UNIVERSITY OF KERALA
B.TECH DEGREE COURSE- 2003 SCHEME
Scheme of Studies And Syllabi for Combined I And II Semesters (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	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

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-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)

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)

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"

Note: Part A Compulsory questions , 10 Questions of 4 marks each

Part B Three questions of 10 marks from each module, out of which two from each module should be answered (10 x 2 x 3 = 60)

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

Note: The question paper will consist of two parts. Part I is to be compulsory for 40 marks. This may contain 20 questions of 2 marks each or 10 questions of 4 marks each. Part II is to cover 3 modules. There can be 3 questions from each module (10 marks each) out of which 2 are to be answered. Or there will be 2 questions from each module (20 marks each) out of which one is to be answered.

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).

03.109 Basic Electronics Engineering Credits:6 L-T-D/P:2-1-0
(Analysis and derivations not required)

Module I

1. Passive components

(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.