineering Lab (MN)	0	0	2	50	3	100	2
	Total	15	5	9	400		800	29

Semester IV

Course No	Name of subject	Weekly load, hours			Max sessional marks	Exam Dur Hrs	Exam max marks	Credits
		L	T	D/P				
03.401	Engineering Mathematics - III	3	1	-	50	3	100	4
03.402	Mechanics of Machines	3	1	-	50	3	100	4
03.403	Management Science	3	0	-	50	3	100	3
03.404	Operations Management I	3	1	-	50	3	100	4
03.405	Electrical Machines	3	0	2	50	3	100	5
03.406	Thermal Engineering	3	0	0	50	3	100	3
03.407	Fluid Mechanics & Machines Lab (MN)	0	0	3	50	3	100	3
03.408	Thermal Engg. Lab.	0	0	3	50	3	100	3
	Total	18	3	8	400		800	29

Semester V

Course No	Name of subject	Weekly load, hours			Max sessional marks	Exam Dur Hrs	Exam max marks	Credits
		L	T	D/P				
03.501	Engineering Mathematics - IV	3	1	-	50	3	100	4
03.502	Decision Modeling - I	3	1	-	50	3	100	4
03.503	Work System Design	3	1	-	50	3	100	4
03.504	Metallurgy & Material Science (MNPU)	3	1	-	50	3	100	4
03.505	Manufacturing Process (MN)	3	1	-	50	3	100	4
03.506	Mechatronics	2	1	-	50	3	100	3
03.507	Machine shop-I (MNU)	0	0	3	50	3	100	3
03.508	Work System Design Lab	0	0	3	50	3	100	3
	Total	17	6	6	400		800	29

Semester VI

Course No	Name of subject	Weekly load, hours			Max sessional marks	Exam Dur Hrs	Exam max marks	Credits
		L	T	D/P				
03.601	Statistical Quality Control	3	1	-	50	3	100	4
03.602	Machine Design	3	1	-	50	3	100	4
03.603	Computer Aided Design(MN)	2	1	-	50	3	100	3
03.604	Machine Tools(MN)	3	1	-	50	3	100	4
03.605	Financial Mgt. & Accountancy	3	1	-	50	3	100	4
03.606	Elective – I	3	1	-	50	3	100	4
03.607	CAD Lab(MNU)	0	0	3	50	3	100	3
03.608	Machine shop II(MNU)	0	0	3	50	3	100	3
	Total	17	6	6	400		800	29

Semester VII

Course No	Name of subject	Weekly load, hours			Max. sessional marks	Exam Dur Hrs	Exam max marks	Credits
		L	T	D/P				
03.701	System Modeling & Simulation	3	1	-	50	3	100	4
03.702	Design for Manufacturing	3	0	-	50	3	100	3
03.703	Human Aspects of Management	3	1	-	50	3	100	4
03.704	Metrology & Instrumentation (MN)	3	1	-	50	3	100	4
03.705	Elective II	3	1	-	50	3	100	4
03.706	Elective III	3	1	-	50	3	100	4
03.707	Software Lab	0	0	2	50	3	100	2
03.708	Quality Control Lab	0	0	2	50	3	100	2
03.709	Project & Seminar	0	0	2	100			2
	Total	18	5	6	500		800	29

Semester VIII

Course No	Name of subject	Weekly load, hours			Max sessional marks	Exam Dur Hrs	Exam max marks	Credits
		L	T	D/P				
03.801	System Dynamics	3	1	-	50	3	100	4
03.802	Computer Integrated Manufacturing(MN)	3	2	-	50	3	100	5
03.803	Elective IV	3	1	-	50	3	100	4
03.804	Seminar *	0	0	3	100			3
03.805	Elective V	3	1	-	50	3	100	4
03.806	Elective VI	3	1	-	50	3	100	4
03.807	Project & Viva voce	0	0	5	150		100	5
	Total	15	6	8	500		600	29

List of Electives(B.Tech – 2003 scheme)

03.606

Elective I

03.606.1 Knowledge Management
03.606.2 Innovation and value Engineering
03.606.3 Human Resource Planning and Development
03.606.4 Human Factors in Engineering
03.606.5 Marketing Management
03.606.6 Facilities Planning And Management

03.705

Elective II

03.705.1 Management Information Systems
03.705.2 Decision Support System
03.705.3 Artificial Intelligence and Expert Systems
03.705.4 Software Engineering and Management
03.705.5 E-Commerce – Technology and Management

03.706

Elective III

03.706.1 Quality Management
03.706.2 TQM Tools and Techniques
03.706.3 Software Quality Management
03.706.4 Total Productive Maintenance
03.706.5 Reliability Engineering
03.706.6 Management of projects
03.706.7 Computer Graphics

03.803

Elective IV

03.803.1 Advanced production planning and control
03.803.2 Customer Relationship Management
03.803.3 Supply Chain and Logistics Management
03.803.4 Enterprise Resource Planning
03.803.5 Business Process Reengineering

03.805

Elective V

03.805.1 Flexible Manufacturing Systems
03.805.2 Agile and Lean Manufacturing
03.805.3 Industrial Automation
03.805.4 Robotics
03.805.5 Composite Materials and Mechanics
03.805.6 Instrumentation and control

03.806

Elective VI

03.806.1 Decision Modeling II
03.806.2 Advanced Optimization Techniques
03.806.3 Evolutionary Computation
03.806.4 Advanced Numerical Methods
03.806.5 Computerized Materials Management

Syllabus - Combined I&II Semester Industrial (2003 Admissions)

03.101 Engineering Mathematics-1 Credits: 6 L-T-D/P:2-1-0

Module-1

Differential Calculus and Infinite series

Successive differentiation-Leibnitz' Theorem (with out proof)-Indeterminate forms-
1. L'Hospital's rule-Curvature in Cartesian and parametric forms-Evolutes-Partial differentiation-Euler's Theorem(with out proof)-chain rule-Maxima and minima of functions of two variables-Method of Lagrange's Multipliers.

Infinite series-Notion of convergence and divergence-Integral test-Comparison test-Ratio test-Raabe's test-Cauchy's root test-Test for alternating series-Absolute convergence(All tests with out proof).

Module-2

Plane Analytical Geometry and Laplace Transforms

Conics-Elementary properties and parametric representation of Parabola,Ellipse, Hyperbola and Rectangular hyperbola-Tangents and normals-Asymptotes of a hyperbola.

Laplace Transforms-Properties-inverse transforms-convolution theorem(with out proof) Laplace transforms of unit step function,unit impulse function and periodic functions-Solution of O.D.E using Laplace transforms.

Module-3

Matrices

Rank of a matrix-linear dependence of vectors-solution of a system of linear equations-Consistency-Eigen value problem-properties of eigen values and eigen vectors-Cayley-Hamilton Theorem (with out proof)-Diagonalisation-Quadratic forms-reduction to Canonical form.

References

1. S.S.Sastry , "Engineering Mathematics Vol 1", Prentice-Hall of India(P) Limited
2. B.S.Grewal, "Higher Engineering Mathematics", Khanna Publishers
3. Michael D.Greenberg, "Advanced Engineering Mathematics", Pearson Education
4. Sarveswara Rao Koneru, "Engineering Mathematics",Universities Press
5. Lekshminarayan,Sunderem,Balasubramanian, "Engineering Mathematics", Vikas Publishing House (P) Ltd.

Note: The question paper shall consist of two parts. Part A will have ten compulsory questions, each having 4 marks. Part B will have 3 modules. Three questions (10 marks each) will be asked from each module and the students will have to answer two questions from each module.

03.102 Engineering Physics Credits- 6 L-T-D/P:2-1-0

Module 1

Chapter 1- *Waves*

Sinusoidal waves : concept of frequency and wavelength, types of waves, energy transport in wave motion, the one-dimensional wave equation, transverse vibrations of a stretched string-derivation, the general solution of the one-dimensional wave equation, three dimensional wave equation and its solution, plane waves and spherical waves.
[Chapter 9 of Ref.7]

Chapter 2 - *Electromagnetic Theory*

The operator del, definition of grad, div and curl and their physical significance, equation of continuity of time-varying fields, deduction of Maxwell's equations from the basic laws of electricity and magnetism, conduction current and displacement current, Maxwell's equations in free space, prediction of electromagnetic waves, transverse nature of electromagnetic waves, **E** and **H** are at right angles, Poynting's vector and Poynting's theorem. [Chapter 1,4&6 of Ref. 1, Chapter 12 of Ref. 6]

Chapter 3 – *Crystallography*

Space lattice, unit cell, primitive and non-primitive cells, lattice constants, the seven crystal systems, Bravais lattices, number of atoms per unit cell, coordination number and packing factor with reference to simple cubic, body centered cubic and face centered cubic crystals, structure of sodium chloride crystal, directions and planes, Miller indices, inter-planar spacing in terms of Miller indices, band theory of solids (qualitative study), superconductivity, transition temperature, magnetic properties of superconductors- Meissner effect, Type I and Type II superconductors, BCS theory (qualitative study), applications of superconductors.
[Chapter 1 and 12 of Ref.5; Chapter 10 of Ref. 4 & Chapter 14 of Ref. 3]

Module II

Chapter 4 – *Interference of Light*

Coherence: spatial coherence, temporal coherence and partial coherence, superposition of two coherent waves with a phase difference – theory of interference (trigonometric solutions), Young's double slit experiment: derivation of the expression for bandwidth, Young's double slit experiment using white light, shift of fringes when a thin film is introduced in the path of one of the beams, calculation of thickness of thin films, interference in thin films, conditions for brightness and darkness with reflected and refracted light, air-wedge : expression for the diameter of a thin wire, Newton's rings arrangement with reflected light : expression for diameter of bright and dark rings, Michelson's interferometer : determination of wavelength of monochromatic light, measurement of thickness of thin film, interference filters, antireflection coatings.
[Chapter 11 of Ref.2, Chapter 4 of Ref. 3]

Chapter 5 – *Diffraction of Light*

Diffraction phenomenon, Fraunhofer diffraction at a single slit, Fraunhofer diffraction at a circular aperture (no mathematical analysis), resolving power - Rayleigh's criterion, plane transmission grating, grating equation: $\sin\theta = Nn\square$, three dimensional grating, X-ray diffraction, Bragg's law.

[Chapter 12 of Ref.2, Chapter 5 of Ref. 3]

Chapter 6 – *Polarisation of Light*

Linear, circular and elliptical polarization of light, partially polarized light, production of polarized light by (1) scattering (2) reflection (3) transmission (4) selective absorption – polaroid and (5) double refraction, uniaxial and biaxial crystals, negative and positive crystals, Nicol prism, quarter wave and half wave plates, production of circularly and elliptically polarised light with theory, analysis of light of unknown polarisation, Kerr effect, Pockels effect, Cotton-Mouton effect, Faraday effect.

[Chapter 13 of Ref. 2, Chapter 6 of Ref. 3]

Module III

Chapter 7 - *Quantum Mechanics*

The concept of matter waves, de Broglie wavelength, wave function, probability interpretation of wave function, normalisation condition, time dependent and time independent Schrodinger equation, energy and momentum operators, eigen values and eigen functions of operators, Schrodinger equation as an eigen value equation, Hamiltonian operator, expectation values, Heisenberg's uncertainty principle, explanation of absence of electron in the nucleus, uncertainty in the frequency of light emitted by an atom, postulates of quantum mechanics, particle in one-dimensional box, energy eigen values and probability distributions, quantum mechanical tunneling (qualitative study).

[Chapter 5,6&7 of Ref.4]

Chapter 8 – *Statistical Mechanics*

Macrostates and microstates of systems, phase space , cells in phase space, basic postulates of Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac statistics, distribution equations in the three cases (derivation in the case of Maxwell-Boltzmann statistics only), bosons and fermions, density of states, photon gas, derivation of Planck's formula, free electrons in a metal as a fermi gas, fermi level and fermi energy.

[Chapter 9 and Appendix 4 of Ref.4]

Chapter 9 – *Lasers*

Spontaneous emission, absorption and stimulated emission of photons, Einstein coefficients and their relations, coherence in stimulated emission, lasing media, metastable level, population inversion, pumping, optical resonant cavity, types of lasers: solid state laser - Ruby laser, gas laser – He-Ne laser, semiconductor laser, application of lasers, holography and its applications, optical fibre, step index and graded index fibre, numerical aperture : derivation, uses of optical fibre.

[Chapter 14 of Ref. 2, Chapter 7 & 8 of Ref. 3, Chapter 23 of Ref. 7]

References:

1. Jordan Edward C and Balmain Keith G., "Electromagnetic waves and radiating Systems", Prentice Hall of India.
2. Kshirasagar P.G and Avadhanulu M.N., "A Text Book of Engineering Physics", Chand and Co.
3. Srinivasan M.R., "Physics for Engineers", New Age International Publishers
4. Beiser Arthur, "Concepts of Modern Physics, (Ed.IV)", Mc Graw Hill Book Co.

5. Kittel C, “Solid State Physics”, (Ed. V), Wiley Eastern Ltd.
6. Kipp Arthur F., “Fundamentals of Electricity and Magnetism”, Mc Graw Hill Int.Book Co.
7. Ghatak, Ajoy; *Optics* (Ed. II), Tata Mc Graw Hill
8. Hassan T.A. et.al., “A Text Book of Engineering Physics”, Aswathy Publishers, Vazhuthacaud, Trivandrum
9. Premlet B., “Advanced Engineering Physics”, Phasor Books, Kollam

List of demonstration experiments to support theory

1. Newton’s rings - determination of wavelength
2. Air wedge – diameter of a thin wire
3. Spectrometer - plane transmission grating – wavelength of light
4. Spectrometer- refractive indices of calcite for the ordinary and extra ordinary rays
5. Optic bench – biprism – wavelength of light
6. Laser – diffraction at a narrow slit
7. Laser - diffraction at a straight wire/circular aperture
8. Michelson’s interferometer – wavelength of light
9. Michelson’s interferometer - thickness of thin transparent film
10. Polarisation by reflection – Brewster’s law
11. Computer simulation – superposition of waves
12. Computer simulation – study of **E** & **H** (Gauss’ law and Ampere’s law)

Note: The question paper will consist of two parts. Part 1 is compulsory for 40 marks. This may contain 20 questions of 2 marks each. Part 2 is for 60 marks. This will cover the three modules. There can be three questions from each module (10 marks each), out of which two are to be answered. OR There will be two questions from each module (20 marks each), out of which one is to be answered.

03.103 Engineering Chemistry Credits:6 L-T-D/P:2-1-0

Module 1

Electrochemistry – electrodes – electrode potential – origin of electrode potential – Helmholtz double layer – Nernst equation – reference electrodes – standard hydrogen electrode and saturated calomel electrode – cell emf – Weston cadmium cell - experimental determination of e.m.f. of cells and electrode potentials - electrochemical series – determination of pH using glass electrode and quinhydrone electrode – galvanic cells – concentration cells – dry cell – lead storage battery – nickel-cadmium cell – H_2-O_2 fuel cell – polarization – decomposition potential - over voltage

Corrosion and its control – theories of corrosion – galvanic series - differential aeration corrosion – stress corrosion - factors affecting corrosion and methods of corrosion control– protective coatings – metallic coating - chemical conversion coating - paints

Chromatography – general principles – column, thin layer and paper chromatography – high performance liquid chromatography – gas liquid chromatography

Module 2

Water treatment – soft and hard water – units of hardness – disadvantages of hard water – sludge and scales in boilers – priming and foaming – determination of hardness – EDTA

and soap titration methods – water softening methods – internal conditioning – lime soda process – lime soda requirement - ion exchange methods – desalinization process – purification of water for domestic use

Pollution and its control – air pollution – water pollution – BOD and COD – sewage water and its treatment

Instrumental methods of analysis – basic principles involved in thermogravimetry, differential thermal analysis, electronic, vibrational, and rotational spectroscopy and mass spectroscopy

Module 3

Cement – manufacture of Portland cement – theory of setting and hardening of cement

Fuels – calorific value – HCV and LCV – experimental determination of calorific value – nuclear fuels – fission and fusion reactions

Explosives – classification of explosives – Rocket propellants - classification

Adhesives – classification – preparation – Detergents – theory of detergent action

Lubricants – theories of friction – mechanism of lubrication – solid and liquid lubricants – properties of lubricants – viscosity index – flash point and fire point – cloud point and pour point - aniline value

Polymers – classifications – mechanism of polymerization – general methods of preparation – compounding and moulding of plastics – elastomers – structure of natural rubber – vulcanization – synthetic rubbers – silicone polymers – application in electrical and electronic industries

References:

1. E.C.Potter, "Electrochemistry, Principles and Applications", Cleaver-Hume Press, London
2. P.C.Jain, "Engineering Chemistry "
3. V.Raghavan, "Material Science and Engineering-A First Course", Prentice Hall, New Delhi.
4. H.A.Willard, L.L.Merrit and J.A.Dean, "Instrumental Methods of Analysis", Van-Nostrand.
5. J.C.Kuriakose and J.Rajaram, "Chemistry in Engineering and Technology, Vols. I&II".
6. K.L.Kapoor, "Physical Chemistry Vols. I&II", Macmillan, New Delhi.
7. Juhaina Ahad, "Engineering Chemistry"
8. R.Gopalan, D.Venkappayya and S.Nagarajan, "Engineering Chemistry"
9. Shashi Chawla, "A Text Book of Engineering Chemistry"

Demonstration Experiments

1. Estimation of total hardness in water using EDTA
2. Estimation of chloride ions in domestic water
3. Estimation of dissolved oxygen.
4. Estmation of COD in a sample of sewage water.
5. Estimation of available chlorine in bleaching powder.
6. Estimation of copper in brass.
7. Estimation of iron in a sample of haematite.
8. Determination of flash point and fire point of lubricant using Pensky Marten's apparatus.

9. Potentiometric Titrations.
10. Preparation of buffers and standardization of pH meter.
11. Determination of the molarity of HCl solution pH-metrically.
12. Determination of pH using glass electrode and Quinhydrone electrode

References:

1. A.I.Vogel, "A text of Quantitative analysis", ELBS, London
2. D.P.Shoemaker and C.W.Garland, "Experiments in Physical Chemistry", McGraw Hill

Note: The question paper will consist of Parts A and B. Part A will have 10 questions with 4 marks each. All questions are compulsory. Part B will have three questions from each module. Any two from each module will have to be answered. Each question carries 10 marks.

03.104 Engineering Graphics **Credits - 6** **L-T-P/D : 1-0-2**

Module I

Scales : Representative fraction, construction of plain, diagonal and vernier scales.

Conics: Construction of conics when eccentricity and distance from directrix are given-construction of ellipse: (i) given the major axis and foci (ii) given the major axis and the minor axis (iii) given a pair of conjugate diameters (iv) by the four center method. Construction of parabola given the axis and base. Construction of hyperbola (i) given the asymptotes and a point on the curve (ii) given ordinate, abscissa and the transverse axis. Construction of Tangent and normal at points on these curves.

Miscellaneous curves : Cycloids and Trochoids, Epicycloids and Epitrochoids, Hypotrochoids, Involute of a circle. Archemedian spiral and Logarithmic spiral, Helix. Tangent and normal at points on these curves.

Module II

Projection of points and lines: Types of projection, principle of orthographic projection. Fixing of plan and elevation of points and lines. Determination of true length, inclination to the planes of projection and traces of lines.

Projection of solids : Projection of simple solids such as prisms, pyramids, cylinder, cone, tetrahedron, octahedron and sphere, when they are placed in simple positions.

Auxiliary projections: Auxiliary projection of simple solids to satisfy given conditions.

Section of solids: Types of cutting, sections of simple solids cut by parallel. Perpendicular and inclined planes. True shape of sections.

Module III

Note : Treatment of topics in this module shall be such that the principles are explained with reference to simple problems.

Development of surfaces: Development of surfaces of (i) simple solids like prisms, pyramids, cylinder and cone (ii) cut regular solids

Intersection of surfaces : Intersection of surfaces of two solids as given below in cases where the axes of the solids are perpendicular to each other : (i) Two cylinders (ii) Cone and a cylinder (iii) Prism and a prism

Note: Only the cones where the axes are perpendicular to each other.

Isometric Projection: Isometric scale – Isometric projections of simple solids like prisms, pyramids, cylinder, cone and sphere. Isometric projections of cut solids – Prisms and cylinder only.
Perspective projection : Principles of perspective projection, definition of perspective elements. Perspective projection of simple solids such as prisms and pyramids only.
Note : Only simple positions when the axis is perpendicular to the ground and parallel to picture plane are to be discussed.
General Note :
(i) First angle projection to be followed
(ii) Question paper shall contain 3 questions from each module. Students are required to answer any two questions from each module
(iii) Distribution of marks (Module I – 2x14, Module II - 2x18, Module III – 2x18, Total – 100)

Text books:

1. N.D.Bhatt, "Engineering Drawing"
2. Varghese, "Engineering Graphics"
3. K.R.Gopalakrishnan, "Engineering Drawing"
4. K. Venugopal, "Engineering Drawing & Graphics"
5. Thamaraselvi, "Engineering Drawing"
6. John, "Engineering Graphics"
7. Gill, "Engineering Graphics"

03-105 ENGINEERING MECHANICS Credits 6 2-1-0

Review: (5 Hrs)
Different formulations of Mechanics. – Fundamental concepts. Space time and matter. Principal systems of Units. Elements of vector Algebra
Lami's Theorem, Law of triangle of forces, Plane motion projectile.

Module I (18 Hrs)
2. Statics of rigid bodies – force acting on a body, principle of transmissibility of a force Classification of force systems Equilibrium of force, concurrent, coplanar force systems.
Moment of a force, couple, properties of couple Varignon's theorem, Resultant and equilibrium of non-concurrent coplanar forces. Beam reactions.
Forces in space, equations of equilibrium, Vector approach
Analysis of plane perfect frames – Method of joints and method of sections and method of sections
Friction – ladder, wedge, screw and belt friction. Forces in flexible suspension cables, Principle of virtual work.

Module II (18 Hrs)
Properties of surfaces – centroids of composite areas.
Theorem of Pappus - Centroid of solids, Moment of inertia of areas, Parallel axes and perpendicular axes theorems. Radius of gyration.. MI of composite area. Product of

inertia and principal moments of inertia. Mass moment of inertia of thin plates and composite bodies.
Dynamics: Combined translatory motion and rotational motion Instantaneous centre, Motion of link, Motion of connecting rod, and piston in a reciprocating engine wheel rolling without slipping.
Simple harmonic motion – free vibration – simple mechanical systems Features of vibrating systems – linear free vibrations, Angular free vibrations, pendulum motion.
Relative velocity – simple cases

Module III (18 Hrs)

3. Work power & Energy, Impulse momentum, Collision of Elastic bodies, Direct and indirect impact between elastic bodies and fixed plane.
Newton's laws of translatory motion. D'Alembert's Principle. Motion of lift, Motion of connected bodies, Centrifugal & centripetal force.
Curvelinear motion. Differrential equation of motion, D'Alembert's principle in curvelinear motion. Work done by torque, Equation of rotation, Angular momentum, Angular impulse. Law of conservation of momentum. Kinetic energy due to rotation, Kinetic energy due to combined motion. Analogy between linear, and curvelinear motion.

Reference :-

1. Timoshenko, "Engineering Mechanics"
2. Beer & Johnston, "Engineering Mechanics"
3. Gupta, "Interactive Engineering Mechanics"
4. Irving H Shames, "Engineering Mechanics"
5. Hibbler, "Engineering Mechanics"
6. Benjamin, "Engineering Mechanics"

03-106 BASIC CIVIL NGINEERING Credits 6 2-1-0-3

Module I

Measurement of distance-Direct measurement-Tape & chain only- Ranging out survey lines-Taking measurement of a sloping ground-Errors-Tape correction problems.
Levelling instruments (Dumpy Level, Tilting Level and Auto Levels). Levelling Staff (folding type only)- How to make measurements,-temporary adjustment, holding the staff, reading the staff, principles of leveling-recording measurements in the field book-deduction of level-height of collimation method only, examples.
Introduction to Distomat and Total Station .(description only)-How to make linear and angular measurements using total station, Brief description of contour maps . Computation of areas from plan.

Module II

Selection of site for buildings- types of buildings-,Components of buildings.
Foundation:- different types (description only). Spread footing, Isolated footing, Combined footing, Mat foundation¸ Pile foundation. What is Safe Bearing Capacity of Soil?, Importance of determination of the Safe Bearing Capacity of Soil(theory only).

Super structure:- Masonry-stone masonry, brick masonry, test for checking the quality of stone and brick (brief description).
Partition-Materials used for making partition-plywood, particle boards and glass.
Doors, windows-materials used for the construction of doors and windows-wood, steel, Aluminium.
Plastering- Cement mortar, Cement mortar plastering ,
Painting- How to prepare the surface for painting-plastered , wood and steel surfaces-types of paint- enamel, emulsion, distember.
Flooring- using mosaic tiles, ceramic tiles, marble, granite and synthetic materials.
Roofing- Selection of type of roof -flat roof, sloping roof -Concrete roof, tiled roof, timber roof, GI Sheet , AC Sheet, PVC Sheet. Selection of roof covering materials.

Module III

Concrete:- Ingredients- cement, aggregate-and water. Qualities of ingredients (brief description only). Tests to determine the qualities of fine aggregate-fineness modulus and grading curves. Cement- consistency, initial and final setting times, coarse aggregate-specific gravity, bulk density, porosity and void ratio. IS Specifications. Cement-mortar-IS Specification for preparation and determination of mortar strength .
Plain Cement Concrete (PCC) preparation-proportioning-mixing of concrete.
Test of fresh concrete-Slump Test and Compaction Factor Test. Test on Hardened Concrete to determine the Compressive Strength of concrete . IS specification for the compressive strength of concrete. Steel-common types used in construction- Mild Steel, HYSD Steel and their properties. Reinforced Cement Concrete(RCC)-advantages of RCC over Plain Cement Concrete. Elementary ideas on pre-cast and pre-stressed concrete constructions.

References:

1. T. P. Kenetke & S. V. Kulkarni, “Surveying & leveling Vol. –I”
2. B.C Punmia, “Surveying & Leveling”
3. Rangwala, “Building Materials”
4. Rangwala, “Building Construction”
5. Moorth, “Building Construction”
6. Jha & Sinha, “Construction and Technology”
7. S.K. Roy, “Fundamentals of Surveying” Prentice-Hall of India, New Delhi.
8. S. Narayanan and Lalu Mangal, “Introduction to Civil Engineering”, Phasor books

Note: The question paper will consists of two parts. Part I and part II..
Part I is Compulsory covering the entire syllabus, for 40 marks. It contains 10 questions of 4 marks each.
Part II is to cover 3 modules. These will be two questions from each module (20 marks each) out of which one is to be answered.

03.107 Basic Mechanical Engineering: Credits - 6 L-T-P/D : 3-0-0

Module I

Thermodynamics : definitions and basic concepts – system, properties, state, process and cycle-work and heat-thermodynamic equilibrium, Zeroth law of thermodynamics-concept of temperature-temperature scales. First law of thermodynamics-concepts of internal energy and enthalpy. Second law of thermodynamics- Clausius and Kelvin-Plank statements –concept of reversibility, availability and entropy. Thermodynamic processes – constant volume, isothermal, adiabatic, polytropic processes, throttling and free expansion- p-v and T-s diagrams-work done, heat exchanged, change in internal energy.

Air cycles: Carnot, Otto and Diesel cycles-Air standard efficiency

IC Engines: Working and comparison of two strike and four stroke petrol and diesel engines- general description of various systems using block diagrams and/or simple sketches – air system, fuel system, ignition system and governing system.

Module II

Steam : Properties- entropy of steam- T-s diagram – simple problems (such as calculation of dryness fraction, enthalpy and entropy, given necessary data).

Steam boilers: Classification – Cochran boiler- Babcock and Wilcox boiler, High pressure boilers, Functions and uses of boiler mountings and accessories.

Elementary ideas of simple impulse and reaction turbines. Compounding-Velocity compounding, Pressure compounding.

Refrigeration: Vapour compression refrigeration system, Refrigerants, CFC free refrigerants.

Psychrometry- definitions of terms. Air Conditioning – Comfort and Industrial air conditioning-typical air conditioning unit (general description only).

Gas turbines : Working principle of open and closed cycle gas turbines - applications

Module III

Mechanical Power transmission systems: Belt, rope and gear drives-types, comparison and fields of application-velocity ratio-friction disc, single plate clutch, gear trains (no derivations).

Manufacturing processes: Elementary ideas of moulding, sand casting, die casting, forging, rolling, extrusion, wire drawing, punching and blanking, stamping, coining, surfacing, turning, taper turning, thread cutting, shaping, drilling, boring, tapping, reaming, grinding, milling, broaching, honing, lapping, welding, soldering and brazing (simple sketches and short notes only)

Pumps : Working principles of reciprocating, centrifugal, gear and deep well pumps, applications – criteria for selection of pumps.

Note : Lectures are to be supplemented by demonstration in laboratories.

References

1. Spalding and Cole, “Engineering Thermodynamics”
2. Gill, Smith and Zuirys, “Fundamentals of IC Engines”
3. Roy and Choudhary, “Elements of Mechanical Engineering”
4. Amstead, Ostwald and Begeman, “Manufacturing processes”
5. Benjamin, “Basic Mechanical Engineer

03.108 Basic Electrical Engineering Credits 6 2-1-0

Module - I

Elementary concepts - Kirchoffs current law - Kirchoffs voltage law, formation of network equations by node voltage and mesh current methods. Matrix representation - solution of network equations by matrix methods, star-delta conversion.

Magnetic Circuits - MMF, field strength, flux density, reluctance - simple problems. Review of electromagnetic induction - Faradays laws, Lenz's law. Statically induced and dynamically induced emf, Self and mutual induction - inductance.

Alternating current fundamentals - generation of alternating currents - waveforms frequency - period - average and rms values - form factor. Different waveforms. Phaser representation of alternating quantities - rectangular polar and exponential forms.

Analysis of simple ac circuits – Concept of impedance and admittance - Phaser representation - *j* notation - power and power factor in ac circuits - active and reactive components. Solution of RL, RC and RLC circuits, series and parallel resonance. Q factor.

Three phase systems - generation of three phase voltage - star and delta connection relation between phase and line values of voltage and current - phasor representation of three phase circuits - three wire and four wire systems.

Measurement of power - Measurement of active and reactive power in single and three phase circuits. Measurement of energy - energy meter.

Module - II

Methods of bulk generation of electric power. Block schematic of layout of generating stations - hydroelectric, coal fired and gas based power plants. Renewable energy sources - solar, wind, tidal, wave and geothermal energy.

Economics of generation - load factor, diversity factor, plant factor. Energy conservation methods.

Tariffs - different types of LT and HT consumers - tariff schemes - uniform tariff and differential tariff.

Transformers - Principle of operation - EMF equation - constructional details of single phase and three phase transformers - Losses and efficiency of transformers - All day efficiency - CT and PT.

Bulk transmission of electric power - typical electrical power transmission scheme - need for high transmission voltage - substations - substation equipments. Primary and secondary transmission and distribution systems. Effect of power factor - simple problems.

Module - III

DC machines - principle of operation of dc generator - constructional details - emf equation - types of generators. Principle operation of dc motors. Electrical and mechanical characteristics and application of dc series, shunt and compound motors - applications.

AC motors - principle of operation - rotating magnetic field - three phase and single phase induction motors. Synchronous motors - applications.

Different methods of wiring for LT installations. Schematic layout of LT switchboards. Earthing of installations - necessity of earthing - plate and pipe earthing. Protective fuses, MCBs, ELCBs and switches.
Characteristics of different types of lamps - incandescent lamps, vapour lamps - fluorescent, mercury vapour, sodium vapour and metal halide lamps, energy efficient lamps and control accessories for vapour lamps.
Storage batteries - lead acid and nickel cadmium batteries. Construction, characteristics, charging and discharging, specifications and maintenance.

TEXT BOOKS

1. Edward Hughes, "Electrical and Electronic Technology", Pearson Education, 2002.
2. ML Soni, PU Guptha, US Bhatnagar and A Chakrabarthy, "A Text Book on Power System Engineering", Dhanpath Rai & Sons, New Delhi 1997.

REFERENCES

1. V.N. Mitlle, "Basic Electrical Engineering", TMH, 1990.
2. DP Kothari, LJ Nagrath, "Theory and Problems of Basic Electrical Engineering", Prentice Hall of India, 2000.
3. B.L. Thereja, "A Text Book of Electrical Technology, Volume I", S Chand & Co, New Delhi, 1992.
4. Francis M Fernandez, "A Basic Course in Electrical Engineering", Rajath Publishers, Ernakulam.
5. TP Imthias Ahmed, B. Premlet, "Introduction to Electrical Engineering", Phaser Books, Kollam.

Note : The question paper will consist of two parts. Part – A is to be compulsory for 40 marks (10 questions of 4 marks each). Part-B is to cover 3 modules for 60 marks. (50% choice, One out of two or two out of four from each module).

Basic Electronics Engineering Credits:6 L-T-D/P:2-1-0

(Analysis and derivations not required)

Module I

1. Passive components

4. (a) Resistors: concepts of fixed & variable resistors, metal film resistors, construction, power rating, tolerance, colour code, standard values, wire wound resistors, fixed & variable, construction, power rating & tolerance.
(b) Capacitors: different types, Construction of mica and ceramic capacitors (disc & tubular), colour code, electrolytic (Teflon) capacitors, typical range of values and voltage ratings of different types of capacitors
(c) Inductors: construction of single layer, multilayer and variable inductors, principle of low power transformers.

2. Active components

(a) Diodes: PN junction diodes, typical doping concentration, formation of barrier potential, forward and reverse biasing. V-I characteristics, dynamic & static resistance, principle of working and V-I characteristics of Zener diode, principle of Photo diode, Solar cell, & LED.

(b) Bipolar junction transistors: NPN & PNP transistors, structure, typical doping, working of NPN transistor, concepts of common base, common emitter & common collector configurations. Current gain of each, input & output characteristics of common emitter configuration, concepts of
Input & output resistances, comparison of three configurations with reference to voltage & current gain input & output resistances, specific uses of common collector configuration.
(c) Junction Field Effect Transistors: N & P channel JFETs, structure, input & output characteristics of N channel JFET under common source, definition of parameters, comparison of performance parameters with BJT.

Module 2

1. Electronic circuits & systems

(a) Rectifiers & power supplies: bock diagram description of a dc power supply, rectifying action of diodes. circuit diagram & working of half-wave & full wave (including bridge) rectifier, final equations of Vrms, Vdc ripple factor & peak inverse voltage in each case, principle of working of series inductor and shunt capacitor filters, need of voltage regulator, working of simple zener voltage regulator.
(b) Amplifiers & Oscillators: circuit diagram & working of common emitter amplifier, function of each component in the circuit, need of proper biasing, concept of voltage gain and 3dB bandwidth, circuit diagram and working of common source JFET amplifier, concept of gain & bandwidth, concepts of class A, B, AB power amplifier, working of a single ended class A power amplifier, concepts of feedback, working principles of Wien bridge and Hartley oscillator.
(c) Integrated circuits: Advantages of ICs, symbol of operational amplifier, use as inverting and non inverting amplifier, truth table and symbol of AND, OR, NOT, NAND, NOR and EX-OR gates, concepts of SSI, MSI, LSI & VLSI circuits.
(d) Transducers, instrumentation & measurements: working principles of resistance strain gauge. Typical uses, use of thermistor for temperature measurement, principle of resistance & condenser microphone and moving coil loudspeaker. Working of CRT. Block diagram of CRO, uses of CRO, working & uses of multimeter block diagram of digital multimeter.
(e) Principles of digital computer: block diagram representation of digital computer, functions of each unit, memory, input & output units, need of operating system, conceptual differences of Hardware, Software.

Module 3:

Communication systems:

(a) Radio communication: electromagnetic spectrum, concepts of propagation through ground, sky & space, frequency range in each, need for modulation, concepts of AM & FM, wave forms & final equations of AM, FM & their bandwidths, block diagrams of AM & FM transmitters. Block diagrams of AM & FM superhetrodyne receivers.
(b) Principles of colour television**:** Standard TV channels, interlaced scanning, PAL system standards used in India, block diagram of PAL TV transmitter & receiver, yagi antenna, basic principles of cable TV.
(c) Principles of pulsed radar: Block schematics of pulsed radar, final equation for radar

range, factors affecting range, applications of Radar.
(d) Principles of satellite communications: concept of geo-stationary satellite, frequency bands used, components of a typical satellite, block diagram concepts of earth station transmitter & receiver & transponder, advantages of satellite communication.
(e) Principles of optical communications: Block diagram of the system, concepts of optical fiber, source (LED) & detector (photo transistor), advantages of optical communication.
(f) Principles of microwave links**:** frequency bands used, block diagram of transmitter, receiver & repeater, advantages of link communications.
(g) Principles of mobile communications: basic principles of cellular communications, concepts of cells, frequency reusage, advantages of cellular communications.

References:

1. Santiram Kal, "Basic Electronics", Prentice Hall of India, 2002.
2. T.F.Bogart, "Electronic Devices & Circuits", Universal Book Stall, New Delhi.
3. R.J.Schoenbeck, "Electronic Communications", Universal Book Stall, New Delhi.
4. A.Kumar, "Communication Engineering", Umesh Publications, Delhi.
5. N.N.Bhargava, "Basic Electronics and Linear Circuits",T.M.H.
6. Gopakumar, "Introduction To Electronics and Communications", .Phasor Books, Kollam

Note: The question paper shall consist of two parts. Part A will have ten compulsory questions, each having 4 marks. Part B will have 3 modules. Three questions (10 marks each) will be asked from each module and the students will have to answer two questions from each module.

03. 110 Engineering Workshops : Credits – 4 L-T-P/D : 0-0-2

A. Carpentry : Study of tools and joints- planning, chiseling, marking and sawing practice. Joints – cross and tee joints- dove tail joint, mortise and tenon joint
B. Fitting : Study of tools – practice in chipping, filing, cutting, drilling, tapping and dieing- male and female joints-stepped joints
C. Smithy : Study of tools – forging of square prism, hexagonal bolt, T bolt and eye bolt.
D. Foundry : Study of tools, preparation of sand, moulding practice, casting demonstration.
E. Sheet metal work : Study of tools, selection of different gauge GI sheets for jobs – types of joints, riveted and soldered joints- preparing tube joints, frustums, trays and containers.
F. Plumbing : Study of tools – details of pluming work in domestic and industrial applications, study of pipe joints, cutting, threading and laying of pipes with different fittings. Use of special tools in plumbing work.
   Note : For the university examination the student shall be examined in any one of the first five trades (A-E) by drawing lots.

Syllabus - III Semester Industrial (2003 Admissions)

03.301

ENGINEERING MATHEMATICS 3-1-0 4 Credits

(Common to all branches)

MODULE 1

Ordinary Differential Equations

Differential equations of the first order and higher degree: Equations solvable for p-Equations solvable for x-Equations solvable for y-Clairut's Equation.
Linear Diffirential Equations: Higher order with constant coefficients-Method of variation of parameters-Homogeneous linear equations(Cauchy's and Legender's)-Simultaneous linear equations with constant coefficients.
Orthogonal Tragectories: Cartesian form only.

MODULE 2

Fourier Series And Multiple Integrals

Fourier Series: Dirichlet's conditions-Euler's Formula-Functions with periods 2π and $2l$-Even and odd functions-Half range sine and cosine series.
Multiple Integrals: Evaluation-Change of order of integration-Transformation to polar coordinates-Area as double integral-Volume as triple integral(cartesian coordinates only).

MODULE 3

Vector Calculus

Vector differentiation: Derivative of a vector function-Velocity and acceleration-Scalar and vector fields-Gradient-It's geometrical interpretation-Directional derivative-Divergence and Curl-Their physical meaning-Relations involving ∇ -Solenoidal and irrotational fields-Scalar potentials(simple problems).
Vector Integration: Line integral,surface integral and volume integral-work done by a force-Statement and verification of Green's theorem,Stoke's theorem and Gauss' Divergence theorem-their use in evaluating the integrals.

References:

1.Engineering Mathematics,Vol 2:S.S Sastry,Prentice Hall of India (P) Ltd
2.Higher Engineering Mathematics:B.S.Grewal,Khanna Publishers
3.Engineering Mathematics:Sarveswara Rao Koneru,Universities Press
4.Advanced Engineering Mathematics:Michael D.Greenberg,Pearson Education

Note:

The question paper consists of two parts.
Part A (40 marks)
Ten compulsory questions of 4 marks each
Part B (60 marks)

Students must answer one out of two questions from each module.
Each question carries 20 marks

03.302

HUMANITIES (MNPU) 3-0-0 3 Credits

Part I – Economics (2 Periods per week)

Module I

1. Definition and scope of Economics- Definition of basic terms-Goods-wants and their classifications-wealth- Income –Money- -Near money- Credit money- Utility, features and kinds of utility – National Income and related concepts as GNP, NNP, -Disposable Income Resource Allocation, Technological choice & production possibility curve. Indifference curve analysis- the concept of supply- Supply curves-Cost curves – loss of returns.
2. Basic laws in Economics – Law of Diminishing marginal utility – Demand, Law of Demand and demand curve- The concept of supply- Supply schedule and supply curve**.**

Module II

3. Market structure – Classifications – Pricing under different markets as perfect competition, monopoly and oligopoly, pricing under monopolistic competition.
4. Inflation – Measures to control inflation – Monetary measures and fiscal measures – Effects of inflation.
5. Tax – Classification of Taxes – Direct & Indirect taxes specific and AdValorem taxes – personal Income tax – characteristics of a Good tax system – Tax evasion.

Module III

6. International Monetary Fund– Issues & Challenges – International liquidity – Special Drawing Rights - India & IMF.
7. Welfare Economics – Old Welfare Economics - piguo's Analysis – New Welfare Economics Pareto's welfare criterion**.**

Books for Study :-

Dewtt.K.K Modern Economic theory

Books for References:-

1. Prof. G.Narendrababu " Elements of Ecomic Analysis"
2. Sundaram K.P.M " Money, Banking . Trade & Finance "

Part II – Communicative English (1 period per week)

Reading- Skimming-scanning-detailed reading-predicting content-interpreting charts and tables-identifying stylistic features in texts - evaluating texts-understanding discourse coherence-guessing meaning from the context- note making / transferring information.

Word formation with prefixes and suffixes-discourse markers and their functions-degrees of comparison- expressions relating to recommendations and comparisons-active and passive voice-antonyms-tense forms- gerunds- conditional sentences-modal verbs of probability and improbability-acronyms and abbreviations - compound nouns and adjectives-spelling-punctuation.

Sentence definition-static description-comparison and contrast-classification of information-recommendations- highlighting problems and providing solutions-formal and informal letter writing-using flow-charts/diagrams paragraph writing-editing.

Defining, describing objects-describing uses/functions-comparing-offering suggestions-analysing problems and providing solutions-expressing opinions (agreement/ disagreement) –expressing possibility/certainty – framing questions-providing answers.

Text Books: Part B

1. " English for Engineers and Technologists ", Volume I. Authors : Humanities and Social Science Department, Anna University, Published by Orient Longman Ltd., 1990.
2. Sarah Freeman, Written communication in English, Orient Longman, 1977.

References:

1. Narayanaswami, V.R, .Strengthen Your Writing, Orient Longman Ltd., Chennai 1996 (Revised Edition)
2. Pickett and Laster, Technical English, Writing, Reading and Speaking, New York Harper and Row Publications.
3. Swan, Michael, Basic English Usage, Oxford University Press, 1984.
4. Bhatnagar and Bell, Communication in English, Orient Longman, 1979.
5. Pravin.S.R.Bhatia, A.M.Sheikh, Professional Communication skills, S.Chand and Company Ltd., 2003.

University Question

Part – I Humanities

Part A – 30 Marks (short answers) Covering entire syllabus (3x10=30)

Part B – 40 Marks (50% choice – One out of two or two out of four from each module.)

Part - II Communicative English

30 marks (50 % choice)

03 303

MACHINE DRAWING 0-0-4 4 Credits

Conversion of pictorial views into Orthographic views- Dimensioning techniques - Different forms of screw thread and conventional representation of screw threads, Orthographic views of Hexagonal Bolt with Hexagonal Nut (Dimensioned Drawing), Square headed Bolt and Nut (sketching), Sketching of different types of Lock Nuts, Locking Devices and Foundation Bolts.

5. Riveted Joints - Lap and Butt Joints with Single and Multiple rows of riveting in chain and zigzag arrangements (Both Dimensioned Drawing and Sketching), Forms of rivet heads (sketching)

Fully Dimensioned and Sectional Drawings of the following

Joints :Socket and Spigot , Cotter Joint, Knuckle Joint

Shaft Couplings: Flanged Coupling, Protected type Flanged Coupling, Bushed Pin Flexible Type Coupling.

Assembly drawings of Machine components such as piston, cylinder, crossheads, and Safety Valves, etc.

Pipe Joints: Armstrong Joint (Hydraulic Joint) Sketching Only

Note:-

1. First Angle Projection to be followed
2. The student should be made conversant with relevant BIS Specification.

References:

1. Machine Drawing – N.D. Bhutt.
2. Machine Drawing – K. C. John & P.I. Varghese.

03.304

MECHANICS OF SOLIDS (MNPU) 3-1-0 4 Credits

Module I

Stress and strain, stress-strain relationships – Hook's law – deformation of axially loaded bars- Poisson's ratio – elastic constants-relationship between elastic constants-thermal strain and deformation – Saint-Venant's Principle and stress concentration- definition of plane stress, plane strain and axi-symmetric problems and their examples – principal stress and principal strains- Mohr's circle representation of principal stress and strains.

Shear force and bending moment – cantilever, simply supported and over hanging beams-concentrated and UD loads-analytical and geometric methods. Theory of simple bending-bending stress and shear stress distribution-rectangular, circular and I sections.

Module II

Slope and deflection of simply supported beams and cantilevers-simple proof of deflection of beams-double integration and area moment method only-torsion of circular shafts-solid and hollow shafts-power transmitted by shafts.

Thin cylinders and shells subjected to internal and external pressures – thick cylinders and spherical shells- Lame's equation – compound cylinders – rotary discs and cylinders, critical speeds – disc of uniform strength.

Module III

Direct and bending stress – short columns – instability of slender columns – Euler's theory – different end conditions – empirical formulae.

Strain energy – axial loads- gradually and suddenly applied impact loads- strain energy and complementary strain energy theorems- Castigliano's theorems. Statically indeterminate systems – Elastic theory of bucking loads-virtual work principles – virtual force and deflections, virtual force equation- trusses and beams.

Text book

S.B.Junarkar, Mechanics of structures Vol I & II,

References

1. Egor P Popov, Engineering Mechanics of solids,PHI
2. Timoshenko, Strength of Materials

Note: University question paper consists of two parts

Part A – 40 Marks (10 compulsory questions of 4 marks each to cover the entire syllabus)

Part B – 60 marks (50% Choice, One out of Two or Two out of Four from each module)

03.305

COMPUTER PROGRAMMING & APPLICATIONS (MN) 3-2-0
5 Credits

Module – I

Introduction to computer- Hardware- CPU, Memory, Input/Output and storage devices – Software – system software-operating systems-Application packages.

Data representation- Algorithms & Flowchart – Programming paradigms – Monolithic programming – Procedural programming – Structured programming – Object oriented

programming – Concept of OOP – Benefits of OOPS – Application of OOPS- Object Oriented Languages.

Module – II

Introduction to C++ - Structure of C++ program – key words- identifiers – C++ declarations – Data type – Operators - declaration of variables-- dynamic initialization of variables- Operators in C++, Scope resolution operator - Predefined classes in C++ - Input and output statements – Streams in C++ - Formatted console input/Output Operations- manipulators - Control structures – Decision making statements – Loop statements- Functions in C++ - Inline functions – Function over loading .

Module –III

Introduction to Classes and Objects . User defined data types – specifying a class – Defining class member - Controlling access to class members- member functions – Static member functions – array of objects- Pointers and Arrays, Constructor and Destructors – Operator overloading and type conversion- Inheritance – Polymorphism and virtual functions –Templates, exception handling. File handling, file pointers and their manipulations, Command line arguments

(Note: 2 periods per week for practical training in computer lab, Exercises in word processing, spread sheet, database and presentation software in addition to exercises in C++ have to be done in the lab. 50% credit of sessional marks (25 marks) to be given to lab work.)

6. Text Book

Ashok M. Kamthane , Object oriented Programming with ANSI & Turbo C++, Pearson Education

References

1. Nagler, Learning C++, A Hands on Approach, Jaico publications
2. Balaguruswamy, Object Oriented Programming with C++,TataMcgraw Hill
3. Nabajyothi barkakati ,Object Oriented Programming in C++ , Prentice Hall
4. Introduction to Computers , S.Jose

The question paper shall contain two parts. PART- A & PART – B

Part – A shall contain 10 compulsory short answer type questions of 4 marks each, covering the entire syllabus (10 x 4 = 40)

Part – B shall contain 2questions from each module. Each question carries 20 marks. Student has to answer three full questions selecting one each from module I , II and III. (3x 20 = 60).

03.306

FLUID MECHANICS AND HYDRAULIC MACHINES 3-1-0 4Credits

Module I

Properties of fluids-pressure, density, specific gravity, specific weight, viscosity, compressibility, vapor pressure - gas laws - Capillarity and surface tension-various types of manometers and pressure gauges-transmission of fluid pressure-continuity equation for one-dimensional steady flow. Bernoulli's equation for steady, one dimensional incompressible flow- venturimeter-orifice meter -pitot tube-notches-weirs.

Flow of incompressible fluids through pipes - Laminar flow through circular tubes and Annuli boundary layer concepts - Boundary layer thickness - Reynolds experiment-Laws of fluid friction in laminar flow-steady laminar flow in circular pipes-Haigen-Poissullie law .Darcy Weisbach equation-Chezy's formula- Friction factor - Moody diagram -transmission of power through pipes- Flow through pipes in series and in parallel - Commercial pipes.

Module II

Dimensional analysis: Dimensions and units, the Buckingham π theorem. Discussions on dimensionless parameters - Models and similitude - Application of dimensionless parameters.

Impact of jets on vanes -flat, curved, stationary and moving vanes-radial flow over vanes-hydraulic turbines-classification - Pelton wheel, Francis turbine and Kaplan turbine-work done and efficiency-draft tube-surge tank-penstock-governing-cavitation-specific speed-similarity and model testing-selection of water turbines for power plants

Module III

Positive displacement pumps-reciprocating pumps-inertia pressure-air vessels and their purpose-separation and cavitation-slip and efficiency-multi-cylinder pumps

Rotary motion of liquids-free, forced, spiral, and vortex flow, rotodynamic pumps:-centrifugal pumps – impeller, casing - manometric heads, work, efficiency and losses-priming-specific speed. Performance characteristics-multistage pumps -selection of pumps-pumping devices-

Hydraulic ram, jet pumps, gear pumps, vane pump, lobe pump, rotary pumps.

References

1. Fluid Mechanics and Machines: R.K.Bansal .

2. Hydraulics and Fluid mechanics: Lewitt
3. Hydraulics and Fluid mechanics: Dr..Jagadish Lal
4. Fluid flow machines: N.S.Govinda Rao
5. Fluid mechanics and machines : Modi and Seth.
6. Fluid Mechanics (IV th Edn.), J. F. Douglas, Pearson education.
7. Introduction to fluid dynamics, Robert W. Fox, John Wiley and sons
8. Theory and applications of fluid mechanics, K. Subrahmanya, (TMH)

The question paper shall contain two parts. PART- A & PART – B

Part – A shall contain 10 compulsory short answer type questions of 4 marks each, covering the entire syllabus (10 x 4 = 40)

Part – B shall contain 2questions from each module. Each question carries 20 marks. Student has to answer three full questions selecting one each from module I , II and III. (3x 20 = 60).

03.307

CIVIL ENGG. DRAWING & ESTIMATION (MN) 0-0-3 3 Credits

Principles of building drawing, preparation of drawing of buildings such as office building (for 20 staff), residential building (RCC and tiled roof, single storied and two storied), factory building with steel trusses for small scale industries.

Estimating

Principles of estimation, quality estimation and cost estimation of buildings such as residential buildings and factory buildings

Scheme of examination

7. References:

1. Dutta, *Estimating and Costing*
2. Balagopal, R.S. Prabhu, Vincent Paul, *Building drawing and detailing*

03.308

CIVIL ENGINEERING LAB (MN) 0-0-2 2 Credits

Study of UTM, Torsion, hardness and Impact testing Machines, surveying equipments-Chain, plain table, Theodolite

Experiments

1. Test on Mild Steel, High carbon Steel and Cast Iron specimens
2. Shear test on MS Rod
3. Torsion test on MS Rod
4. Torsion test using Torsion Pendulum on MS, Aluminium and Brass wire
5. Izod and Charpy Impact tests

6. Hardness test (Rockwell and Brinnel)
7. Spring test (Open and closed)
8. Bending and Compression test on Wood
9. Determination of Moment of Inertia of Rotating Bodies
10. Chain survey
11. Plain table survey
12. Theodolite survey

Syllabus - IV Semester Industrial(2003 Admissions)

03. 401
Engineering Mathematics – III 3-1-0 4 CREDITS
(Common to all branches)

MODULE 1

Partial Differential Equations

8. Formation of P.D.E-Solution by direct integration-solution of Lagrange's linear equations-Nonlinear equations of first order-Types f(p,q)=0,f(z,p,q)=0,f(x,p)=g(y,q)-Homogeneous P.D.E with constant coefficients-solution by the method of separation of variables.

MODULE 2

Application of partial differential Equations

9. Derivation of one dimensional wave equation-solution of the wave equation by the method of separation of variables –Boundary value problems involving wave equation-Derivation of one dimensional heat equation-solution by the method of separation of variables-Problems with zero and nonzero boundary conditions-Solution of Laplace equation in two dimensions(cartesian only)-Problems on finite and infinite strips.
10.

11. MODULE 3

12. Fourier Transforms and Optimization Techniques

13. **Fourier Transforms:**Fourier integral Theorem(no proof)-Fourier sine and cosine integrals-Fourier Transforms-complex form-Sine and cosine Transforms-Inversion Formula-simple problems.
14. **Optimization techniques:**Linear Programming Problems-Formulation-Graphical solution-General L.P.P-Slack and Surplus variables-Basic feasible solution-Solution of L.P.P. using Simplex method-Big-M-method-Duality-Dual Simplex method.

15. References:

16. 1.EngineeringMathematics,Vol.3:V.Sunderam,R.Balasubramanian,K.A.Lakshmin ara-yanan,Vikas Publishing House (P) Ltd.
17. 2.Higher Engineering Mathematics:B.S.Grewal,Khanna Publishers.
18. 3.Advanced Engineering Mathematics:Michael D Greenberg,Pearson Education.
19. 4.Engineering Mathematics,Vol2:S.S.Sastry,Prentice Hall Of India(P)Ltd.
20. 5.Engineering Mathematics:Sarveswara Rao Koneru,Universiries Press.
21. 6.Quantative Techniques:P.C.Tulsian and Vishal Pandey,Pearson Education.

Note:

The question paper consists of two parts.
Part A (40 marks)
Ten compulsory questions of 4 marks each
Part B (60 marks)
Students must answer one out of two questions from each module.
Each question carries 20 marks

03.402

MECHANICS OF MACHINES 3-1-0 4 CREDITS

Module 1

Kinematics: links-parts-chains, mechanism inversion and machine. Quadratic cycle chain. Slider crank chain-inversions and practical applications. Velocity and acceleration diagrams of simple mechanisms.

Power transmission-belt, rope and chain drives-ratio of belt tensions-power transmitted-centrifugal tension-initial tension. V-belts, chain drives, length of belt, design of cone pulley.

Module 2

Friction: laws of friction: pivot and collar friction. Plate clutch friction in turning pairs-friction and friction axis-power loss in friction at the bearing.

Brakes and dynamometers-analysis of brakes of different types-block brakes-internal shoe brakes-band brakes-different band brakes-self energizing and self-locking in braking-heat generation in braking. Dynamometers- transmission and absorption types.

Governors, types of governors-simple watt governor, porter, proell, and hartnell governors - sprig controlled governors - effect, power, isochronisms, hunting, sensitivity and stability.

Module 3

Gyroscope-gyroscopic stability -gyroscopic effect on two wheeled vehicles and automobiles

Gyroscopic stabilization of ships, aeroplanes and rockets.

Balancing: balancing of several masses rotating in a plane-balancing of masses rotating in several planes-balancing of reciprocating and rotating parts-balancing of locomotives

Vibration: kinematics of vibrating motion-vibration systems having single degree of freedom - equilibrium method and Raleigh's method-criterion of whirling speed-torsional vibrations-multirotor systems-torsional vibrations of general systems.

References

1. Theory of machines-P C Ballaney.
2. Theory of machines- Bevan.

The question paper shall contain two parts. PART- A & PART – B

Part – A shall contain 10 compulsory short answer type questions of 4 marks each, covering the entire syllabus (10 x 4 = 40)

Part – B shall contain 2questions from each module. Each question carries 20 marks. Student has to answer three full questions selecting one each from module I , II and III. (3x 20 = 60).

03.403

MANAGEMENT SCIENCE 3-0-0 3 Credits

Module 1

Management Science concept , Management Practice- Conceptual Requirements, Principles of Management ,Nature of Managerial Job ,Guidelines for Managerial Excellence and success. Schools of Management, Management functions – Planning – Organising- Coordinating - Controlling, Universality of Management. Globalisation and Managers – Technology Enhanced Management- Social Responsibility – Managing Innovation -Ethical Dilemmas - Stress Management.

Module2

Planning-Objectives, Nature of objectives, Types of Plans - Strategy and tactics, Implementation of Plans, Resistance to plans, Plannning Standards – Budget – Program – MBO –SWOT -Management by Exception. Organisational Structure and Design-Elements of structure-Authority and Responsibility, Span of control, Unity of command, Work Specialization, Departmentalization ,Centralization and Decentralization-Variables affecting structure, Applications of Organisational Design, Organisational Culture, Organisational Change.

Module 3

Foundations of Individual and Group Behaviour-Personality, Perception, Moivation and Leadership. Human resource management process-HRP, Recruitment and Selection, Orientation, training and Development, Appraising Techniques– Developing Compensation Plans –- Quantitative and Qualitative measures of Control – Feed back Management. Decision making – Styles of Decision Making -Contingency approach, Decision making tools.

References:

1. Stephen P. Robbins and David A. Decenzo, Fundamentals of Management, Pearson Education.
2. Principles and practice of Management –L.M.Prasad ,Sulthan chand
3. Stewart Black and Lyman W. Porter, Management – Meeting New Challenges, Prentice Hall
4. Koontz, Essentials of Management, Tata McGraw Hill
5. Bateman Snell, Management: Competing in the new era, McGraw Hill

The question paper shall contain two parts. PART- A & PART – B

Part – A shall contain 10 compulsory short answer type questions of 4 marks each, covering the entire syllabus (10 x 4 = 40)

Part – B shall contain 2questions from each module. Each question carries 20 marks. Student has to answer three full questions selecting one each from module I , II and III. (3x 20 = 60).

03.404

OPERATIONS MANAGEMENT- I 3-1-0 4CREDITS

22. Module I

Demand forecasting:- basic models, Long and Short-term demand forecasting methods, Regression analysis and smoothing methods, Estimation of trend, cycle, and seasonality components, Analysis of forecast error and computer control of forecasting systems, multi item forecasting, slow-moving item forecasting. Basic inventory models:- assumptions, performance measures, multi-item joint replacement model. Inventory systems under risk:- service levels, safety stock, joint determination of Q and R, time-varying demands. Aggregate inventory management:- Exchange curves, stock out situations, safety stock policies, distribution inventory systems.

23. Module II

24. Design of layout of factories, Office, Storage area etc. on consideration of facilities of working people, Storage facilities and general equipment for amenities of working people – Product, Process and combination layout – Systematic layout planning – Design of Assembly lines, Line balancing methods, Computer applications in layout designs. Routing problems:- algorithms, Dispatching

25. Module III

Aggregate planning:- definition, value of decision rules, aggregate planning strategies, methods. Master production schedule:- bill of material, structuring BOM, disaggregation techniques, managing and maintenance of MPS. Material Requirements Planning:- MRP and MRP II, MRP concepts and advantages, implementation. Capacity planning and

control, controlling continuous production, batch processing technique, Just-in-time, KANBAN system. Job Shop production activity planning:- scheduling, shop loading, sequencing, priority rules for dispatching jobs, mathematical programming and heuristics. Introduction to BusinessProcessReengineering, Enterprise Resource Planning, and software packages.

Text:

1. Production Planning and Inventory Control – Narasimhan et al., PHI
2. Facilities Location and Layout – an analytical approach – R. L. White and J. A. White – PHI

Reference:

1. Production and Operations Management – Buffa – John Wiley & Sons
2. Operations Management: Strategy and Analysis – Krajewski LJ – Pearson Education
3. Production systems – James .L. Riggs – John Wiley & Sons
4. Inventory Management and Production Planning and Scheduling – Silver, Pyke & Peterson – John Willey & Sons

The question paper shall contain two parts. PART- A & PART – B

Part – A shall contain 10 compulsory short answer type questions of 4 marks each, covering the entire syllabus (10 x 4 = 40)

Part – B shall contain 2questions from each module. Each question carries 20 marks. Student has to answer three full questions selecting one each from module I , II and III. (3x 20 = 60).

03. 405
Electrical Technology (MU) 3-0-2 5 CREDITS

Module I

DC Machines – principles of operation-EMF equations-types of excitations-separately excited, shunt and series excited DC generators- general idea of armature reaction – OCC and load characteristics - simple numerical problems. Principles of DC motors – torque and speed equations – torque – speed characteristic – variations of speed, torque and

power with motor current – applications of shunt motor for traction and hoists. Principles of starting, losses and efficiency – testing –load test – simple numerical problems.

Module II

Transformers – principles of operation – EMF equation – vector diagrams – reduction losses and efficiency – OC and Sc tests – equivalent circuit – auto transformers – current voltage transformers – constant voltage transformers – simple numerical problems – Synchronous machines – types – EMF equations – principles of operation of synchronous motor – V curve – methods of starting- methods of improving power factor.

Electric traction – systems of power supply – functional schematic of a.c. electric locomotives – types of motors used in traction systems and methods of speed control – methods of braking.

Module III

3-Phase induction motors – slip ring and squirrel cage – rotating magnetic field – torque slip characteristics, simple circle diagrams, no load and blocked rotor tests, methods of starting, principles of operation and applications of single phase stepper motor, universal motor.
Electric heating – resistance furnaces and ovens- methods of temperature control. Electric arc furnaces and induction furnace. High frequency heating – induction and dielectric heating – applications.

Text books:

1. B.L.Theraja and A.K. Theraja, A Text book of Electrical Technology,
2. Pratab, Art and Utilisation of Electric Energy

References

1. Mehta V.K.,Principles of Electrical Engineering and Electronics
2. Gupta, J.B.,A course in Electric Power

Note : -

1. The question paper shall contain two parts. Part A and Part B. Part A shall contain 10 compulsory short answer type questions of 4 marks each, Covering the entire syllabus. (10 * 4)= 40
2. Part B shall contain 2 questions from each module I, II.. and III . (All questions in part B carry 20 marks). Students have to answer I full questions from each module (3* 20) = 60.
3. There is no university examination for Electrical lab, however 40 percent of the sessional marks should be awarded for the performance in the practical classes as per the syllabus given below:

Electrical Lab

Study of DC Motor, DC Generator, Transformer (single phase), Polyphase induction motor, Synchronous machines.

Experiments

1. OCC of DC self Excited shunt Generator
2. Load Characteristic of shunt generator
3. Load test on Series motor
4. Load Characteristics of compound Generator
5. Load characteristics of single phase transformer
6. Load characteristics of slip ring induction motor
7. Starting and Load test of squirrel cage 3 -phase induction motor
8. Synchronising of alternator by Dark Lamp Method
9. Load test on Alternator by Direct Loading
10. Starting and Load test of single phase induction motor – determination of characteristics.

Electrical Workshop

1. Wiring Practice in PVC conduit system
   i. Two lamps & a plug (independent control)
   ii. Stair case wiring / Tunnel wiring
   iii. Main switch & Energy meter connection (study of Earthing system)
   iv. Fluorecent Lamp & Ceiling Fan connection.

03 406

Thermal Engineering 3-0-0 3 CREDITS

Module I

Steam Engineering – Entropy of steam – temperature-entropy diagram – Mollier chart – Rankine cycle, modified Rankine cycle – binary vapor cycle. High-pressure boilers, steam condensers. Steam nozzles – flow through steam nozzles, effect of friction, super saturated flow. Steam turbines; impulse and reaction turbines, Velocity diagrams, condition for maximum efficiency, Multi-stage turbines, condition lines. Cycles with reheating and regenerating heating – reheat factor, degree of reaction, governing of turbines, End thrust balancing, and leakage prevention.

Introduction to heat transfer: Different Modes of heat transfer, Fourier law, derivation of heat transfer equations for all modes of heat transfer from basic assumptions, heat exchangers and designs.

Module II

Fuels and combustion – stochiometry, calculation of A/F ratio, and equivalence ratios, volumetric and gravimetric analysis, fuel properties.

IC engines: normal combustion and flame front propagation in SI engines – auto ignition-pre ignition and detonation – factors affecting detonation, combustion chambers for SI engines. Knocking in CI engines, combustion chambers for CI engines. Engine tests: heat balance, measurement of BP, IP, FP, A/F ratio and calculation of efficiency.

Module III

Compressors: reciprocating compressors – work done and efficiency, volumetric efficiency- effect of clearance, Rotary compressors- roots blowers, vane type compressor, centrifugal and axial type compressors, work done and efficiency, and performance characteristics.

Gas turbines: open, closed and semi closed cycle – ideal gas turbine cycle. Simple cycle, simple cycle with regeneration, intercooling and reheating – cycle efficiency and work output. Performance of practical gas turbine cycle. Compressor and turbine efficiency – type of turbine combustion chambers.

Reference:

1. P. L. Ballaney Thermal Engineering
2. VanWylen-An Introduction to Classical Thermodynamics
3. Keralin- Steam turbines
4. J.B.Heywood, I.C.Engines Fundamentals
5. Cohen, Rogers and Saravanamittoo, Gas Turbine Theory
6. Ob, I.C. Engines
7. Gill and Smith, I.C. Engines
8. Rajput, Thermal Engineering
9. T.D.Eastop and A McConkay, Applied Thermo Dynamics for Engineering Technology Pearson Education.
10. Fundamentals of engineering Heat and Mass Transfer- R. C. Sachdeva

Note : -

1. The question paper shall contain two parts. Part A and Part B. Part A shall contain 10 compulsory short answer type questions of 4 marks each, Covering the entire syllabus. (10 * 4)= 40
2. Part B shall contain 2 questions form each module I, II.. and III . (All questions in part B carry 20 marks). Students have to answer I full question from each module (3* 20) = 60.
3. Use of Heat and Mass Transfer data book is permitted in University Examination

Fluid Mechanics and Machines Lab 0-0-3 3 CREDITS

Study of pipe fittings (GI and PVC), plumbing tools and materials, pressure gauge, vacuum gauge, manometers, flow measuring equipments-water meters-venturi meter-orifice meter-current meter.

Study of pumps-centrifugal-reciprocating-rotary-jet. Study of Turbines-impact and reaction types. Study of Hydraulic ram, accumulator etc.

Experiments

1. Determination of Coefficient of discharge of Notches, Orifice, Nozzle, Venturi meter.
2. Calibration of Notches, Orifice, Nozzle, Venturi meter.
3. Experiment on pipe friction apparatus
4. Determination of Hydraulic coefficients of circular orifice
5. Determination of Metacentric Height and radius of gyration of floating bodies.
6. Experiment on Bernoulli's apparatus
7. Experiment on Reynolds apparatus
8. Performance evaluation test on pumps
9. Performance evaluation test on turbines
10. Speed ratio test on impulse turbine
11. Determination of best guide vane opening for Francis turbine
12. Determination of best blade angle for Kaplan turbine
13. Performance test on variable speed pump and plotting iso-efficiency curves
14. Test on Hydraulic Ram

.

03 408

Thermal Engg. Lab. 0-0-3 3 CREDITS

1. Study of I.C engines :-
    a) Diesel engines - all systems and parts
    b) Petrol engines - all systems and parts.

2. Experiment on I C Engines
    a) Load test to obtain performance curves based on B.P and B.M.E.P
    b) Valve timing diagram
    c) Economic speed test
    d) Best cooling water Temperature test
    e) Retardation test
    f) Volumetric efficiency and Air-fuel ratio test

3. Determination of flash and fire points of petroleum products
4. Determination of viscosity of lubricating oil using Redwood Viscometer.
5. Determination of calorific value of solid, liquid and gaseous fuels using Bomb calorimeter and Gas Calorimeter
6. Study of pollution testing equipment and flue gas analyser.
7. Study and Performance Analysis of
    a. Reciprocating compressor
    b. Rotary compressor
    c. Blowers
8. Determination of thermal Conductivity of metals, experiments on convection and radiation heat transfer.
9. Performance analysis of parallel flow, Counter flow and cross flow heat exchangers

Syllabus - V Semester Industrial (2003 Admissions)

03.501

ENGINEERING MATHEMATICS – IV 3-1-0 4 Credits

(Common to all branches)

MODULE 1

Complex Analysis-Differentiation

Differentiation of functions of complex variable-Analytic functions-Cauchy-Riemann Equations(cartesian only)-Harmonic function-Orthogonal system-velocity potential

Conformal mapping-Mapping by $w=1/z, w=z^2, w=e^z, w=z+1/z, w=\sin z, w=\cos z$.

Bilenear Transformation-fixed points-Problems to find the transformation when three points and their images are given.

MODULE 2

Complex Analysis-Integration

Line integrals-simple problems-Statements of Cauchy's integral theorem,Cauchy's integral formula-Formula for higher derivatives-Evaluation of integrals using the above results.

Taylor series and Laurent's series(no proof)-simple problems.

Singularities-Residues-Cauchy's Residue theorem(no proof)-problems.

Evaluation of real definite integrals of the following types:

$\int_0^{2\pi} f(\sin\theta,\cos\theta)d\theta$,	$\int_0^{\infty}[f(x)/F(x)]dx$,	$\int_0^{\infty}[\sin mx/f(x)]dx$,	$\int_0^{\infty}[\cos mx/f(x)]dx$

MODULE 3

Probability and statistics

Random variable-continuous and discrete distribution-mean and variance-

Binomial distribution-mean and variance-fitting a Binomial distribution-Problems.

Poisson distribution-Poisson distribution as a limiting case of the Binomial distribution-mean and variance-Problems.

Normal distribution-Properties-Problems

Curve fitting-Fitting of a straight line and a second degree parabola,by the method of least squares.

Testing of Hypothesis-Types of errors-Null hypothesis-level of significance-Confidence limits-Large sample tests-testing of proportion of attributes-confidence limits for unknown mean-test of significance for means of two large samples-Use of Student's t distribution for small sample tests-Significance test of a sample mean-Significance test of difference between sample means.

52. References:

53. 1.Higher Engineering Mathematics:B.S.Grewal,Khanna Publishers

54. 2.Engineering Mathematics,Vol.2:S.S.Sastry,Prentice Hall of India(P)Ltd.

55. 3.Complex Variables Theory And Applications:H.S.Kasana,Prentice Hall of India(P)Ltd

56. 4.Advanced Engineering Mathematics:Michael D Greenberg,Pearson Education

57. 5.Probability and Statistics for engineers ;Miller & Freund ,Pearson Education

Note:

The question paper consists of two parts.

Part A (40 marks)

Ten compulsory questions of 4 marks each

58. Part B (60 marks).Students must answer one out of two questions from each module.Each question carries 20 marks.

03.502

DECISION MODELING – I 3-1-0 4 Credits

Module I

59. Introduction to operations research, applications. Formulation of Linear programming problems, Graphical solutions, Unit worth of a Resource, simplex method, duality concept, concept of sensitivity analysis. Queuing theory – Pure Birth and Pure Death processes, relationship between Poisson and Exponential Distributions. Basic Poisson queues. Limited source, limited queue etc. Priority disciplines – Queuing decision models.

Module II

Formulation of transportation problems. Solution of Transportation problems by Vogel's approximation method and modified distribution method, degeneracy in transportation problem. Transshipment problems with examples from industrial situations. Assignment problems – the Hungarian method. Traveling salesman problems. Game theory – Practical application of game theory – Two-person zero–Sum games – Solving simple games – Mixed strategy – Graphical solution. Basic inventory model:- assumptions, derivation of basic equation, deviations in basic assumptions. Replacement analysis:- gradual deterioration, group replacement, etc.

Module III

60. Network problems:- shortest route problems , algorithms-Minimum spanning tree problem- maximal flow models - algorithms, CPM and PERT networks. Decision theory, Introduction to Dynamic programming:- deterministic and stochastic models - Cargo-Loading model, Work Force Size model, Equipment replacement model, Investment

model, etc. Scheduling on machines- Two-job – Two-machine problem – Johnson's algorithm – graphical solution.

Case studies illustrating above models in Industries, introduction to software packages for decisions.

References:

1. Introduction to Operations Research – Taha – PHI
2. Principles of Operations Research with Applications to Managerial Decisions – H.M.Wagner – PHI
3. Quantitative Methods in Management – N. D. Vohra – TMH

The question paper shall contain two parts. PART- A & PART – B

Part – A shall contain 10 compulsory short answer type questions of 4 marks each, covering the entire syllabus (10 x 4 = 40)

Part – B shall contain 2questions from each module. Each question carries 20 marks. Student has to answer three full questions selecting one each from module I , II and III. (3x 20 = 60).

03.503

WORK SYSTEM DESIGN 3-1-0 4 Credits

Module I

History and applications of Industrial Engineering, contributions of F. W. Taylor, and Gilbreth. Nature and scope of work-study, work-study and productivity. Organization of Work study Department. Method study - process, operation, activity, motion and micro motion, and memo motion analysis. Application of various tools and techniques, preparation of charts and diagrams. Principles of motion economy.

Module II

Work measurement: Establishment and maintenance of true standards by time study, predetermined time standards and standard data: MTM, Work factor systems. Performance rating and allowances, Work sampling. Work incentive plans. Organization and methods. Measurement of clerical and indirect work. Estimation of manpower requirement in a factory or service organization.

Job evaluation and merit rating. Introduction to value engineering.

Module III

Human physiological and psychological capabilities and limitations. Analysis and design of job requirements, work place arrangements, materials handling devices -systems and machine controls for the improvement of human work place. Advances in applied biomechanics and ergonomics. Heat stress: thermal balance of human body, heat tolerance, heat stress management. Factors affecting Oxygen uptake. Fatigue:-Factors affecting degree of fatigue, Anthropometry and workstation design. Work capacity, design of manual handling tasks, NIOSH lift equation.

Introduction to industrial engineering Software packages.

Preparation and presentation of technical reports and proposals.

Case studies in Work study and ergonomics.

References:

1. Motion and Time Study; Design and Measurement of Work – Ralph M. Barnes
2. Introduction to Work Study – ILO
3. Introduction to Ergonomics – Bridger – McGraw Hill
4. Motion and Time Study – Mundel
5. A Guide to Ergomics of Manufacturing – Halender
6. Work Sampling: For Modern Management – Hansen B. L. – Prentice Hall
7. Job Evaluation: A Practical Guide – British Institute of Management
8. Industrial Engineering Handbook – Maynard – McGraw Hill
9. Business Correspondence and Report Writing, Sharma R.C. and K. Mohan, TMH
10. Ergonomics- KFH Murrl

The question paper shall contain two parts. PART- A & PART – B

Part – A shall contain 10 compulsory short answer type questions of 4 marks each, covering the entire syllabus (10 x 4 = 40)

Part – B shall contain 2questions from each module. Each question carries 20 marks. Student has to answer three full questions selecting one each from module I , II and III. (3x 20 = 60).

03.504

METALLURGY AND MATERIAL SCIENCE (MN) 3-1-0 4 Credits

Module I

Classification of engineering materials – selection of materials with reference to properties, service and economic considerations. Thermal properties, Physical and

Mechanical properties Electrical and magnetic properties, dielectric properties of materials, super conductivity. Super plasticity . Bonds in solids, Importance of metallic bonds Crystal structure, Space lattice, unit cell-types, coordination number Atomic packing factor polymorphism and allotropy, Miller indices, Imperfections in crystals, Structure & material property relationships, Deformation of metals, Elastic and Plastic deformation, Slip, Critical shear stress, Dislocation. Frank-Read source, Strain hardening.

Module II

Diffusion, Mechanism of diffusion in crystals, Fick's Laws. Theory of alloys, Phases, Gibb's phase rule, Solid solutions, Hume Rothery's rule. Equilibrium diagrams – Construction and uses; Equilibrium diagram of binary alloys: Eutectic, Eutectoid, peritectic and peritectoid reactions. Iron-Carbon Equilibrium diagram, Isothermal TTT diagrams, Critical cooling rate. Heat treatment processes, Hardenability , Jomini end quench test, Case Hardening, Surface heat treatment , Precipitation hardening, Recovery, Re-crystallisation and Grain Growth. Strengthening mechanisms in metals.

Module III

Testing of materials- Tensile test Compression test, Impact test Fracture of metals, Brittle fracture, Griffith's crack theory Ductile fracture, Factors leading to crack formation, Ductile Brittle transition in steels fatigue-Mechanism- Creep, mechanism of creep-creep residence .Properties. composition and uses of important non-ferrous metals and its alloys, Effect of various alloying elements. Brass, Bronze, Aluminium and its alloys- Ni-Cr high temperature alloys bearing materials, Fusible alloys, properties, composition and use of various types of cast Iron and Steels – Effect of various alloying elements. Composites, Metal matrix composites Smart Materials.

References:

1. Elements of Materials Science –L.W.Van Wlack – Addison Wesley Publication.
2. Material Science Vol-I, II, III, Iv Wulff – Series.
3. Introduction of Engineering materials – By B.K.Agrawal – Tata McGraw Hill
4. Engineering Material Science – C.W.Richards.
5. Material Science and Engineering – R.K Rajput, S.K.Kataria & Sons
6. Engg. Physical Metallurgy – Prof Y.Lakhtin
7. Mechanical Metallurgy - Dieter
8. Manufacturing Engg and Technology Serope Kalpakjain, Pearson Education
9. Advanced Material Science – R.K.Dogra & A K Sharma
10. Introduction to Material Science – William.D.Callister , John Wiley

The question paper shall contain two parts. PART- A & PART – B

Part – A shall contain 10 compulsory short answer type questions of 4 marks each, covering the entire syllabus (10 x 4 = 40)

Part – B shall contain 2questions from each module. Each question carries 20 marks. Student has to answer three full questions selecting one each from module I , II and III. (3x 20 = 60).

03.505

MANUFACTURING PROCESS (MN) 3-1-0 4 Credits

Module I

Foundry – basic requirements of casting processes. Patterns – types, Materials, Allowances. Moulding Sand – Properties, testing, Sand Muller, Sand Slinger, Types of mould – Green Sand Mould, Dry Sand Mould, Sodium Silicate – Carbon Dioxide Moulding, Shell Moulding, Ceramic Mould Casting , Plaster mould casing. Moulding Machines – Plain Squeezing Machine, Jolt Squeezing machines – Cores – Core Sand, Core Types, Core Prints , Core Baking, Principles of gating and Risering – Riser location and Direction Solidification, Blind riser, Chills and Chaplets. Internal external chills, Pressurised and Unpressurised Gating systems – Sodification of Castings – Cleaning and Inspection of castings, casting Defects.

Module II

Welding- classification, Weldability, Metallurgy of welding, structure of weld, HAZ, solid phase welding-forge, butt, flash butt, friction welding, oxyacetylene pressure welding. Arc welding-Arc welding with coated electrodes, TIG, Consumable Metal inert gas welding, submerged arc welding. Resistance welding-electroslag welding, spot welding, projection, seam welding. Thermit welding, ultrasonic welding, electron beam welding-explosive welding. Weld defects and inspection.

Principles of liquid phase and solid phase welding-calculation of arc length and power-simple problems.

Module III

Forming-plastic deformation and yield criteria-relation between tensile and shear yield stress-Rolling-cold hot rolling-Types of rolling mills-Rolling of channels, I and rail sections. Rolling of tubes, wheels and axles. Defects in rolled products. Forging-analysis of forging of strip-problems open and closed die forging, press forging, roll forging, surging, forging hammers, presses. Defects in forging. Extrusion-hot and cold extrusion-wire drawing-Rotary piercing-rotary swaging, cold forming-thread rolling, metal spinning.

References

1. Amitabh Ghosh and Amitkumar Mallik, Manufacturing Science, Affiliated East West press(p) Ltd, NewDelhi, 2002
2. H.F.Taylor, M.C.Flemmings, John Wulff: Foundry Engineering, Wiley Eastern Pvt. Ltd.
3. Campbell: Principles of Manufacturing materials and processes – TMH
4. Paul dE Grarmo , J.T.Black, RA.K Kosher: Materials and process in Manufacturing , PHI

Note: Question paper shall consist of 2 parts

Part A – Compulsory short answer questions of 4 marks each covering the entire syllabus (10x4=40 marks)

61. Part B – 60 Marks (50 % choice, one out of two or from each module)

03.506

MECHATRONICS 2-1-0 3 Credits

Module I

Introduction. Sensors and transducers – classification of thermal, electrical, optical, acoustic, pneumatic, piezo electric, and magnetic sensors. Sensors and transducers for monitoring force, vibration, noise and temperature, acoustic emission. Open loop control systems and closed loop control systems, servo mechanisms. Principles – servomechanism components. Potentiometers – different types. Condition monitoring – principles.

Module II

Position measuring systems for NC machines – linear measuring devices – smart sensors – adaptive control of machine tools. Microprocessor systems programmable logic devices – application of specific IC's – automatic control and real time control systems.

Module III

Neural Networks – fundamentals of ANN – Perceptions – back propagation – automobile Mechatronics – Mechatronics in Robotics. Robot position and proximity sensing – tactile sensing – sensing touches – sensing slip – Man-Machine interface. Introduction to Fuzzy logic and Genetic Algorithms

References:

1. Mechatronics – Electronics in products and Processes – Bradley D A – Chapman and Hall
2. MECHATRONICS – HMT, Bangalore
3. Mechatronics – Denny K Min – Springer
4. Sensors, A Comprehensive Survey – Vol 1-8 – Gopel W etal. – VCH Publishers
5. Mechatronics: Designing Intelligent Machines – Institution of Mechanical Engineers – MEP (UK) 1990
6. Mechatronics: The Integrating of Engineering Design – MEP(UK) 1992
7. Neural Computing, Theory and Practice – Philip D Wasserman – Reinhold, Newyork

The question paper shall contain two parts. PART- A & PART – B

Part – A shall contain 10 compulsory short answer type questions of 4 marks each, covering the entire syllabus (10 x 4 = 40)

Part – B shall contain 2questions from each module. Each question carries 20 marks. Student has to answer three full questions selecting one each from module I , II and III. (3x 20 = 60).

03.507

MACHINE SHOP I(MNU) 0-0-3 3 Credits

General study of Lathe and Accessories, Tools used for different operations. Exercises involving plane turning, Groove cutting, form turning, taper turing, facing and thread cutting.

Study of shaping and slotting machines, and planning machines, exercises involving production of flat surfaces, grooves and key ways.

03.508

WORK SYSTEM DESIGN LAB 0-0-3 3 Credits

Experiments to

1. explain the principles of motion economy
2. determine method improvement
3. determine standard times of different jobs by stop watch time study
4. demonstrate learning effects (learning curve)
5. experience and practice of performance rating
6. determine location for facilities by gravity method, etc.
7. determine physiological work for doing different tasks
8. find Oxygen consumption rate
9. demonstrate micro-motion analysis
10. design of work stations

Syllabus - VI Semester Industrial (2003 Admissions)

03-601
STATISTICAL QUALITY CONTROL 3-1-0 4 Credits

Module I

Basic concepts of probability and probability distributions, standard probability distributions, concepts in sampling and sampling distributions, confidence intervals, statistical tolerance, significance testing Basic concepts in quality control and quality assurance, statistical process control, systematic approach, process variability. Process control and Control Charts for variables and attributes.

Module II

CUSUM and Exponentially Weighted Moving Average (EWMA) Control charts. Process capability analysis, process capability indices, Process Capability analysis using histogram, probability plotting, and control chart. Acceptance sampling plans – single, double, multiple and sequential - for attributes and variables, minimum inspection per lot, formulation of inspection lots and selection of samples. OC curve. MIL-STD 105E sampling method and its equivalents. Dodge-Romig tables and ABC standards, AOQL and LTPD plans.

Module III

Designing for quality - reliability concepts, Life-Cycle curve and probability distributions in reliability modeling, estimation of system reliability for different configurations of elements, Standby and Shared-Load operation, elements of typical reliability programme – FMECA. Product and system reliability measurements, prediction, evaluation, and optimization, fault tree analysis, maintainability. Introduction to Total Quality Management and Total Productive maintenance.

Introduction to Software packages for SQC, reliability and their features.

References:

1. Fundamentals of Quality Control and Improvement _ Amitava Mithra – Pearson Education
2. Statistical Quality Control –Grant - McGraw Hill
3. Introduction to Statistical Quality Control – Montgomery – John Wiley & Sons
4. Quality Control Handbook – Tata McGraw Hill
5. Industrial Engineering Handbook – Maynard
6. Probability and Statistics for Engineers - Johnson Richard. A., Miller & Freund - Pearson Education

7. SPC - Concepts, Methodologies, and Tools – A. Zaidi – PHI

The question paper shall contain two parts. PART- A & PART – B

Part – A shall contain 10 compulsory short answer type questions of 4 marks each, covering the entire syllabus (10 x 4 = 40)

Part – B shall contain 2questions from each module. Each question carries 20 marks. Student has to answer three full questions selecting one each from module I , II and III. (3x 20 = 60).

03.602

MACHINE DESIGN 3-1-0 4 Credits

Module I

Design Principles-Common engineering materials and their properties, stress in machine parts, tension, compression, shear, bending and torsional stresses -Combined stress-Stress concentration-Variable stress, Endurance Limit, Fatigue factor, Theories of failure- Combined steady and variable stress, Goodman, and Soderberg method-Preferred numbers-Fundamentals of creative designs

Shafts:- torsion and bending of shafts, Hollow shafts, design of shafts for strength and stiffness-Effect of key ways-Crankshafts, Propeller shafts.

Module II

Detachable joints-Pins, Keys, Splines, Cotters, Set screws, Threaded fasteners-Power screws, Shaft couplings, Welded joints- types of joints, strength of welds, fillet welds, stress concentration in welded joints-eccentric loading.

Riveted joints:- Types of rivets, strength of rivets, Joints for pressure vessels-Structural joints, eccentric loading.

Design of gears:- nomenclature, Lewis equation, form factor, working stress on gear teeth, dynamic and wear loads on gear teeth and its applications.

Module III

Springs:- classification and uses of springs, spring material- Design of helical, co-axial and leaf spring. Effect of end trusses, stress concentration factor, energy absorbed- deflection-Design for fluctuation loads- vibration in springs- buckling of springs-length of leaf springs.

Lubrication and bearings:- hydrodynamic lubrication principle, minimum oil film thickness, clearance ratio, bearing materials, end leakage factor, problems (using machine design handbook) Rolling contact bearings:- ball and roller bearing, types, static and dynamic load capacity, bearing life. Design of ball and roller bearings, and selection of rolling contact bearings using design data handbook.

Design Data hand books

1. Prof. Narayana Iyengar B. R. & Dr Lingaiah K., *Machine Design Data Handbook,* Vol. I &II
2. P.S.G., Tech., *Machine Design Data Handbook*
3. Design data Book -K. Mahadevan – C.B.S Pub.

Reference :

1. Mechanical Engg Design – Joseph Edward Shighy
2. Machine Design -M.F. Spotts
3. Machine Design -Shaum's Series
4. Machine Design – Abdulla Sherief.

(Note : Use of Design Data hand books allowed for reference during examinations)
The question paper shall contain two parts. PART- A & PART – B

Part – A shall contain 10 compulsory short answer type questions of 4 marks each, covering the entire syllabus (10 x 4 = 40)

Part – B shall contain 2questions from each module. Each question carries 20 marks. Student has to answer three full questions selecting one each from module I , II and III. (3x 20 = 60).

03.603

COMPUTER AIDED DESIGN (MN) 2-1-0 3 Credits

Module –I

Computer Aided Design – Definition , necessity for CAD Design process – Application of computers in Design- Geometric modeling, Engineering analysis, design review and evaluation, Automated drafting. Benefits of CAD.
Hardware in CAD- components, Design workstation, computer graphics terminal, types of display devices, CRT tubes, directed beam refresh, DVST and raster scan displays, LCD and plasma discharge displays. User interaction devices.

Module II

Computer graphics software, functions of CG packages.
Computer graphics. Methods of defining points, lines- arcs - Bresenhams algorithm. 2D Transformations– translation, scaling, rotation, mirroring, concatenation of transformations. 3D transformations. Windowing and Clipping- Cohen Sutherland line clipping algorithm.
3D modeling, types of models- wire frame - surface and solid models

Module III

Introduction to finite element analysis-steps involved in FEM- Preprocessing phase-discretisation-types of elements-selection of interpolation functions- Formulation of stiffness matrix - formulation of load vector- Transformation of coordinates- assembly of global equations-solution procedure, post processing phase. Simple problems with Axial element - beam element, CST element. Solution of 1D and 2D structural and solid mechanics problems-linear static analysis.

Reference:

1. Daryl Logan, A First course in Finite Element Method, Thomson Learning
2. Groover, CAD/CAM Prentice Hall
3. Roger and Adams, Mathematical Elements of CAD Prentice Hall.
4. Hearn and Baker, Computer Graphics, Prentice Hall
5. Sait, CAD/ CAM,
6. Thirupathi Rao and Belagundu, Introduction to Finite Element Analysis

The question paper shall contain two parts. PART- A & PART – B

Part – A shall contain 10 compulsory short answer type questions of 4 marks each, covering the entire syllabus (10 x 4 = 40)

Part – B shall contain 2questions from each module. Each question carries 20 marks. Student has to answer three full questions selecting one each from module I , II and III. (3x 20 = 60).

03.604

MACHINE TOOLS(MN) 3-1-0 4 Credits

Module-I

62. Introduction to Metal cutting, Orthogonal and Oblique cutting, Chip formation, Types of chips, Tool Signature – Tool Geometry – Machinability – Tool Wear and wear measurement – Factors affecting tool life – Analysis of cutting forces in orthogonal cutting - Merchants theory (simple problems), Work done. Economic of Machining – Tools for different materials and cutting speeds. Characteristics of Tool materials, Measurement of cutting forces. Tool dynamo meters, Cutting Fluids. Introduction to Powder Metallurgy process – Compacter and Sintering

Module II

General Purpose Machine Tools – Principle of operation of Late – Types of lathers and size specification, Work holding parts of lathes and their functions – Main operations – attachments – Feeding Mechanisms. Shaper mechanism – Calculation of cutting speed – Shaper operation and tools used, Milling Machine – Types – Principal parts – Types of milling cutters – Elements of plain milling cutters – Up milling, Down milling and face milling operations – Indexing – Simple Indexing – Differential indexing angular Indexing. Grinding Machines – Classification – Operations – Surface, Cylinderical and Centreless grinding, Standard marking systems of grinding wheels. Glazing and Loading in wheels. Dressing and Truing of Grinding wheels. Introduction to Jigs and Fixtures.

Module III

Semi – automatic Machine Tools – Turret and Capstan Lathes. Automatic Machine Tools – Single Spindle and Multi-spindle machines , Swiss Type, transfer machines, unconventional machining process – EDM, ECM, LBM, AJM, EBM and Chemical Machining, High energy rate forming process –Explosive forming , Hydro forming, Electromagnetic forming.

Reference:

1. Manufacturing Engineering & Technology : Kalpakjian – Addison Wesley
2. Materials and Processes in Manufacturing : Poul De Garmo, J.T.Black, R.A.Kosher – Printice Hall of India.Pvt. Ltd. 1997.
3. Tool Engineering & Design : G.R.Nagpal –Khanna Pub.
4. Mechanical Estimating and Costing : T.R.Banga & S.C.Sharma – Khanna Pub.
5. design & Manufacturing : Dr.M.Ramaswamy – S.K.Kataria & Sons.
6. Product Design and Manufacturing : A.K.Chitale & R.C.Gupta – Printice Hall of India Pvt. Ltd.
7. Chernov – Machine Tools, Mir Publishers
8. R.K.Jain – Production Technology, Khanna Publishers
9. R.K.Gupta - Production Technology, Sathya Prakashan
10. Ghosh A and Malic A.K – Manufacturing Science, Affiliated East West Press
11. Mechatronics, HMT, TMH
12. Production Technology , HMT, TMH

The question paper shall contain two parts. PART- A & PART – B

Part – A shall contain 10 compulsory short answer type questions of 4 marks each, covering the entire syllabus (10 x 4 = 40)

Part – B shall contain 2questions from each module. Each question carries 20 marks. Student has to answer three full questions selecting one each from module I , II and III. (3x 20 = 60).

03.605

FINANCIAL MANAGEMENT AND ACCOUNTANCY 3-1-0 4 Credits

Module 1

Basic accounting concepts, financial statements and double entry book-keeping, cost concepts and classification, elements of manufacturing cost, cost ladder, overhead, overhead absorption, methods, concept of variance, Activity based costing.

Introduction to Financial management: Evolution, Scope, Objectives, Functions, and Environment of corporate finance. Indian financial system: financial markets, capital market, all India financial institutions-IFCI, IDBI, ICICI, investment institutions-LIC, UTI-commercial banks.

Module 2

Working capital management: importance, objectives, inventory management, techniques, planning and control of inventory, receivables management, credit policy, cash management.

Capital budgeting: Purpose, principles in estimating costs and benefits of investments, Appraisal criteria-payback period, ARR, NPV, Benefit –Cost ratio, IRR. Risk analysis in capital budgeting. Cost of capital.

Sources of finance: Long term-equity capital-debenture capital-term loans, deferred credit-government subsidies -leasing and hire purchase, Short term financing-accruals-trade credit-short term bank finance public deposit-commercial paper.

Module 3

Capital structure and dividend policies. Financial analysis: ratio analysis- types of ratios-time series analysis-common size analysis-DuPont analysis-funds flow analysis. Break even analysis and leverages.

International financial management: world monetary system, foreign exchange markets and rates, financing foreign operations.

References:

1. Corporate Finance – Berely & Mayers
2. Financial Management Theory and Practice – Prasannachandra – TMH
3. Financial Management – Van Horne – Pearson Education
4. Financial Management – Khan & Jain – TMH
5. Financial Management – S. N. Maheswary – Himalaya
6. Investment Analysis – Preethi Singh – Himalaya

The question paper shall contain two parts. PART- A & PART – B

Part – A shall contain 10 compulsory short answer type questions of 4 marks each, covering the entire syllabus (10 x 4 = 40)

Part – B shall contain 2questions from each module. Each question carries 20 marks. Student has to answer three full questions selecting one each from module I , II and III. (3x 20 = 60).

1.

2. 03.606

- **Elective – I 3-1-0 4 Credits**

The question paper shall contain two parts. PART- A & PART – B

Part – A shall contain 10 compulsory short answer type questions of 4 marks each, covering the entire syllabus (10 x 4 = 40)

Part – B shall contain 2questions from each module. Each question carries 20 marks. Student has to answer three full questions selecting one each from module I , II and III. (3x 20 = 60).

- **03.607**

CAD LAB (MNU) 0-0-3 3 Credits

Introduction to CAD packages. 3D modeling, assembly and surfacing.
Introduction to FEM packages. Linear static analysis of simple systems (one dimensional and two dimensional). Dynamic analysis of simple systems. Simple problems in heat transfer and fluid mechanics.

03.608

MACHINE SHOP II (MNU) 0-0-3 3 Credits

Study of Milling Machines and Milling Cutters
Study of Grinding machines, surface Grinding and Cylindrical grinding machines – study of Drilling machines

Exercise on Milling machines-face milling, end milling – spur and Helical gear cutting – milling of keyways

- Exercise on Grinding and drilling Machines

03.606 Elective I

03.606.1

KNOWELDGE MANAGEMENT 3-1-0 4 Credits

Module 1

Introduction: Knowledge – what, why – Information to knowledge – classification of knowledge – categories, types, components, integration – creating the knowledge edge. Knowledge management – definition, value – drivers – personal focused, process, economic, knowledge management versus existing technologies.

Knowledge Management System Analysis, Design and development: KM architecture and design – knowledge audit and analysis – designing KM team – creating KM system blueprint – developing the KM system.

Module 2

Implementing Knowledge Management: Infrastructural evaluation – analyzing existing infrastructure – enabling technologies for knowledge management - aligning RM and business strategy – knowledge maps to link knowledge to strategy – strategic imperatives for successful KM systems.

Module 3

Deployment and Evaluation: Pilot testing, deployment using the Results Driven Icrementalism (RDI) methodology – the CKO, reward structures, technology and change management – metrics of knowledge work.

Case studies : Aerospace industry, sales and marketing, customer support – KM assessment kit – alternative schemes for structuring KM systems front end – software tools.

TEXT BOOKS

1. "Knowledge Management Toolkit, The Practical Techniques for Building a Knowledge Management System", Amrit Tiwana, Prentice Hall, BK & Cd Rom edition.
2. "Best Practices in knowledge Management & Organizational Learning Handbook", Louis Carter, Phil Harkin, Amy Timmins, Hubert St. Onge., Linkage Press.

The question paper shall contain two parts. PART- A & PART – B

Part – A shall contain 10 compulsory short answer type questions of 4 marks each, covering the entire syllabus (10 x 4 = 40)

Part – B shall contain 2questions from each module. Each question carries 20 marks. Student has to answer three full questions selecting one each from module I , II and III. (3x 20 = 60).

03.606.2
INNOVATION AND VALUE ENGINEERING 3-1-0 4 Credits

Module 1

Innovation as a built-in feature in nature, need and challenges for survival and excellence, biological, physiological, psychological and social motives, entrepreneurial and business aspects-agricultural industrial and information revolution, innovation in diverse fields of arts and science, major landmarks, contributors in scientific, industrial and social (leadership) spheres.

Innovations in products, processes, services and procedures, product life cycles, favorable and unfavorable aspects in innovation; human attitudes, risks ,hardships, examples of failure, case studies of inventors, inventions as intellectual property, patents and patent laws, procedures in India and developed countries, study of patents in different fields and their innovative content, motivating and encouraging innovative attitude in individuals and organizations, entrepreneurial qualities and skills, learning and training.

Module 2

Introduction: History, development and scope of value management, value analysis Vs Value engineering, principles of costing &cost estimation, benefits.

Basic concepts of value engineering: Selection of project, team members, general phase, information phase, creation phase, evaluation phase, investigation and implementation phase, audit.

Module 3

Project work: work sheets, objectives, techniques, guidelines, Checklist, cost worth model, role of creativity.

Value engineering cases: Value Engineering raises production and productivity, Value Engineering is intensive cost search, Value Engineering prevents unnecessary uses of resources.

Methodology, Industrial cases - Product manufacturing, Chemical processing, Automated Production, Semi –Automated production.

References:

1. Value Engineering, S.S. Iyer, New Age International (P) Ltd, New Delhi.
2. Materials Management, Inventory Control and Logistics, A. K. Datta, Jaico Publishing House, Mumbai.
3. Techniques of Value Analysis and Value Engineering, Miles . L. D, McGraw hill.
4. The fourth Eye-Excellance through creativity, Khandwala.P.N, Wheeler Publishing Co.

The question paper shall contain two parts. PART- A & PART – B

Part – A shall contain 10 compulsory short answer type questions of 4 marks each, covering the entire syllabus (10 x 4 = 40)

Part – B shall contain 2questions from each module. Each question carries 20 marks. Student has to answer three full questions selecting one each from module I , II and III. (3x 20 = 60).

03.606.3 HUMAN RESOURCE PLANNING AND DEVELOPMENT 3-1-0 4 Credits

Module 1

Human Resourse Management - role and scope of Human Resourse Management in industries - Functions of Human Resourse Management.

Methods and implementing practices in Human Resourse Management . Role and use of Motivation in Human Resource Management.

Manpower planning, elements of manpower management control

Manpower recruitment, selection and placement -Induction process, Training and development of personnel in present day organizations. Training programmes for executives.

Module2

Performance appraisal - job performance and performance measurement, methods of appraisal, BARS procedure. Improving effectiveness of Appraisal systems, Use of results in practice.

Promotions, transfer and retirement planning in Industries, role of incentives (monetary and non-monetary) in manpower movements and adjustments. Job evaluation - Job descriptions and job analysis process. Job analysis and its techniques. Merit rating plans - types, uses and applications.

Module 3

Industrial Relations - role of trade unions in Indian industries. Industrial disputes - causes, effects and elimination . Collective bargaining.

Industrial legislations in India relating to safety, health, work practices and labour compensation.

63. Modern concepts - Personnel Information systems, Manpower research, systems approach to Manpower Management.

References :

1. Personnel management - Scott, TMH, New Delhi.
2. Manpower Management - Dwivwdi, Prentice Hall, New Delhi
3. Personnel management - Monappa and Saiyaddin, TMH, New Delhi
4. Practical Guide to performance appraisal - R. Henderson
5. Productivity wages and relations - Suri G.K , East West Press
6. Personnel Management and Industrial relations - Surinder Kumar, Satya Prakashan Publishers, New Delhi.

The question paper shall contain two parts. PART- A & PART – B

Part – A shall contain 10 compulsory short answer type questions of 4 marks each, covering the entire syllabus (10 x 4 = 40)

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03.606.4
HUMAN FACTORS IN ENGINEERING 3-1-0 4 Credits

Module 1

Concepts of human factors engineering and ergonomics-Man-Machine system and Design Philosophy-Physical work-Heat stress-manual lifting-work posture-repetitive motion.

Physical dimensions of the human body as a working machine-Motion size relationships-Static and dynamic anthropometry-Anthropometric acids-Design principles-Using anthropometric measures for industrial design-Procedure for anthropometric design

MODULE 2

Displays and Controls- shapes and sizes of various controls and displays-multiple display and control situations-design of major controls in automobiles, machine tools etc.- Work place- Seating-design of office furniture-redesign of instruments- Work process-Duration of rest periods-Hand tool design-Design of visual displays-Design for shift work

Ergonomics and product design-ergonomics in automated systems-expert systems for ergonomic design. Anthropometric data and its application in ergonomic design-limitations of anthropometric data-use of computerized database.

Color and light-colour and the eye-colour consistency-colour terms- reactions to colour and colour continuation-colour on engineering equipments

MODULE 3

Temperature-Humidity-Noise-Illumination and contrast-Use of Photometers-Recommended illumination levels-The ageing eye-Use of indirect (Reflected) lighting - Cost efficiency of illumination-Special purpose lighting for illumination and quality control-Measurement of sound-Noise exposure and hearing loss-Hearing protectors-analysis and reduction of noise-Effects of noise performance-annoyance of noise and interface with communication-Sources of vibration discomfort it.

Provision of energy for muscular work-Role of oxygen physical exertion-Measurement of energy expenditure-Respiration-Pulse rate and blood pressure during physical work-Physical work capacity and its evaluation.

References:

1. " Human factors in engineering design ",. E.J.McCORMIC, McGraw Hill 1976.
2. " Physiology of muscular activity ", . P.V.KARPOVICH,W.E.SINNING, W.E.Saunders Co.1971.
3. " Applied Ergonomics HandBook ", I.P.C. Science and Technology Press.1978
4. " A guide to the Ergonomics of manufacturing ", Martin Helander, East West Press,1996.
5. Ergonomics-Kroemer et al.-Pearson Education

The question paper shall contain two parts. PART- A & PART – B

Part – A shall contain 10 compulsory short answer type questions of 4 marks each, covering the entire syllabus (10 x 4 = 40)

Part – B shall contain 2questions from each module. Each question carries 20 marks. Student has to answer three full questions selecting one each from module I , II and III. (3x 20 = 60).

03.606.5

MARKETING MANAGEMENT 3-1-0 4 Credits

Module 1

Marketing conceptual framework - Marketing environment -customer oriented organization- Marketing interface with other functional areas-marketing in a globalised environment

Product Planning and Development - Product Life Cycle- Brand management, Developing New Product - Market segmentation-targeting and positioning. Pricing decisions. Promotion methods: Advertising, personal selling, Public relations- Introduction to industrial marketing.

Module 2

Understanding Buyer Behavior - Influencing factors -responding buyer behavior - Building customer satisfaction-marketing to organizations and marketing of services.

Marketing Research: Types, Process - Tools and Techniques-application of Marketing research- Product launching, demand estimation, advertising, brand preference, customer

satisfaction, customer perception, distribution, Customer Relationship, Competitor analysis and related Aspects- preparation of marketing research report.

Module 3

Distribution: distribution Channels – Physical Distribution – channel design and Management - Logistics – Communicating with customers.

Introduction to International Marketing Management: Overview, International economic institutions, foreign markets, export pricing and finance, India's trade policy.

Web enabled Marketing features - structural requirements – specific characteristics and components of marketing mix under web enabled environment.

On-line marketing – On-line retail – On-line sales promotion – Web enabled advertisements. - Web based Marketing research - Emerging new trends and challenges to marketers. .

References:

1. Marketing Management (Millennium edition) , Philip Kotler, PHI (P) Ltd.
2. Marketing, Zikmund d'Amico, South Western, Thomson Learning
3. Essentials of Marketing Research, Aakar, Day and Kumar, John Wiley & Sons.
4. Marketing Management and Information Technology, Keith Flether, Prentice Hall
5. Marketing Management Indian Perspective, R.L.Varshney, S.L.Gupta, Sultan Chand
6. Internet Marketing, Rafia. Mohammed, McGraw Hill,2001.
7. Building an Intelligent E-Business, David Ferris and Larry Whipple, PHI

The question paper shall contain two parts. PART- A & PART – B

Part – A shall contain 10 compulsory short answer type questions of 4 marks each, covering the entire syllabus (10 x 4 = 40)

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03.606.6
FACILITIES PLANNING AND MANAGEMENT 3-1-0 4 Credits

Module I

64. Plant layout: factors affecting choice of location, steps in plant location-planning, methods of choosing between alternative locations, types of layout.

65. Facility layout problem: design problem; reasons; goals; restrictions; methods; Systematic layout planning-data gathering, flow and activity analysis. Activity relationship analysis, relationship diagrams, graph theory based approach; space requirements; space determination, deterministic approach; designing the layout, layout alternatives, flexible layouts, evaluation and implementation of layout.

66. Computer applications in layout designs.

67. Module II

Location of multiple facilities, expansion of facilities, strategic considerations and current trends. Group technology – Production Flow analysis (PFA), ROC (Rank Order Clustering) – Line balancing.

68. Environmental aspects like lighting, Ventilation, dust control, humidity. Different types of Plant services like steam compressed air etc., capacity estimation, cost control . Plant safety, Elements off Industrial safety- Causes and prevention of accidents. Pollution and environmental consideration.

Module III

69. Material handling system and equipment – Material handling in Plants , Stores and warehouses , Receiving and dispatching area – Choice of material handling equipment – Cost control in material handling.

70. Automatic Guided Vehicles- Basic concept, Design and operational control of an AGV system- transportation control, operational control, Combinations

71. Equipment replacement – Repair, replacement based on technical and economical consideration. Use of DCF techniques.

72. Reference:

1. Plant layout and Material Handling- John A Sehbin
2. P L M H - James A Apple
3. P L M H - A W Peymberton
4. Material Handling and Layout – S. C. Sharma
5. Facilities Location and Layout – an analytical approach – R. L. White and J. A. White – PHI
6. Intelligent Manufacturing Systems-Kuiak-Prentice Hall

The question paper shall contain two parts. PART- A & PART – B

Part – A shall contain 10 compulsory short answer type questions of 4 marks each, covering the entire syllabus (10 x 4 = 40)

Part – B shall contain 2questions from each module. Each question carries 20 marks. Student has to answer three full questions selecting one each from module I , II and III. (3x 20 = 60).

Syllabus - VII Semester Industrial (2003 Admissions)

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- **03.701**

SYSTEM MODELING AND SIMULATION 3-1-0 4 Credits

Module I

Systems theory, measures of effectiveness, System modeling, system analysis, system approach to problem solving, applications in industrial and business systems. Areas of application of simulation, steps in simulation study, classification of systems, models of systems-different types, system analysis and system postulation. System simulation:- Monte Carlo method, numerical computation technique for continuous and discrete systems, Distributed Lag models, Cobweb models,. Comparison of simulation and numerical methods. Continuous system models, feedback systems, Real-time simulation. Use of Monte Carlo method to find area under curves, value of π, pure pursuit problem, trajectory simulation, etc.

Module II

Discrete and continuous probability functions, uniformly distributed random numbers, properties of random numbers, generation of Pseudo-Random numbers, random number generators, tests for random numbers:- frequency, gap, run, and Poker tests, tests for autocorrelation. Generation of random deviates for Exponential, Uniform, Weibull, Triangular, and discrete distributions; Inverse Transformation method. Direct transformation method for the Normal and Lognormal distributions. Acceptance-rejection technique:- Poisson and Gamma distributions. Input modeling:- data collection, identifying the distribution with the collected data, goodness of fit tests, selecting input models without data.

Module III

Discrete event simulation techniques:- Next-Event approach/Event scheduling, Fixed Time Increment method, manual simulation using Event Scheduling and Fixed Time Advance methods. Simulation of Queuing models, Production systems, Material handling systems, etc. Verification and Validation of simulation models. Design of simulation experiments, variance reduction techniques, statistical analysis of outputs, and optimization of parameters. Computer simulation languages, packages, and their application.

Simulation of continuous and discrete systems using simulation software packages (practical sessions).

References:

1. System Simulation – Geoffrey Gordon – PHI
2. System Simulation with Digital Computer – Narsingh Deo – PHI
3. Discrete Event System Simulation – J. Banks – Pearson Education
4. Concepts and Methods in Discrete Event Digital; Simulation – Fishman – John Willey & Sons

The question paper shall contain two parts. PART- A & PART – B

Part – A shall contain 10 compulsory short answer type questions of 4 marks each, covering the entire syllabus (10 x 4 = 40)

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03.702

DESIGN FOR MANUFACTURING 3-0-0 3 Credits

Module 1

Introduction to design for manufacture, DFM principles and rules, Systematic approach to Design engineering systems, Collection of information, Role of Engineering design in production, Flow diagrams for design procedures.

Effect of materials and manufacturing processes on design: Major phases of design. Effect of material properties on design. Effect of manufacturing processes on design. The material selection process – cost per unit property, weighted properties, and limits on properties methods.

Module 2

Tolerance analysis: Process capability, mean, variance, skewness, kurtosis, process capability metrics, Cp, Cpk, cost aspects, feature tolerances, geometric tolerances, surface finish, review of relationship between attainable tolerance grades and different machining process. Cumulative effect of tolerances – sure fit law, normal law and truncated normal law.

Selective assembly: Interchangeable part manufacture and selective assembly, deciding the number of groups – Model – I: Group tolerances of mating parts equal; Model-II: total and group tolerances of shaft equal. Control of axial play – Introducing secondary machining operations, laminated shims, examples.

Datum systems: Degrees of freedom, grouped datum systems – different types, two and three mutually perpendicular grouped datum planes; Grouped datum system with spigot and recess, pin and hole; Grouped datum system with spigot and recess pair and tongue – slot pair – computation of translation and rotational accuracy, geometric analysis and applications.

Module 3

True position theory: Comparison between co-ordinate and convention method of feature location, tolerancing and true position tolerancing, virtual size concept, floating and fixed fasteners, projected tolerance zone, assembly with gasket, zero true position tolerance, functional gauges, paper layout gauging, compound assembly, examples.

Form design of castings and weldments: Redesign of castings based on parting line considerations, minimizing core requirements, redesigning cast members using weldments, use of welding symbols.

Tolerance charting technique: Operation sequence for typical shaft type of components. Preparation of process drawings for different operations, tolerance worksheets and centrally analysis, examples, design features to facilitate machining: datum features – functional and manufacturing. Component design – machining considerations, redesign for manufacture, examples.

References:

1. "Designing for Manufacture", Harry Peck, Pitman Publications.
2. "Engineering Design – A systematic Approach", Matousek, Blackie & Son Ltd.
3. "Dimensioning and Tolerance for Quantity Production", Spotts M.F., Prentice Hall Inc. "Tolerance Control in Design and Manufacturing" Oliver R Wade, Industrial Press Inc.
4. "Hand Book of Product Design for Manufacturing", James G Bralla, McGraw Hill Publicatons.
5. "Design for Economic Production", Trucks H.E., Society of Manufacturing Engineers, Michigan, 2nd Edition, 1987.
6. "Materials Selection for Engineering Design", Farag M., Prentice Hall,1 997.
7. Design for Manufacture - Dieter
8. Introduction to Design - Asimow. M
9. Design Methods - Jones J. C
10. Product design for efficient manufacture workshop - Stoll H.W

The question paper shall contain two parts. PART- A & PART – B

Part – A shall contain 10 compulsory short answer type questions of 4 marks each, covering the entire syllabus (10 x 4 = 40)

Part – B shall contain 2questions from each module. Each question carries 20 marks. Student has to answer three full questions selecting one each from module I , II and III. (3x 20 = 60).

HUMAN ASPECTS OF MANAGEMENT 3-1-0 4 Credits

Module1:

Dimensions of Human Behaviour, Self development, Perception, Motivation and Personality-concepts, theories and applications .Modes of values, beliefs, attitudes and intelligents in determining human behaviour. Group dynamics-nature of groups and group decision making. Leadership –nature and significance ,theories and styles.Conflict management ,Transactional Analysis ,Case studies.

Module 2:

Organizational development, Concepts of QWL-strategies for improved QWL, Organizational change, Resistance to change, Goals of organizational change and organizational development, Concept of organizational climate-health and effectiveness. Organizational culture- nature and characteristics, types, impact of culture in organizational behaviour, Motivation of person across cultures, Managerial leadership across cultures, Case studies.

Module 3:

Human Resource Management –Concepts and objectives. Man power planning, Recruitment and selection, Training and development. Performance appraisal, Wage and salary administration, Grievance handling, Compensation policies, Safety and health maintenance, Labour legislation, Case studies.

References:

1. 1.Organisational Behaviour concepts and applications – Jerry l. Gray, Frederick A. Stark
2. Organizational Behaviour –Fred Luthans (McGraw Hill)
3. Organizational Behaviour – Stephen P.Robbins (PHI)
4. Organizational Behaviour-Text and Cases – Uma Sekharan (TMH)
5. 5.Human Resource Management – Gary Dessler (PHI)
6. 6.Personnel Management – Scott (TMH)

The question paper shall contain two parts. PART- A & PART – B

Part – A shall contain 10 compulsory short answer type questions of 4 marks each, covering the entire syllabus (10 x 4 = 40)

Part – B shall contain 2questions from each module. Each question carries 20 marks. Student has to answer three full questions selecting one each from module I , II and III. (3x 20 = 60).

03.704

METROLOGY & INSTRUMENTATION (MN) 3-1-0 4 Credits

Module-I

General Principles of Measurement: Introduction Concept of Precision, accuracy, sensitivity, calibration. Basic standards of length- Line standard and End standards – slip gauges, Angular measurements using bevel protractors, spirit levels, clino-meters, sine bar, Angle gauges, optical dividing head.

Limits and Fits:- Systems of limits and fits. Interchangeability & selective assembling Tolerance- Allowance- Deviation as per BIS (simple problems).

Taylor's principles- Limit gauges design. Considerations- gauges materials- Gauges tolerance and wear allowance.
Classification of Limit gauge- plug, ring, taper, Bore, Gap, Snap gauges, position gauges etc – merits and demerits.

Module II

Comparator:- Mechanical, Optical, Pneumatic, Electrical and Electronic comparators.
Optical Measuring Instruments:- Principle of Interferometry – Optical flat – Interferometers – angle detector Autocollimators, Tool makers- Microscope. Co-ordinate measuring machine.

Concepts of machine Vision system – CCD, CID cameras.

73.

74. Surface Finish- Surface Texture – Evaluation of surface roughness- Simple problems.

Surface roughness measuring instruments – Different types.
Measurement of major elements of Screw threads and Gears.

Module III

Transducers:- Classification- Pressure, Temperature, Torque, Force, Vibration, humidity, Sound measuring Transducers (Working, Principle and Application of above transducers) and Dynamometers.

Stress- Strain Measurement: Types of strain gauges- Strain measurements by using resistance strain gauges and Mechanical strain gauges-types, application.

75. Basic concept in static and dynamic measurements: Analysis of Experimental errors Gaussian and normal error Distribution- methods of Least Squares- Simple problems.

Reference :

1. Measurement system (Application and Design) – Ernest O Doebelin.
2. Mechanical and Industrial measurements- R. K. Jain
3. Engineering metrology – R. K. Jain
4. Engineering precision metrology – R. C. Gupta
5. A text book of engineering of metrology- I. C. Gupta.
6. Hand book of Industrial Metrology – ASME

The question paper shall contain two parts. PART- A & PART – B

Part – A shall contain 10 compulsory short answer type questions of 4 marks each, covering the entire syllabus (10 x 4 = 40)

Part – B shall contain 2questions from each module. Each question carries 20 marks. Student has to answer three full questions selecting one each from module I , II and III. (3x 20 = 60).

03.705

Elective II 3-1-0 4 Credits

The question paper shall contain two parts. PART- A & PART – B

Part – A shall contain 10 compulsory short answer type questions of 4 marks each, covering the entire syllabus (10 x 4 = 40)

Part – B shall contain 2questions from each module. Each question carries 20 marks. Student has to answer three full questions selecting one each from module I , II and III. (3x 20 = 60).

- **03.706**

Elective III 3-1-0 4 Credits

The question paper shall contain two parts. PART- A & PART – B

Part – A shall contain 10 compulsory short answer type questions of 4 marks each, covering the entire syllabus (10 x 4 = 40)

Part – B shall contain 2questions from each module. Each question carries 20 marks. Student has to answer three full questions selecting one each from module I , II and III. (3x 20 = 60).

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3. 03 707

SOFTWARE LAB0-0-2 2 Credits

1. Use of OR packages for solving LPP, Transportation, Assignment, and Traveling salesman problems.
2. Use of statistical packages for design of experiments, correlation testing, curve fitting, etc.
3. Use of simulation packages for building system models for Continuous and discrete event simulations.
4. Mini Project

03 708

QUALITY CONTROL LAB 0-0-2 2 Credits

1: Experiments to prove central limit theorem.
2: Drawing X and R charts from actual measurements.
3: Drawing P chart and C chart from actual measurements.
4: Experiments and calculations in Acceptance control.
5: Finished products inspection and certification procedure.
6: Experiments in performance testing and life testing.
7: Demonstrating and utilizing NDT equipment.

4. 03.709

PROJECT & SEMINAR 0-0-2 2 Credits

25% credit for Project, which is the preliminary work of final project, and 75% credit for Seminar reports for both seminar and project to be submitted at the end of semester.

03.705 Elective II

03.705.1

MANAGEMENT INFORMATION SYSTEMS 3-1-0 4 Credits

MODULE I

Introduction to Information Systems - Challenges of Information Systems - Contemporary approach to Information systems - Computer based Information Systems - Types and examples of Information systems. OAS, TPS, MIS,DSS and ESS. Information technology Infrastructure- Hardware, Software, Database, the data Communication network- Modems, Types of Communication Channels, Channel configurations, Channel sharing devices, Types of networks. - People and Procedures. System concept; Organisation as a system; The strategic role of information in Organisational Management; Technical foundations of information systems

MODULE II

System Dervelopment – system development life cycle – structured methodologies – prototyping – CASE methodology.

System analysis, Need for System analysis, Role of System Analyst in Data processing and User departments. Project selection, Feasibility study. Cost-benefit analysis- System Investigation, Fact finding, Identifying areas for system study, inspection of Documents, Interviewing staff, Tools for determining System requirement, Activities in requirement determination, Identify Data and Information Produced, Development of System Profiles, tools for Documenting procedures and Decisions. Structured analysis, Data flow diagram, Data dictionary, Data structure diagram, structure chart. Physical and logical Dataflow Diagram, System analysis completion reports.

MODULE III

System Design, Structured system design, Input design and control, Output system design, File and data base design, System Development, System control, Documentation, Coding techniques- Detection of errors – verification and validating- System Implementation and control - testing –Software quality assurance-software metrics- Security.

Application of Information Systems, Accounting Information systems and Financial Information System, Marketing Information System, Banking Information Systems.

REFERENCES

1. Management Information Systems – Managing the digital firm, Kenneth C. Laudon and Jane P. Laudon, Pearson education, 2002.
2. Management Information Systems : Conceptual Foundations, structure and Development, Gordon B Davis, McGraw Hill
3. Computers and Information Systems – Robert .A.S, Prentice-Hall
4. Information Systems theory And Practice- Burch John.G Jr and Others, John wiley &Sons
5. Management Information Systems-James A O'Briean, Tata Mc Graw Hill
6. Information Systems – A Management Perspective – Steven Alter, Addison Wesley, 1999.
7. Information Systems for Modern management, Murdick and Ross

The question paper shall contain two parts. PART- A & PART – B

Part – A shall contain 10 compulsory short answer type questions of 4 marks each, covering the entire syllabus (10 x 4 = 40)

Part – B shall contain 2questions from each module. Each question carries 20 marks. Student has to answer three full questions selecting one each from module I , II and III. (3x 20 = 60).

03.705.2

DECISION SUPPORT SYSTEM 3-1-0 4 Credits

Module 1

Decision Support System:Decision Concept - Steps-Decision Support System-Components-Characteristics-Classification and Applications.Data Management System:Data Base-Sources of data-Data Directory-Data Structure and Data Base Languages-Query Facility- Data Management System-DBMS as DSS Development Tool.

Module 2

Model Management: Models - Modeling Process-Types of Models-Optimization-Simulation-Heuristic-Descriptive-Predictive-Model Base-Modeling Languages-Model Directory-Model Base Management System-Model Execution, Integration and Command Processing-Model Packages.

Module 3

Dialog Management: User Interface-Graphics - Multimedia-Visual Interactive Modeling-

Natural Language Processing-Speech Recognition and Understanding-Issues in User Interface. Development of Decision Support System: Development Process-Software and Hardware and Data Acquisition-Model Acquisition-Dialog Development-Integration - Testing and Validation-Training and Implementation.

References:

1. Decision Support Systems and Intelligent Systems, Efraim Turban and Jay E. Aronson, Prentice Hall International, 1998.
2. Decision Support Systems; Janakiraman V.S. and Sarukesi.K,Prentice Hall of India,1999.
3. Decision Support System and Management, Lotfi, McGraw Hill Inc., International Edition, New Delhi, 1996.
4. Decision Support System, Marakas, Pearson Education

The question paper shall contain two parts. PART- A & PART – B

Part – A shall contain 10 compulsory short answer type questions of 4 marks each, covering the entire syllabus (10 x 4 = 40)

Part – B shall contain 2questions from each module. Each question carries 20 marks. Student has to answer three full questions selecting one each from module I , II and III. (3x 20 = 60).

03.705.3
ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS

3-1-0 4 Credits

Module 1

Human and machine intelligence : Concepts of fifth generation computing, programming in A1 environment, developing artificial intelligence system, definition of expert systems, natural language processing, neural networks.

Tools for machine thinking: Forward chaining, backward chaining, use of probability and fuzzy logic.

Expert system development: Choice of domain, collection of knowledge base, selection of inference mechanism, case studies of expert system development in design and manufacturing.

Module 2

Advanced programming techniques: Fundamentals of object oriented programming, creating structure and object, object operation, invoking procedures, programming applications, object oriented expert system.

Languages used in AI: Using PROLOG to design expert systems, converting rules to PROLOG, Conceptual example, introduction to LISP, function evaluation, lists, predicates, rule creation.

Module 3

Advanced knowledge representation for smart systems : Semantic nets structure and objects, ruled systems for semantic nets, certainly factors, automated learning.

Expert system development: Choice of domain, collection of knowledge base, selection of inference mechanism, case studies of expert system development in design and manufacturing.

Industrial application of AI and expert systems: Robotic vision systems, image processing techniques, application to object recognition and inspection, automatic speech recognition.

References:

1. "Comprehensive Guide to AI and Expert Systems", Robert Levine et al, Mc Graw Hill Inc..
2. "Understanding AI", Henry C. Mishkoff, BPB Publication, New Delhi, 1986.

The question paper shall contain two parts. PART- A & PART – B

Part – A shall contain 10 compulsory short answer type questions of 4 marks each, covering the entire syllabus (10 x 4 = 40)

Part – B shall contain 2questions from each module. Each question carries 20 marks. Student has to answer three full questions selecting one each from module I , II and III. (3x 20 = 60).

03.705.4

SOFTWARE ENGINEERING AND MANAGEMENT

3-1-0 4 Credits

Module I

Emergence of Software Engineering, aims of Software Engineering, Software Engineering approach, programs Vs. products. Software crisis. Software process:- characteristics, software development process, Project management process, software classification management process, process management process. Software development lifecycles:- Classical Waterfall model, Iterative Waterfall model, Prototyping model, Evolutionary model, Spiral model. Comparison of different life cycle models.

Module II

Program logic modeling by structured language, decision tables, flow charting, etc. Function oriented software design;- structured analysis, structured design, data flow diagrams (DFD), transformation of DFD model into structure charts. Object Oriented Software design- UML notations, system sequence diagrams, and collaboration diagrams. Requirement analysis and specification- SRS preparation

Module III

Software cost estimation:- software productivity, estimation techniques, factors effecting programming productivity, project duration and staffing. Project size estimation metrics, Line of Code (LOC), Function Point (FP). Project estimation techniques- empirical estimation techniques, Putnam's model, basic COCOMO model, Halstead's Software Science. Software testing:- unit testing, Black-box testing, White-Box testing, Mc Cabe's cyclomatic complexity metric, Computer Aided Software Engineering (CASE).

Software quality assurance and standards, quality policy, quality controls Risk management.

References:

1. Software Engineering – a Practitioner's approach – Pressman – McGraw Hill
2. An Integrated Approach to Software Engineering – Pankaj Jalote – Narosa Publishers
3. Fundamentals of Software Engineering - Rajib Mall – PHI
4. Software Engineering - Somerville I. - Pearson Education
5. Software Engineering – Gregory W. Jones – John Wiley & Sons

The question paper shall contain two parts. PART- A & PART – B

Part – A shall contain 10 compulsory short answer type questions of 4 marks each, covering the entire syllabus (10 x 4 = 40)

Part – B shall contain 2questions from each module. Each question carries 20 marks. Student has to answer three full questions selecting one each from module I , II and III. (3x 20 = 60).

03.705.5
E-COMMERCE – TECHNOLOGY AND MANAGEMENT

3-1-0 4 Credits

Module 1

E-commerce Technology: Principles – Potential – Data Warehousing – Temporal Coherency – Networking Infrastructure – Software Tools – IP, TCP HTTP, HTML – Cryptography – Consumer Interface Technologies – OALP & Data mining – Case studies.

E-commerce: Effect on job, growth, trade, international co-operation – Tax problems - Application of E-commerce in different sectors – service, industry, domestic etc., - multidisciplinary approach to E-commerce – Soft wares – case studies.

Module 2

E-commerce Management: Net Centrism – Navigation – Digital Design – Web Metrics – Business models – Hyper Markets – Intelligent Agents – Auctions – Design, Protocol – Case Studies.

Channel conflict management: Security and Encryption – Abuse and Netiguette – Internet Governance – Economics of E Commerce – Equilibrium price – Electronic Marketing – Taxing – E business – Road map for success – case studies.

Module 3

E-commerce – Legal Issues: Software Intellectual property law – Contract law for E-commerce, Warranties and New Products – Cyber law issues – Privacy and Transborder flows, Fraud – Security of Information and Risks – Electronic Highway Robbery –

Consumer Protection – Case Studies.

References:

1. Frontiers of Electronic Commerce, Kalakota & Whinston, Addison Wesley, 2001.
2. Electronic Commerce, A Managerial Perspective, Efraim Turbon, Jae Lee, David King, H. Michael Chung, Pearson Education Asia, 2001.
3. Electronic Commerce, Nabil R.Adam, Oktay Dogramaci et al, Amazon, 1999.

4. Electronic Commerce:Technical Business and Legal Issues, Nabil R.Adam and Oktay Dogramaci , Prentice Hall USA, 1998.
5. Electronic Commerce and International Taxation, Doernberg, Richard L and Hinnekens Luc , Peachpit Press, USA, 1996.
6. Electronic Commerce, .Greenstein Firsman, Tata McGraw Hill,1999.
7. E-Commerce strategies, Charles Trepper, Microsoft, Eastern Economy Edition, 1999.
8. Creating a winning E-Business, Napier, Judd, Rivers and Wagner, Thomson
    a. Learning, 2000.

The question paper shall contain two parts. PART- A & PART – B

Part – A shall contain 10 compulsory short answer type questions of 4 marks each, covering the entire syllabus (10 x 4 = 40)

Part – B shall contain 2questions from each module. Each question carries 20 marks. Student has to answer three full questions selecting one each from module I , II and III. (3x 20 = 60).

03.706. Elective III

03.706.1

QUALITY MANAGEMENT 3-1-0 4 Credits

Module 1

Introduction to the concepts of Inspection, quality control, quality assurance, and CWQM. Quality trilogy. Continuous improvement philosophy – Kaizen, components of TQM, PDCA Cycle, TQM implementation, Improvement through elimination of wastes, 5S campaign, 4M checklists. Planning process and strategies for continuous improvement, Organizational structure, education and training, communications, process and project management for quality improvement, costs of quality, use and evaluation of quality costs, Zero Defect programmes, identification and solution of quality problems-Pareto, Cause and Effect, and Force Field analysis, Brainstorming, Quality Circles, QC tools and their applications. QFD, JIT philosophy and techniques.

Module 2

ISO-9000 standards (latest revision of the standards) – origin and development of standards, terminologies, characteristic features and Clauses of ISO-9000 standards, certification procedures, quality audit procedures, implementation procedures. Productivity and quality improvement through ISO standards implementation.

Module 3

Capability Maturity Model: Capability Maturity Model (CMM) for Software – Personal CMM – Levels and Road Map – CMM structure – Operational features – Capability evaluation methods – Certification procedures – TQM for Software – System and Human Components.

Quality control software packages.

References:

1. Fundamentals of Quality Control and Improvement - Amitava Mithra – Pearson Education
2. Statistical Quality Control – E. L. Grant - McGraw Hill
3. Quality Control Handbook – Tata McGraw Hill
4. TQM for Engineering by Mohamed Zairi, Gulf Pub. Co., 2nd Edition, New Delhi
5. Total Quality Management - D.D. Sharma, Sultan Chand & Sons
6. The Capability Maturity Model: Guidelines for improving the software process, CMU-SEI-Pearson education

The question paper shall contain two parts. PART- A & PART – B

Part – A shall contain 10 compulsory short answer type questions of 4 marks each, covering the entire syllabus (10 x 4 = 40)

Part – B shall contain 2questions from each module. Each question carries 20 marks. Student has to answer three full questions selecting one each from module I , II and III. (3x 20 = 60).

03.706.2

TQM TOOLS AND TECHNIQUES 3-1-0 4 Credits

Module I

History of quality, total quality, principles of Total Quality Management (TQM), Quality trilogy, models for TQM, core concepts, characteristics and subjects of TQM. Total Quality and Quality Management systems, quality principles. Total quality control, total waste elimination, total employee involvement. Quality assurance: total quality assurance, management principles in quality assurance, objectives of quality assurance system, hierarchical planning for Quality Assurance, Vendor rating,

Module II

Quality improvement: elements, programmes - KAIZEN. Benchmarking; introduction, why benchmark; Planning: what to benchmark, benchmarking partners, data collection methods; Analysis: determining the current competitive gap, projecting future performance levels; Integration: developing action plan, implementing specific actions & monitoring progress, re-calibration; Maturity: beyond benchmarking. Quality in service systems. Total Quality Culture, system approach to TQC.

Module III

Quality function deployment, QFD concept, overview & QFD process, the voice of customer developing a QFD matrix, reviewing the matrix for priority items, organizing teams & planning QFD projects; Process RE-engineering, BPR philosophy, possibilities & pitfalls, BPR framework, opportunity assessment, planning & BPR project, risk & impact assessment, planning & implementing the transition; Failure mode & effect analysis; FMEA: concepts & applications in TQM; Quality cost, concepts, quality cost definitions, quality cost program implementation use of quality cost, reducing quality cost.

Reference

1. Total Quality Management - Sharma - Sultan Chand & Sons
2. Total Quality Management - R.P. Mohanty & RR Lakhi, Jaico Pub, New Delhi,
3. Process Re-Engineering - Lon Roberts, Tata McGraw Hill, New Delhi
4. TQM for Engineering - Mohamed Zairi, Gulf Pub. Co., 2nd Edition, New Delhi

The question paper shall contain two parts. PART- A & PART – B

Part – A shall contain 10 compulsory short answer type questions of 4 marks each, covering the entire syllabus (10 x 4 = 40)

Part – B shall contain 2questions from each module. Each question carries 20 marks. Student has to answer three full questions selecting one each from module I , II and III. (3x 20 = 60).

03.706.3
SOFTWARE QUALITY MANAGEMENT 3-1-0 4 Credits

Module 1

Software Quality: Quality Management – Principles – Software Quality – Software IQUE

In plant Quality Evaluation – Software Configuration Management –Software Life Cycle Model – Software Quality standards – Strategic Planning for Software Quality Improvement.

Quality Metrics: Fundamental measures, size, effort, defects, Software Quality metrics, Complexity metrics, FURPS + (Functionality, Usability, Reliability, Performance, Supportability) model, Defect identification & removal efficiency – Economics of software quality Improvement – New metrics –Research proposals – Case studies.

Module 2

Software Quality Management Tools: Management Quality Control tools (7 New QC Tools) – Poke Yoke –Statistical Quality Control for software – Quality Function Deployment (QFD)-Failure Mode and Effect Analysis (FMEA) – Benchmarking of Software Quality metrics – Continuous Improvement Tools. Reliability estimation – Basic concepts, Musa's basic model,

Module 3

Software Quality Assurance: Software Quality and Reliability – Reliability models – Quality Manual –ISO 9000 series standards – Program Installation – Software Risk Identification & mitigation. Software Testing and Acquisition Management –Zero defect software development..

Capability Maturity Model: Capability Maturity Model (CMM) for Software – Personal CMM – Levels and Road Map – CMM structure – Operational features – Capability evaluation methods – Certification procedures – TQM for Software – System and Human Components

References:

1. Total Quality Management for Software, Gordon Schulmeyer G and James McHanus, International Thomson Computer Press, USA, 1990.
2. Managing the Software Process, W.S.Humphrey, Addison Wesley, Reading, MA, 1989.
3. Practical Software Metrics for Project Management and Process Improvement, Grady Robert B, NJ Prentice Hall, 1992.
4. Software Quality: Concepts and Plans, Dunn Robert M., Englewood Cliffs, Prentice Hall Inc., 1990.
5. Statistical Quality Control, 6th Ed, Grant RE and Leavenworth RS, McGraw Hill Inc., NY, 1988.
6. Quality Data Processing, Burrill, Claude W. and Ellsworth, Leon W.,Tenafly:Burrill-Ellsworth Associates, Inc., 1982.
7. Software Quality-Producing Practical, Consistent software, Mordechai Ben Menachem and Garry S. Marliss, Thomson Learning, 2001.

The question paper shall contain two parts. PART- A & PART – B

Part – A shall contain 10 compulsory short answer type questions of 4 marks each, covering the entire syllabus (10 x 4 = 40)

Part – B shall contain 2questions from each module. Each question carries 20 marks. Student has to answer three full questions selecting one each from module I , II and III. (3x 20 = 60).

03.706.4
TOTAL PRODUCTIVE MAINTENANCE 3-1-0 4 Credits

Module 1

Overview of TPM implementation: TPM Basic Policy & Objectives, Maximize Equipment Effectiveness through Total Employee Involvement, Improvement, Improve Equipment Reliability, Maintainability & Productivity, Aim for Economical Life cycle costs, Enhance Equipment Expertise & skills, Create a vital, Enthusiastic work environment, Company wide TPM Goals, TPM Promotion Organization & management.

Autonomous maintenance : Implementing Autonomous Maintenance Step, Initial cleaning, Addressing the causes of Dirty Equipment, Improving Access to hard-to-clean Areas, Standardizing Maintenance activities, General Inspection skills, Autonomous Inspection, Organizing & Managing the workplace, Autonomous Management.

The manager's role in autonomous maintenance: Three keys to successful TPM circle, Role of Managers & Supervisors, Learning from Breakdowns, Time table of Autonomous Maintenance Activities, Results & Evaluation.

Module 2

Equipment improvement: Equipment Improvement objectives, Promoting Successful Equipment Improvements, Four levels of Equipment Improvement Activity, Effect of Equipment Improvements.

Quality maintenance (QM): Relation between Quality Assurance & QM, conceptual approach QM, preconditions for promoting QM, techniques for developing QM, implementing QM.

Module 3

Education and training : Education & training system, introductory education, studies in general inspection, studies in PM analysis, cultivating in-house maintenance techniques, training in equipment, diagnostic techniques using vibration using vibration measurements, results of TPM education and training.

Example of implementation programmes: From equipment to product Development and Design, From Equipment Development and Design to Product Development & Design, Establishing and Equipment Design, Preliminary Evaluation (Design), Step by step management, Collecting and using maintenance prevention (MP) data, product set-up procedure & daily management.

Overall effects of TPM implementation: Striving for overall equipment effectiveness, defects prevention systems, relationship between TPM and terotechnology.

References:

1. "Training for TPM", Nahchi-Fujikoshi Corporation, Japan Institute of Plant Maintenance, 1990.
2. "Introduction to TPM, The Purtor Factory", Selichi Nakajima, Japan Institute of Plant Maintenance, 1986.
3. "TPM Myumon", Sciichi Nakjima, Japan Institute for Plant Maintenance, 1989.
4. "TPM Maintenance Prevention Design", Sciichi Nakjima, Productivity Press Inc. First Indian Edition, 1993.
5. "An Advanced Step in TPM Implementation", Unio K Shirose, Oshifumi Kimura Y. and Itsugu Kaneda M, Japan Institute of Plant Maintenance

The question paper shall contain two parts. PART- A & PART – B

Part – A shall contain 10 compulsory short answer type questions of 4 marks each, covering the entire syllabus (10 x 4 = 40)

Part – B shall contain 2questions from each module. Each question carries 20 marks. Student has to answer three full questions selecting one each from module I , II and III. (3x 20 = 60).

03.706.5

RELIABILITY ENGINEERING 3-1-0 4 Credits

Module I

Reliability: Definition and Basic concepts, Mean Time Between Failures (MTBF), Mean Time To Repair (MTTR), derivation of the Reliability function, Statistical failure modes: Exponential, Gamma, Weibull, Lognormal, and Fatigue life models. Point and interval estimation procedures for the above distributions. Reliability in terms of Hazard rate. Hazard models and bath-tub curve, applicability of Weibull distribution.

Module II

76. Factors related to reliability:- availability, utilization factor, system effectiveness, overall equipment effectiveness (OEE), Reliability and maintenance costs, factors affecting reliability and maintenance costs, basic stages in achievement of reliability. Design and manufacture for reliability:- customer or market specification for reliability, Reliability Block Diagrams (RBD), RBD reduction techniques, reliability calculations for series, parallel, and series parallel systems. Reliability of maintained and standby systems. Introduction to software packages for reliability modeling and optimization.

Module III

Reliability prediction and control – the need for reliability control, feasibility studies, prototype tests, manufacture and production testing – reliability management – reliability objectives, the people concerned with reliability, co-ordination, training.

Maintainability: Definitions and basic concepts. Relationship between reliability, availability and maintainability. Corrective maintenance time distribution. Markovian failure models. Maintenance planning: activities, resource mobilization, planning methods, evaluation of maintenance performance. Case studies in maintenance management.

Software packages for maintenance scheduling.

References:

1. Planning and control of Maintenance Systems- modeling and analysis – Duffuaa - John Willey & Sons
2. Maintenance, Replacement and Reliability – Jardine – Pitman Publishing
3. An introduction to Reliability & Maintainability Engineering - Charles E Ebeling - McGraw-Hill Publishers
4. Mechanical Reliability - A D S Carter - Macmillan Education Ltd.

5. Reliability Engineering-A.K.Govil
6. A practical approach to Reliability-Rowland Caplan

The question paper shall contain two parts. PART- A & PART – B

Part – A shall contain 10 compulsory short answer type questions of 4 marks each, covering the entire syllabus (10 x 4 = 40)

Part – B shall contain 2questions from each module. Each question carries 20 marks. Student has to answer three full questions selecting one each from module I , II and III. (3x 20 = 60).

03.706.6

MANAGEMENT OF PROJECTS 3-1-0 4 Credits

Module 1

Project identification and formulation-different types of needs leading to different types of projects under BMRED (Balancing, Modernization, Replacement, Expansion, and Diversification) considerations involved in decision under each of these types. Macro parameters in project selection, different considerations for project under private, public and joint sectors. Project formulation-preparation of project profile, project report and detailed project report. Broad criteria for pre-investment decisions.

Project appraisal-different types of appraisal-Technical, Economic, Organizational and Managerial, Commercial and Financial- financial techniques for project appraisal and feasibility, discounted cash flow and non-discounted cash flow methods, social cost benefit analysis and economic rate of return. Non-financial justification of projects.

Module 2

Project financing-pattern of financing, sources of finance, impact of taxation, public loans, small savings surplus of public enterprises, deficit financing, foreign aid. Public sector project financing. Role of tax planning in project financing.

Project cost systems-project cost accounting and monitoring, appointment of contractor and its problems, labour and equipment costs, accounting, codification, development of cost data, labour time, reporting, direct measurement of work quantities, labour cost analysis, equipment accounting, activity based cost accounting, production rates for estimates, control of cost, computer application to cost control.

Module 3

Project administration- progress payments, expenditure planning, project scheduling and network planning, use of Critical Path Method (CPM), schedule of payments and physical progress, time-cost trade off, cash flow preparing, cash forecast and monitoring

of fund and resources, control of groups of projects under one administration and associated problems in sharing resources.

Concepts and uses of PERT, cost as a function of time, project evaluation and review techniques/cost mechanisms. Accountant's role in project evaluation and review techniques/cost budgeting. Determination of least cost duration. Post project evaluation.

References:

1. Project planning, analysis, selection, implementation and review – Prasannachandra – Tata McGraw Hill
2. Project Management – the Managerial Process – Clifford F. Gray & Erik W. Larson -McGraw Hill

The question paper shall contain two parts. PART- A & PART – B

Part – A shall contain 10 compulsory short answer type questions of 4 marks each, covering the entire syllabus (10 x 4 = 40)

Part – B shall contain 2questions from each module. Each question carries 20 marks. Student has to answer three full questions selecting one each from module I , II and III. (3x 20 = 60).

03.706.7

COMPUTER GRAPHICS 3-1-0 4 Credits

Module – I

Introduction to computer Graphics- Display devices and Display techniques –Description of graphic devices - Graphic standards - Graphic primitives- Line & circle generation algorithms – text generation.

Module – II

Transformation – Two and three dimensional transformations- scaling – Rotation, shearing – reflection . Perspective geometry – Orthographic and Oblique projections – perspective transformations.

Module – III

Plane curves – Non parametric curves – space curves – Representation of space curves – cubic spline – Bezier curves , B- Spline curves , NURBS.

Surface description and generation- Surface of revolution – Sweep surfaces, quadric surfaces . Hidden line and hidden surfaces , Z-Buffer algorithm , Scan Line algorithm for curved surfaces.

References :

1.

1. David F. Rogers & J.H Adams : Mathematical Elements ofComputer Graphics ; 2nd Edition; McGraw Hill International Editions.

2. Donald Hearn & M. Pauline Baker : Computer Graphics, Second Edition; Prentice Hall of India Private Ltd.

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Syllabus - VIII Semester Industrial (2003 Admissions)

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- **03.801**

SYSTEM DYNAMICS 3-1-0 4 Credits

Module I

Systems Concept and System theories, Evolution of System Dynamics as a System Enquiry Methodology. Structure and Behavior of Dynamic systems:- fundamental modes of dynamic behavior – Exponential growth, goal seeking, oscillation and process point – interactions of fundamental modes. Tools for systems thinking: - Causal loop diagramming. Behavior of low order systems-analytical approach. Elements of System Dynamics Modeling, physical flows, information flows, level & rate variables, flow diagrams, delays, information smoothing, table functions and table function multipliers. First order positive and negative feedback systems, second order systems.

Module II

Steps in system dynamics modeling:- problem identification/conceptualization, fixing model aggregates and boundary, principles of simulation modeling, developing model equations, algorithm for Euler integration, hand simulation of system dynamics models. Qualitative Study of model behavior and policy recommendation. Case presentation on qualitative analysis. Dynamics of growth:- S-Shaped growth, the Bass diffusion model.

Strategy modeling: Approaches and procedures, techniques - a comparative study. Conceptual models, Suitability of System Dynamics for Policy analysis, Qualitative System Dynamics, Physical resources conversion modules

Module III

Tools for modeling dynamic systems:- delays, formulation of rate equations, formulation of nonlinear relations. Modeling human behavior, modeling expectation formation-forecast. Case of product growth, price stabilization, Manpower flow in R&D organizations, environmental impact analysis, the manufacturing Supply Chain, etc. Model validation and testing, Policy design, Algorithms for resource allocation and dynamic policy option selection. Optimization with SD models. Parameter and sub-structure optimization. Policy design through optimization.

Introduction to Software packages for System Dynamics modeling and simulation. Practice sessions in computer with standard examples.

References:

1. Business Dynamics – Sterman – McGraw Hill
2. System Dynamics – Mohapatra – PHI
3. System Dynamics – Ogata – Pearson Education

The question paper shall contain two parts. PART- A & PART – B

Part – A shall contain 10 compulsory short answer type questions of 4 marks each, covering the entire syllabus (10 x 4 = 40)

Part – B shall contain 2questions from each module. Each question carries 20 marks. Student has to answer three full questions selecting one each from module I , II and III. (3x 20 = 60).

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03.802

COMPUTER INTEGRATED MANUFACTURING (MN) 3-2-0 5 Credits

Module I

NC machines- Types – Point- to point, straight cut and continuous path type- Feed back devices- Encoders, Resolvers, Optical grating- induetosyn-Open and closed loop controls-Accuracy of NC machines- Stic – Slip, Backlash and wind-up. Antifriction bearings- linear guides.

Ball screws, stepper motor, servo meter, I V and PIV drives-CNC and DNC, Adaptive controls.
Part programming.

Module II

CIM- Meaning and scope of CIM, Nature of CIM systems, Types of manufacturing systems-Computers in manufacturing- needs of CIM- CIM software- manufacturing automation protocol (MAP)- Date base technology-basic concepts, requirements, Types-Data base management-DBMS- RDBMS.

CAD-areas of application-benefits, CAE-CAPP-Elements of CAPP system, advantages of CAAP- MRP.

Module III
Group Technology- Cellular manufacturing –FMS- JII- communication networks in manufacturing. Robotics and material handling – Introduction, types- Programming-Robotic controls, Automated guided vehicles- types, Technology- AS/RS.
Role of management in CIM- Expert system, computer vision, concurrent Egineering.

References:

1. CAD/CAM/CIM – Mikell P Groover- PHI
2. CAD/ CAM/CIM—P. Radhakrishnan & S. Subramoniam
3. Principles of CIM—S. Kant and Vajpayeee, PHI
4. Manufacturing Engg & Technology- Kalpakijan.
5. Industrial Automation- Mikell P Groover

The question paper shall contain two parts. PART- A & PART – B

Part – A shall contain 10 compulsory short answer type questions of 4 marks each, covering the entire syllabus (10 x 4 = 40)

Part – B shall contain 2questions from each module. Each question carries 20 marks. Student has to answer three full questions selecting one each from module I , II and III. (3x 20 = 60).

03.803 Elective IV 3-1-0 4 Credits

The question paper shall contain two parts. PART- A & PART – B

Part – A shall contain 10 compulsory short answer type questions of 4 marks each, covering the entire syllabus (10 x 4 = 40)

Part – B shall contain 2questions from each module. Each question carries 20 marks. Student has to answer three full questions selecting one each from module I , II and III. (3x 20 = 60).

03.804

SEMINAR * 0-0-3 3 Credits

2.

Seminar based on industrial visits under taken from V-VII semesters (minimum four) and Minimum four Seminars by experts from industry to be arranged by the department. The evaluation based on report, presentation, performance in the class and general awareness on topics of expert lectures.

03.805

Elective V 3-1-0 4 Credits

The question paper shall contain two parts. PART- A & PART – B

Part – A shall contain 10 compulsory short answer type questions of 4 marks each, covering the entire syllabus (10 x 4 = 40)

Part – B shall contain 2questions from each module. Each question carries 20 marks. Student has to answer three full questions selecting one each from module I , II and III. (3x 20 = 60).

03.806

Elective VI 3-1-0 4 Credits

The question paper shall contain two parts. PART- A & PART – B

Part – A shall contain 10 compulsory short answer type questions of 4 marks each, covering the entire syllabus (10 x 4 = 40)

Part – B shall contain 2questions from each module. Each question carries 20 marks. Student has to answer three full questions selecting one each from module I , II and III. (3x 20 = 60).

03.807

PROJECT & VIVA VOCE (M. N. P. U)0-0-5 5 Credits

Out of 100 marks sessionals,. Marks of Viva voce examination may be assessed based on the overall performance, Project, Seminar, industrial visits and industrial training.

03.803 Elective IV

03.803.1

ADVANCED PRODUCTION PLANNING AND CONTROL 3-1-0 4 Credits

Module I

A strategic overview of forecasting, components of time series analysis, Medium Range forecasting methods, individual item short term forecasting models and procedures, Winter's seasonal model, aggregate medium range forecasting methods, measures of forecast errors, dealing with special class of individual items. Adaptive forecasting

Sensitivity analysis of the EOQ, implementation aids, quantity discounts, accounting for inflation, special opportunities to procure, percentage cost penalty (PCP). Lot sizing for individual items with time varying demands: Wagner-Whitin method, Silver-Meal or Least cost heuristic, other heuristics – use and performance.

77. **Module II**
78. Individual items with probabilistic demand: key issues, continuous and periodic review systems, inventory policies-four types of control systems, decision rules for the s-Q system. Managing A-class items, managing routine (C-class) inventories, Style goods and perishable items: news boy problem, determination of order quantity by marginal analysis and profit maximization.
79. MRP - information requirements for MRP, weaknesses in traditional replenishment systems, closed loop Materials Requirement planning, CRP, DRP, Weaknesses of MRP.
80. Module III
81. Just-In-Time (JIT) and Optimized Production Technology:- Philosophy of JIT, Kanban Control System, No. of Kanbans, Implementing JIT, Comparison of JIT, MRP and Re-order point systems. Benefits and weakness of JIT, Philosophy of OPT, ten Rules of OPT, Drum-Buffer-Rope (DBR) scheduling, CONWIP system, lot streaming, benefits and weaknesses of OPT.
82. Short range production scheduling:- issues, performance measures, techniques for short range scheduling-finite loading systems, deterministic scheduling of single machine: priority rules, deterministic scheduling with two or three machines, scheduling with probabilistic processing times, factory physics.
83.
84.
85. Reference:

1. Inventory Management and Production Planning and Scheduling – Silver, Pyke, Peterson – John Willey & Sons
2. Advanced Production Planning – R. P. Mohanthy – Pearson Education

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Part – A shall contain 10 compulsory short answer type questions of 4 marks each, covering the entire syllabus (10 x 4 = 40)

Part – B shall contain 2questions from each module. Each question carries 20 marks. Student has to answer three full questions selecting one each from module I , II and III. (3x 20 = 60).

03.803.2
CUSTOMER RELATIONSHIP MANAGEMENT 3-1-0 4 Credits

Module I

Conventional marketing approach – drawbacks – emerging challenges in the marketing front – relationship marketing – definition – concepts – relevance of relationship marketing approach – significance - introduction to CRM – new trends and concepts.

Module II

Understanding buyers' expectations – building customer loyalty – types of loyalty – influencing factors – loyalty ladder – significance of loyal customer – impact of lost customers – computing cost of lost customers. Creating customer database – process and approaches to database marketing – application of data base marketing in relationship building.

Module III

Concept of customer-driven organizations – learning organizations – internal marketing. Customer satisfaction audit - developing relationship strategies for different types of business under competitive environment. Information technology application in building customer relationship – emerging new trends. Introduction to SRM and International Marketing.

References:

1. Customer Relationship Management at the Speed of Light – Paul Greenberg
2. The Handbook of Key Customer Relationship Management – Bukowitz - Pearson Education
3. The CRM Handbook – Dyche - Pearson Education

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03.803.3

SUPPLY CHAIN AND LOGISTICS MANAGEMENT 3-1-0

4 Credits

Module 1

86. Overview of SupplyChain and supply chain management. Supply chain performance and profitability. Role of Supply Chain Management and its Scope and importance. Performance Drivers and obstacles. Achieving strategic fit, Logistics and Competitive Strategy.

Module 2

Inventories in supply chain, Order Processing, Purchasing, Warehousing, Materials

Handling, Packaging, Customer Service Management. Facilities decisions in supply chain. Interfaces with other areas: Marketing and Finance. Distribution Requirement Planning. Distribution Network Planning and Warehouse Location, Integrated

Supply, Production, distribution Policies and Plans.

Module 3

Logistics management. Logistics costing. Quick response Logistics. Logistics information system. Ocean Carrier Management, Import-Export Logistic Management, Decision support models of supply chain management: Transportation Systems, Warehouse Design, Distribution Inventory Policies, Transshipment, etc. International Logistics.

References:

1. 1.Supply Chain Management – Sunil Chopra, Peter Meindl-Pearson
2. Logistical Management, Donald J. Bowersox & David J. Closs,TMH.
3. Logistics and supply chain management, Martin Christopher, Financial times management.
4. Modelling and Supply Chain , . Jeremy F. Shapiro, Thomson Learning, 2001.
5. Manufacturing Operations and Supply Chain Management, David Taylor and David Brunt, Vikas Thomson Learning, 2001.
6. Designing and Managing the supply chain, David Simchi – Levi & Philip Kaminsk, McGraw-Hill Companies Inc.

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03.803.4

ENTERPRISE RESOURCE PLANNING 3-1-0 4 Credits

Module 1

Enterprise Resource Planning: Principle – ERP framework – Business Blue Print – business Engineering vs. Business process Re-Engineering – Tools – Languages – Value chain – Supply and Demand chain – Extended supply chain management – Dynamic Models – Process Models

Module 2

Technology and Architecture: Client/Server architecture – Technology choices – Internet direction –CRM – CRM pricing – chain safety – Evaluation framework.

ERP System Packages: SAP, People soft, BAAN and Oracle – Comparison – Integration of different ERP applications – ERP as sales force automation – Integration of ERP and Internet – ERP Implementation strategies – Organizational and social issues.

Module 3

Oracle: Overview – Architecture – AIM – applications – Oracle SCM.

SAP: Overview – Architecture – applications -Before and after Y2K – critical issues – Training on various modules of IBCS ERP Package-Oracle ERP and MAXIMO, including ERP on the NET

ERP Procurement Issues – Market Trends – Outsourcing ERP – Economics – Hidden Cost Issues – ROI

References:

1. ERP Demystified, Alexis Leon , Tata McGraw – Hill Publishing company limited, New Delhi, 2002
2. Enterprise Resource Planning, Brady, Thomson Learning, 2001
3. ERP-A Managerial Perspective, Sadagopan.S, Tata McGraw Hill, 2001.
4. The SAP R/3 Handbook, Jose Antonio Hernandez , Tata Mcgraw Hill, 2001.
5. Enterprise Resource Planning Strategy, Vinod Kumar Crag and Bharat Vakharia,Jaico Publishing house, Mumbai, 1999

6. ERPWARE , ERP Implementation Framework, Garg & Venkitakrishnan, Prentice Hall, 1999.
7. Enterprise Resource Planning, Vinod Kumar Grag and N.K.Venkitakrishnan, Prentice Hall of India, New Delhi, 2001.

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03.803.5

BUSINESS PROCESS REENGINEERING 3-1-0 4 Credits

Module 1

87. Business process reengineering: Introduction – historical outlook – working definition of BPR – overview on four phases of reengineering process.

Setting the foundation for reengineering :Fallacy of programme change – elements of effective change – exploration by the Top Management for reengineering – work force preparation for involvement and change planning for the future : Importance of planning for reengineering – Limitations – key points on planning for reengineering – creating vision, missing and guiding principles – Developing three-to-five year strategic plan – scenario approach – critical.

Issues approach: Goal approach – developing yearly operational or breakthrough plans.

Module 2

Designing change: Process definition – constituents of process – types of processes – process characteristics – processes in service organizations – differences between service and manufacturing processes.

Reengineering steps: Identification of current business processes – Establishing the scope of the process – Mapping project – Mapping and analyzing the process.

Module 3

Process creation: Creating the ideal process – Testing the new process – Implementing the new process.

Evaluation: Evaluating the improvement (criteria) of measurements- hurdles foreseen in designing and implementing meaningful measures – find reengineering steps.

Organization for reengineering: Responsibilities and roles of leader, process owner. Reengineering team, steering committee and reengineering Czar – key points for succeeding at reengineering – case studies.

References:

1. "Reengineering the Organisation – A Step-by-Step Approach to Corproate Revitalisation", Jeffrey N. Lowenthal, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 1995.
2. "Reengineering the Corporation – A Manifesto for Business Revolution", Michael Hammer & James Champy, Nicholar Bareky Publishing, London, U.K., 1996.
3. "The Reengineering Revolution Handbook", Michel Hammer, Herper Collins Publishers., London, UK, 1996.

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Part – A shall contain 10 compulsory short answer type questions of 4 marks each, covering the entire syllabus (10 x 4 = 40)

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03.805 Elective V

03.805.1

FLEXIBLE MANUFACTURING SYSTEMS 3-1-0 4 Credits

Module 1

FMS – An overview: Definition of an FMS – types and configurations concepts – types of flexibility & performance measures. Functions of FMS host computer – FMS host and area controller function distribution.

Development and implementation of an FMS: Planning phases – Integration – System configuration – FMS layouts – simulation – FMS project development steps. Project management- equipment development – host system development - planning – hardware & software development.

Automated material handling and storage: Functions – types – analysis of material handling equipments. Design of conveyor & AGV systems.

Module 2

Automated storages :Storage system performance – AS/RS – carousel storage system – WIP storage system – Interfacing handling storage with manufacturing.

Modeling and analysis of FMS: Analytical, heuristics, queuing, simulation and Petri-net modeling techniques –scope applicability and limitations.

Concepts of distributed numerical control :DNC system – communication between DNC computer & machine control unit – hierarchical processing of data in DNC system – features of DNC systems.

Module 3

Programmable controllers: Control system architecture – elements of programmable controllers: languages, control system flowchart, comparison of programming methods.

Scheduling and loading of FMS :Introduction – scheduling of operations on a single machine – e machine flowshop scheduling – 2 machine jopshop scheduling, 3 machine flow shop scheduling – scheduling ‘n’ operations on ‘n’ machines –scheduling rules – loading problems – tool management of FMS – material handling system schedule.

Economic and technological justification for FMS- as GT, JIT – operation and evaluation – personnel and infra structural aspects – typical case studies – future prospects.

References:

1. Flexible Manufacturing-Parrish D J-ButterWorth Heinemann Ltd,Oxford
2. Automation,Production Systems and CIM-Groover M P-PHI
3. Intelligent Manufacturing Systems-Kuiak-Prentice Hall
4. The design and operation of FMS-Ranky P G-IFS Pub.,UK

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03.805.2

AGILE AND LEAN MANUFACTURING 3-1-0 4 Credits

Module 1

Agile Production System: Introduction-manufacturing production system-components of agile manufacturing system-production support-production planning and control-quality assurance purchasing-maintenance-overview of production support-business operations-engineering-marketing-human resources-finance and accounting.

Agile Practices for Product Development: Five steps for making product development-sources of new product ideas-understanding the product development process and its time duration-initiation of new product development –use of design for manufacture tools – pursuance of CAD/CAM/CAE tools and techniques-institutionalization of product development tools and techniques-cycles of learning

Module 2

Manufacturing agile practices: Overview-establishing a manufacturing system design-embedding manufacturing system design in the shop floor-implementing visual methods of control-flow production-agility through group technology-agility through manufacturing cells-agility through set up and changeover reduction-material management strategy for agility-make Vs buy strategy for agility-understanding the value of investing in people-agility Vs perfectionism

Implementing technology to enhance agility: Guidelines for enhancing agility through new technology-checklist for preparing technology implementation-technology applications that enhance agility-decisions making on agility.

Creating the learning factory: Success through learning factory-process of becoming learning factory-road map for becoming a learning factory-learning challenges for learning manufacturing business.

Module 3

Lean manufacturing: Introduction-definition and scope-continuous Vs lean production-benefits and methodology-process oriented continuous improvement teams-lean manufacturing education-product oriented continuous improvement teams-cell manufacturing training-redesign of plant layout-cross training of team members.

Implementation of lean manufacturing: Training of personnel-equipment selection-zero defect quality methods-improving reliability-quick setups-reduction of inventories-shift to shift communication-employee motivation.

References:

1. The transition to agile manufacturing staying flexible for competitive advantage-J.C.Montigomery,L.O.Levine-ASQC Quality press
2. Agile product development for mass customization –D.M.Anderson,Joseph Pine-Irwin Professional Publishing.

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03.805.3
INDUSTRIAL AUTOMATION 3-1-0 4 Credits

Module 1

Automation methodologies: Concept of Mechanisation and Automation – Types of Automation Detroit type Automation, Automated flow lines. Buffer storage analysis, tends in manufacturing – future automated factory, social impact, economic advantage of automation.

Transfer and CNC systems: Robots in perspective – robot technology fundamentals, robot dynamics simulator, CNC systems, servomotor and servo system design trends,

stepper motors and controls, adaptive control, balls crews, preloading, and selection of drives for CNC machines.

Sensors and measuring systems :Classification of position and motion systems, inductive type, electromechanical switches, rotary position sensor – resolver, synchros, encodes units, integrated motion systems, fundamental sensor methodologies, LVDT, LVRT, LT, photo electric, capacitive, magnetic detectors, impedance type gauging transducers, linear potentiometer, strain gauges.

Module 2

Pneumatic automation : Actuators, control valves – direction, pressure and flow, sequential control of single /multiple actuator systems, ascade and Kamaugh Veitch map methods.

Electro pneumatic automation: Symbols: Basic electrical elements – relay, solenoid, timers; pneumatic – electrical converters, design of circuits and hands on models on material handling systems.

Automated system features :Flexible manufacturing systems – features of FMS, computer integrated manufacturing – need for AI and expert systems in CIM, factory assembly system – flexible assembly automation.

Module 3

Control systems: Sequence control and programmable controllers – logic control and sequencing elements, ladder diagram, PLC, programming the PLC.

Inspection automation: Inspection automation, off-line and on-line inspections, computerized co-ordinate measuring machine – CMM construction, flexible inspection systems., laser interferometer, non-contact inspection methods. Automatic gauging and size control systems, thickness measurement, machine vision systems.

References:

1. "Standard Handbook of Industrial Automation", Onsidine D M C & Onsidine G D C, Chapman and Hall, NJ, 1986.
2. "Automation, Production Systems and Computer Integrated Manufacturing", Groover M.P, Prentice – Hall Ltd., 1997.
3. "Fundamentals of Industrial Automation", Ergan V.T. Andrew I. Ibberman B.L. MIR Publishers, Moscow, 1986.
4. "CNC Machines", Radhakrishnan P., New Central Book Agency, 1992.
5. "Pneumatic Control for Industrial Automation", Peter Rohner & Gordon Smith, John Wiley and Sons, 1987.

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Part – A shall contain 10 compulsory short answer type questions of 4 marks each, covering the entire syllabus (10 x 4 = 40)

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03.805.4
ROBOTICS 3-1-0 4 Credits

Module 1

Fundamental concepts of robotics: History, present status and future trends, Robotics and Automation, Laws of Robotics, Robot Definition, Robotics Systems and Robot Anatomy, Specifications or Robots. Resolution, Repeatability and Accuracy of a Manipulator.

Robot drives: Power transmission systems and control Robot drive mechanisms, hydraulic-electric-pneumatic drives, and Mechanical transmission method – Rotary-to-Rotary motion conversion. Rotary-to-linear motion conversion End effectors – types – grip ping problem – Remote covered compliance devices – Control of Actuators in Robotic Mechanisms.

Sensors and intelligent robotics: Sensory devices – Non-optical - Position Sensors – Optical position Sensors – Velocity Sensors – Proximity sensors – Contact and non-contact type – Touch and slip sensors – Force and Torque Sensors – AI and Robotics.

Module 2

Computer vision for robotics systems :Robot vision systems – Imaging components – Image representation – Hardware aspects – Picture coding – Object Recognition and Categorization – Visual inspection – Software considerations – applications – commercial – Robotic vision systems.

Computer considerations for robotic systems: Computer architecture for robots. Hardware, Computational elements in robotic applications – Robot programming – Sample programs – path planning – Robot's Computer system.

Module 3

Transformations and kinematics :Homogenous Co-ordinates – Co-ordinate Reference Frames – Homogenous Transformations for the manipulator – the forward ad inverse problem of manipulator kinematics – Motion generation – Manipulator dynamics – Jacobian in terms of D.H. matrices controller architecture.

Robot cell design and control: Specifications of commercial robots – Robots design and process specifications – Motor selection in the design of a robotic joint – Robot cell layouts – Economic and Social aspects or robotics.

Applications of robots: Capabilities of Robots – Robotics Applications – Obstacle avoidance – Robotics in India – The future of Robotics.

References:

1. "Robotic Engineering – An Integrated Approach" – Richard D. Klafter, Thomas A Chmielewski, Michael Negin Eastern Economy Edition, Prentice Hall Pvt. Ltd
2. "Robotics : Control Sensing, Vision, intelligence", Fu KS, Gomaler RC, Lee C.S.G., McGraw Hill Book Co
3. "Handbook of Industrial Robotics", Shuman Y. N John Wiley & Sons, New York.
4. "Robotics Technology and Flexible Automation, Deb K.S. Mc Graw Hill Book Co.

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03.805.5
COMPOSITE MATERIALS AND MECHANICS 3-1-0 4 Credits

- **Module 1**

Definition-Need-General characteristics, Applications, Fibers-Glass, Carbon, Ceramic and Aramid fibers. Matrices-Polymer, Graphite, Ceramic and Metal Matrices-Characteristics of fibers and matrices. Smart materials - types and characteristics.

Module 2

Characteristics of fiber-reinforced Lamina-Laminates-Interlaminar stresses-Static Mechanical Properties-Fatigue and Impact properties-Environmental effects-Fracture Behavior and Damage Tolerance.

Bag Moulding-Compression moulding-Pultrusion-Filament Winding-Other Manufacturing Processes-Quality Inspection methods

Module 3

Stress analysis of Laminated composite Beams,Plates,Shells-Vibration and Stability Analysis-Reliability of Composites-Finite Element Method of Analysis-Analysis of Sandwich structures.

Failure predictions-Laminate Design Consideration-Bolted and Bonded Joints.

- Design Examples

References:

1. "Fiber Reinforced composites: Materials,Manufacturing and Design", Mallick,P.K., Marcel Dekker Inc.,1993.
2. "Primer on Composite Materials,Analysis", Halpin,J.C., Techomic Publishing Co.,1984
3. "Analysis and Performance of Fiber Composites", Agarwal, B.D., and Broutman L.J., John Wiley and Sons,New York,1990
4. "Composite Materials Technology: Processes and Properties", Mallick ,P.K. and Newman,S.,(eds),Hansen Publisher, Munich,1990.

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Part – A shall contain 10 compulsory short answer type questions of 4 marks each, covering the entire syllabus (10 x 4 = 40)

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03.805.6
INSTRUMENTATION AND CONTROL 3-1-0 4 Credits

Module I

Measurement : Aims – Fundamental methods – Measurement systems – Functions of Instrument – Static and dynamic Measurements, Terminology, Time element, Errors in measuring Instruments, Sources of error, Error distribution – Sensing elements : Types – Sensors for motion – Angular motion speed, force, flame, smoke and sute - electrical transformation , Simple transducer elements – Types of transducers:– Voltage and current generating Analog type , Variable parameter Analog type ,

Frequency and pulse generating transducers, ultra sonic, laser, fiber optics – Specification for transducers .

Measurement of Temperature – Temperature scales, Basic fixed points – Measuring devices and their ranges – Electrical type and Mechanical type – Measuring systems for resistance thermometers and Thermocouples – Bridge circuits – Calibration – Filled system thermometers – Ambient temperature compensation .

Module II

Measurement of pressure – Force balance principle – Deformation of elastic members – Ring balance – Impulse line layout – Calibration Low pressure measuring devices.

Measurement of flow – Head flow meters – Primary elements Secondary elements – Fleet mono meters – Square root extraction – Flow transducers – Area flow motors – Rota meter – Measurement of liquid level – Direct methods – Inferential methods – Boiler drum – Level Indicator

Module III

Control systems: – Classification of control systems – Block diagrams – Rules of Block diagram algebra – Transfer functions, Set point - Identification of plant Characteristics – types of controllers:- proportional, integral, derivative, and On-Off control. Dynamic response of systems –Analogous circuits-stability of control systems:- Bode plots, polar plots, Nyquist criterion, Routh –Hurwitz criterion.

References:

1. Mechanical Measurements – Beckwith - PHI
2. Mechanical and Industrial Measurements – R.K.Jain
3. Process Instrument and control Hand Book – D.M.Considine
4. Measurements systems , Application and design – E.O.Doeblin
5. Industrial Instrumentation - A.E.Pribanco.

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03.806 Elective VI

03.806.1

DECISION MODELING- II 3-1-0 4 Credits

Module I

Linear programming problems – revised simplex method, duality, dual simplex method, sensitivity analysis,. Integer and discrete programming:- Zero-One programming, Branch and Bound algorithm, Gomory's cutting plane method. Optimization applications for Transportation Assignment, and Network problems, Goal programming

Module II

88. Non-linear programming: classical optimization methods, properties of functions. One dimensional Unconstrained minimization:- Univariate minimization- unimodality and bracketing the minimum, Fibonacci, Golden section, and Polynomial-Based methods. Multivariate minimization- necessary and sufficient conditions for optimality, steepest descent, conjugate gradient, and Newton's methods. Constrained minimization:- problem formulation, graphical solution of two variable problems, necessary and sufficient conditions for optimality, Sensitivity of optimum solution to problem parameters, different methods for optimization.

Module III

Dynamic programming: principle of optimality, concepts of state and stage, solution of discrete and stochastic problems through backward dynamic programming, continuous and multistage dynamic programming problems, stochastic inventory problems.

Queuing theory: definitions and classification, Birth and death process, Markovian and semi-Markovian single and multiple server queues, Queuing networks.

Discrete – Event simulation: time flow mechanisms, random number, and random deviate generation

Reference:

1. Optimization Concepts and Applications in Engineering – A. D. Belegundu - Pearson Education
2. Fundamentals of Queuing Theory - Gross and Harris - John Willey & Sons

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03.806.2
ADVANCED OPTIMIZATION TECHNIQUES 3-1-0 4 Credits

Module I

LINEAR PROGRAMMING

Linear programming problems – revised simplex method, duality, dual simplex method, sensitivity analysis,. Integer and discrete programming:- Zero-One programming, Branch and Bound algorithm

DYNAMIC PROGRAMMING:

Bellman's principle of optimality, examples on the application on routing problem, Inventory problem, simplex problem, marketing problem.

Module II

NONLINEAR OPTIMIZATION:

Introduction – one – dimensional optimization – Elimination methods – unrestricted search, exhaustive search, Fibonacci and Golden section methods – quadratic and cubic interpolations, direct root methods.

CONSTRAINED AND UNCONSTRAINED NON LINEAR OPTIMIZATION:

Direct search methods – Random search methods – Pattern search methods – Method of rotating coordinates – Descent methods – steepest descent, conjugate gradient, Quasi-Newton, and variable metric methods.

Direct methods – the complex method, cutting plane method, methods of feasible directions – indirect method – transformation techniques, interior and exterior penalty function methods.

Module III

INTEGER PROGRAMMING:

Graphical method, the branch and technique, Gomory's cutting plane method, solution to Transportation problem.

NON-TRADITIONAL OPTIMIZATION :

Introduction to Genetic Algorithms, Simulated Annealing, Tabu Search, and Neural Networks.

REFERENCES:

1. "Engineering Optimization: Theory and Practice", Singiresu S. Rao, Wiley-Interscience, 3rd Edition, 1996.
2. "Optimization for Engineering Design", Kalyanmoy Deb, Printice-Hall of India (Pvt.) Ltd., New Delhi, 2000.
3. "Genetic Algorithms in Search, Optimization and Machine Learning", David E. Goldberg, Addison-Wesley Pub Co., 1989.
4. "Dynamic Programming : Deterministic and Stochastic Models", Dimitri P. Bertsekas, Prentice Hall, 1987.
5. "Integer Programming", Harvey M. Salkin, Addison-Wesley Pub Co., 1975.
6. "Linear and Nonlinear Programming", Stephen G. Nash and Ariela Sofer, McGraw Hill College Div., 1995.
7. " Tabu Search", Fred Glover, Manuel Laguna, and Fred Laguna, Kluwer Academic Publishers, 1997.
8. "Artificial Neural Networks for Intelligent Manufacturing", Cihan H. Dagli, Chapman & Hall, London, 1994, ISBN 0412 480506.

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03.806.3
EVOLUTIONARY COMPUTATION3-1-0 4 Credits

Module 1

Introduction to evolutionary computation: Biological and artificial evolution-Evolutionary computation and AI-different historical branches of EC

Search operators: Recombination/Crossover for strings(eg. binary strings)-one-point, multi-point and uniform crossover operators-mutation for strings-bit flipping-recombination/crossover and mutation rates-recombination for real-valued

representations-discrete and intermediate recombinations-mutation for real valued representations-Gaussian and Cauchy mutations, self adaptive mutations

Selection schemes: Fitness proportional selection and fitness scaling-ranking including linear, power, exponential and other ranking methods-tournament selection-selection pressure and its impact on evolutionary search

Module 2

Search operators and representations: Mixing different search operators-an anomaly of self-adaptive mutations-the importance of representation-binary Vs grey coding-adaptive representations

Evolutionary combinatorial optimization: Evolutionary algorithms for TSPs-Evolutionary algorithms for lecture room assignment-hybrid evolutionary and local search algorithms-co-evolution: cooperative co-evolution, competitive co-evolution-Niching and Speciation: fitness sharing (explicit and implicit)-crowding and mating restriction-constraint handling: common techniques-penalty methods, repair methods-analysis

Module 3

Genetic programming: Trees as individuals-Major steps of genetic programming, eg. Functional and terminal sets, initialization, crossover, mutation ,fitness evaluation-Search operators on trees-Automatically defined functions-Issues in genetic programming-bloat, scalability. Examples

Multi objective evolutionary optimization: Pareto optimality-Multiobjective evolutionary algorithms

Theoretical analysis of evolutionary algorithms: Schema theorems-Convergence of Evolutionary algorithms -Computational time complexity of Evolutionary algorithms -No free lunch theorem.

References:

1. Handbook on Evolutionary Computation-Baeck T, Fogel D B & Michalewicz Z-IOP Press
2. Genetic Algorithms + Data Structures = Evolution Programms- Michalewicz Z-Springer-Verlag,Berlin
3. Genetic Algorithms in Search, Optimization & Machine Learning-Goldberg D E-Addisson Wesley
4. Genetic Programming :An Introduction-Banzhaf W,Nordin P,Keller et al.-Morgan Kaufmann
5. Evolutionary Computation: Theory and Applications-Yao X-World Scientific Publ.Co,Singapore

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Part – A shall contain 10 compulsory short answer type questions of 4 marks each, covering the entire syllabus (10 x 4 = 40)

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03.806.4
ADVANCED NUMERICAL METHODS 3-1-0 4 Credits

Module I

Errors and approximations-floating point arithmetic– sources of errors - control of errors –propagation of errors – Condition and stability – Rate of convergence.

Solution of non linear Equations – Review and comparison of various iterative methods – Generalized Newton Raphson Method for multiple roots - Higher order NR methods – Newton's method for Non linear systems.

Solution of Linear Algebraic Equations – Direct and Indirect methods – Gauss Elimination and Gauss Jordan methods – ill-conditioning – pivoting – Jacobi, Gauss – Seidel and Relaxation methods – Conditions of convergence – Eigen value problems – Vector Iteration methods.

Algorithm flow chart and computer programs of Gauss elimination, Gauss Seidel and vector iteration methods.

MODULE II

Curve fitting – Method of least squares – non-linear relationships – Correlation and Regression – Linear correlation - Measures of correlation – Standard error of estimate – Coefficient of correlation. Application of Software packages.

Interpolation – Newton's divided difference, Lagrange, Aitken, Hermite and spline techniques – Inverse Interpolation – Numerical differentiation.

Numerical Integration – Newton Cotes Integration formula – Gauss Quadrature – Double Integration – Trapezoidal and Simpson's methods – Automatic numerical Integration. Algorithm flowcharts and computer programs of linear regression, Newton's divided difference, Lagrange interpolation and integration by Gauss quadrature.

MODULE III

Solution of first order ordinary differential equations – Single step and multi step methods– Picard, Euler, Modified Euler, Taylor series, and Runge Kutta Methods – Milne's and Adams methods – Simultaneous First order differential equations –second order differential equations.

Partial differential equations- classification- Laplace equation – 1 D wave equation and I D heat conduction equation – Finite difference methods – Relaxation methods

Simple computer programs for the RK method and Finite difference methods for the solution of Laplace equation, wave equation and heat equation. Wave equation in two dimensions, computer programs.

REFERENCES

1. Applied Numerical Analysis – Gerald & Wheatley – Addison-Wesley
2. Computer Oriented Numerical Methods – V.Rajaraman
3. Numerical Methods for Scientific and Engineering Computations – M.K.Jain , S.R.K.Iyengar and R.K.Jain.
4. Introductory methods of Numerical Analysis – S.S.Sastry.
5. Numerical Methods in Science and Engg. – S. Rajasekharan
6. Numerical methods for Initial and Boundary Volume problem - S.Rajasekharan
7. Numerical methods in Engg. and Science – B.S.Grewal
8. Statistics – Murrey R Spicgel
9. Elementary Numerical Analysis – Conte and Carl de Book
10. An Introduction to Numerical Analysis – Kendall . E. Atkinson.
11. Numerical methods for Engineers and Scientists- Iqbal H Khan and Q.Hassan

The question paper shall contain two parts. PART- A & PART – B

Part – A shall contain 10 compulsory short answer type questions of 4 marks each, covering the entire syllabus (10 x 4 = 40)

Part – B shall contain 2questions from each module. Each question carries 20 marks. Student has to answer three full questions selecting one each from module I , II and III. (3x 20 = 60).

03.806.5
COMPUTERISED MATERIALS MANAGEMENT 3-1-0 4 Credits

MODULE I

Introduction to Materials management – Importance of material management and its role in industries. The need for the integrated approach in Material management

Demand forecasting – Various qualitative and quantitative methods of demand forecasting – Different type of averaging, Exponentially weighed smoothening, Correction for fluctuations, Time series analysis, Delphi and other Group techniques. Development of simple Computer Program for forecasting.

MODULE II

Inventory control – Basic methods in Inventory – Assumptions used in deriving models. Inventory costs and EOQ model. Price breaks and quantities – Effects of variations in lead-time and demand. Effects of shortage cost on EOQ. Systems of Inventory control, Design of Inventory control systems. Development of Computer Program for forecasting. Classification systems and selective Inventory control – ABC, VED, FSN, HML, and MUSIC, 3-D approaches, Coverage analysis in Material management.

Development of Computer Program for ABC analysis – Codification and standardization Systems and Techniques, Effects in Cost.

MODULE III

Vendor rating and source selection. Techniques and materials. Use of Indian Standards for Vendor rating. Make or buy decisions – Materials Requirements Planning Concept, methods and illustration examples-introduction to ERP packages.

Introduction to JIT philosophy – Features and impact in Materials Management.

Purchasing – Purchase organization – legal aspects of buying – Purchase Procedure. Store and Material control – Receipts and issues – Stores Record. Methods and principles of Storing and retrieving items.

1. Material handling devices used in stores – Application of Computers in Material handling – Design of informatics systems for procurement and storage using computer.

REFERENCES

1. Scientific Inventory Management - Bnchan & Kbenigsberg
2. Inventory Management - Starr & Miller
3. Materials Management - R.M .Shah
4. Integrated Material management - P.Gopalakrishnan
5. Principles of Inventory management - Tershine

The question paper shall contain two parts. PART- A & PART – B

Part – A shall contain 10 compulsory short answer type questions of 4 marks each, covering the entire syllabus (10 x 4 = 40)

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