DRAFT SYLLABUS for BE (E&C) at PDA College of Engg, Gulbarga University, Gulbarga, Karnataka (old annual schema)

TODO: Proof read text, reference textbooks.

Practicals + Total marks as per Marks sheet

ToDo: Send abstract of Digital Entergy Meter and Digital TV Workshop.

BE I year: get from VTU, elsewhere as per exam subjects - LABS are missing/ add from Syllabus Book(Additional PCM)

MATHEMATICS

PART-A
UNIT – 1
Differential Calculus - 1
Determination of n_{th} derivative of standard functions-illustrative examples*. Leibnitz's theorem (without proof) and problems.
Rolle's Theorem – Geometrical interpretation. Lagrange's and Cauchy's mean value theorems. Taylor's and Maclaurin's series expansions of function of one variable (without proof).
6 Hours
UNIT – 2
Differential Calculus - 2
Indeterminate forms – L'Hospital's rule (without proof), Polar curves: Angle between polar curves, Pedal equation for polar curves. Derivative of arc length – concept and formulae without proof. Radius of curvature - Cartesian, parametric, polar and pedal forms.
7 Hours
UNIT – 3
Differential Calculus - 3
Partial differentiation: Partial derivatives, total derivative and chain rule, Jacobians-direct evaluation.
Taylor's expansion of a function of two variables-illustrative examples*.
Maxima and Minima for function of two variables. Applications – Errors and approximations.
6 Hours
UNIT – 4
Vector Calculus
Scalar and vector point functions – Gradient, Divergence, Curl, Laplacian, Solenoidal and Irrotational vectors.
Vector Identities: div (ϕA), Curl (ϕA) Curl (grad ϕ) div (Curl$A$) div ($A \times B$) & Curl (Curl A) .
Orthogonal Curvilinear Coordinates – Definition, unit vectors, scale factors, orthogonality of Cylindrical and Spherical Systems. Expression for Gradient, Divergence, Curl, Laplacian in an orthogonal system and also in Cartesian, Cylindrical and Spherical System as particular cases – No problems
7 Hours
7
PART-B
UNIT – V
Integral Calculus
Differentiation under the integral sign – simple problems with constant limits. Reduction formulae for the integrals of
$\sin^n x$, $\cos^n x$, $\sin^m x \cos^n x$ and evaluation of these integrals with

standard limits - Problems.
Tracing of curves in Cartesian, Parametric and polar forms – illustrative examples*. Applications – Area, Perimeter, surface area and volume. Computation of these in respect of the curves – (i) Astroid:
$x^{2/3}+y^{2/3}=a^{2/3}$
(ii) Cycloid: $x=a(\theta-\sin\theta)$, $y=a(1-\cos\theta)$ and (iii) Cardioid:
$r=a(1+\cos\theta)$
6 Hours
UNIT – VI
Differential Equations
Solution of first order and first degree equations: Recapitulation of the method of separation of variables with illustrative examples*. Homogeneous, Exact, Linear equations and reducible to these forms. Applications - orthogonal trajectories.
7 Hours
UNIT – VII
Linear Algebra-1
Recapitulation of Matrix theory. Elementary transformations, Reduction of the given matrix to echelon and normal forms, Rank of a matrix, consistency of a system of linear equations and solution. Solution of a system of linear homogeneous equations (trivial and non-trivial solutions). Solution of a system of non-homogeneous equations by Gauss elimination and Gauss – Jordan methods.
6 Hours
UNIT – VIII:
Linear Algebra -2
Linear transformations, Eigen values and eigen vectors of a square matrix, Similarity of matrices, Reduction to diagonal form, Quadratic forms, Reduction of quadratic form into canonical form, Nature of quadratic forms
7 Hours

PHYSICS

PART – A
UNIT-1
Modern Physics
Introduction to Blackbody radiation spectrum, Photo-electric effect, Compton effect. Wave particle Dualism. de Broglie hypothesis – de Broglie wavelength, extension to electron particle. – Davisson and Germer Experiment.
Matter waves and their Characteristic properties. Phase velocity, group velocity and Particle velocity. Relation between phase velocity and group velocity. Relation between group velocity and particle velocity. Expression for deBroglie wavelength using group velocity.
7 Hours
UNIT-2
Quantum Mechanics
Heisenberg's uncertainity principle and its physical significance. Application of uncertainity principle (Non-existence of electron in the nucleus, Explanation for β-decay and kinetic energy of electron in an atom). Wave function. Properties and Physical significance of a wave function. Probability density and Normalisation of wave function. Setting up of a one dimensional, time independent Schrödinger wave equation. Eigen values and Eigen functions. Application of Schrödinger wave equation – Energy Eigen values for a free particle. Energy Eigen values of a particle in a potential well of infinite depth.

6 Hours

UNIT-3

Electrical Conductivity in Metals

Free-electron concept. Classical free-electron theory - Assumptions. Drift velocity. Mean collision time and mean free path. Relaxation time. Expression for drift velocity. Expression for electrical conductivity in metals. Effect of impurity and temperature on electrical resistivity of metals. Failures of classical free-electron theory.

Quantum free-electron theory - Assumptions. Fermi - Dirac Statistics.Fermienergy – Fermi factor. Density of states (No derivation). Expression for electrical resistivity / conductivity. Temperature dependence of resistivity of metals. Merits of Quantum free – electron theory.

7 Hours

10

UNIT-4

Dielectric & Magnetic Properties of Materials

Dielectric constant and polarisation of dielectric materials. Types of polarisation. Equation for internal field in liquids and solids (one dimensional). Classius – Mussoti equation. Ferro and Piezo – electricity (qualitative). Frequency dependence of dielectric constant. Important applications of dielectric materials. Classification of dia, para and ferromagnetic materials. Hysterisis in ferromagnetic materials. Soft and Hard magnetic materials. Applications.

7 Hours

PART – B

UNIT - 5

Lasers

Principle and production. Einstein's coefficients (expression for energy density). Requisites of a Laser system. Condition for Laser action. Principle, Construction and working of He-Ne and semiconductor Laser. Applications of Laser – Laser welding, cutting and drilling. Measurement of atmospheric pollutants. Holography – Principle of Recording and reconstruction of 3-D images. Selected applications of holography.

6 Hours

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UNIT-6

Optical Fibers & Superconductivity

Propagation mechanism in optical fibers. Angle of acceptance. Numerical aperture. Types of optical fibers and modes of propagation. Attenuation. Applications – block diagram discussion of point to point communication. Temperature dependence of resistivity in superconducting materials. Effect of magnetic field (Meissner effect). Type I and Type II superconductors - Temperature dependence of critical field. BCS theory (qualitative). High temperature superconductors. Applications of superconductors– Superconducting magnets, Maglev vehicles and squids

7 Hours

UNIT-7

Crystal Structure

Space lattice, Bravais lattice - unit cell, primitive cell. Lattice parameters. Crystal systems. Direction and planes in a crystal. Miller indices. Expression for inter-planar spacing. Co-ordination number. Atomic packing factor. Bragg's Law. Determination of crystal structure by Bragg's x-ray spectrometer. Crystal structures of NaCl, and diamond.

6 Hours

11

UNIT-8

Material Science

Introduction to Nanoscience and Nanotechnology. Nanomaterials: Shapes of nanomaterials, Methods of preparation of nanomaterials, Wonders of nanotechnology: Discovery of Fullerene and carbon nanotubes, Applications.

Ultrasonic non-destructive testing of materials. Measurements of velocity in solids and liquids, Elastic constants.
6 Hours

CHEMISTRY

PART – A

UNIT – 1
Electrode Potential and Cells
Introduction, Differences between galvanic and electrolytic cells, Construction of galvanic cell, EMF of a cell , Origin of single electrode potential, Sign convention and cell notation, Standard electrode potential, Derivation of Nernst equation for single electrode potential.
Types of electrodes: Reference electrodes – Primary and secondary, Limitations of standard hydrogen electrode, Construction and working of calomel electrode and Ag – AgCl electrode, Measurement of single electrode potential, Numerical problems on electrode potential and EMF of a cell, Ion selective electrode: Glass electrode – Construction , Determination of pH of a solution using glass electrode, concentration cells, numerical problems.
7 Hours
UNIT - 2
Batteries and Fuel Cells
Basic concepts, Battery characteristics – primary, secondary and reserve batteries with examples , super capacitors
Classical batteries: Construction, working and applications of Zn – MnO_2, Lead acid storage andNi – Cd batteries.
Modern batteries: Construction , working and applications of Zn – air, Ni – metal hydride and Li – MnO_2 batteries.
Fuel cells – Differences between battery and fuel cell, construction and working of H_2 – O_2 and CH_3OH– O_2 fuel cells.
6 Hours
UNIT - 3
Corrosion and its control
Electrochemical theory of corrosion, Galvanic series, Types of corrosion- Differential metal corrosion, Differential aeration corrosion (Pitting and water line corrosion), Stress corrosion (caustic embrittlement in boilers), Factors affecting the rate of corrosion
Corrosion control: Inorganic coatings – Anodizing and phosphating, Metal coatings – Galvanizing and Tinning, Corrosion inhibitors, cathodic protection.
7 Hours
13
UNIT - 4
Metal Finishing
Technological importance, Significance of Polarization, Decomposition potential and Overvoltage in electroplating, Theory of electroplating. Effect of plating variables on the nature of electrodeposit- Electroplating process, Electroplating of gold and Chromium.
Distinction between electroplating and electrolessplating, Electolessplating of copper and nickel.
6 Hours
PART – B
UNIT – 5
Chemical fuels and Photovoltaic cells
Introduction, Classification of chemical fuels Calorific value – High and Low calorific values, Determination of calorific value –solid or liquid fuel using Bomb calorimeter - numerical problems .
Petroleum – Cracking by fluidized catalytic cracking process, Reformation of petrol, Octane and Cetane numbers. Knocking – mechanism and harmful

effects. Antiknocking agents – TEL, Catalytic converters – Principle and working, Unleaded petrol, Power alcohol and Biodiesel.
Photovoltaic cells – Production of solar grade silicon, Doping of silicon, Construction and working of photovoltaic cell, Advantages.
7 Hours
UNIT – 6
The Phase rule and Instrumental methods of analysis
Statement of Gibb's phase rule and explanation of the terms involved, Phase diagram of one component system – water system, Condensed phase rule , Phase diagram of two component system- Eutectic Pb – Ag system and Fe – C system. Application – Desilverization of lead.
Instrumental methods of analysis- Theory , Instrumentation and applications of Colorimetry, Potentiometry , Conductometry and Flame photometry.
6 Hours
UNIT - 7
Polymers
Types of polymerization – Addition and Condensation, Mechanism of polymerization – Free radical mechanism taking ethylene as example. Glass transition temperature (T_g) , Structure – property relationship. Types of plastics – Thermosetting and thermoplastics. Manufacture of plastics by compression ,injection and extrusion moulding.
Synthesis and applications of Teflon, PMMA, Polyurethane and Phenol – formaldehyde resins.

Elastomers: Deficiencies of natural rubber, Vulcanization of rubber. Synthesis and applications of Neoprene and Butyl rubber, Silicone rubbers.
Adhesives: Synthesis and applications of epoxy resins.
Polymer composites - Synthesis and applications of Kevlar and Carbon fibers.
Conducting polymers – Definition, Mechanism of conduction in Polyacetylene, applications.
7 Hours
UNIT - 8
Water Chemistry
Impurities in water ,Water analysis – Determination of different constituents in water – Hardness, alkalinity, chloride , fluoride , nitrate , sulphate and dissolved oxygen. Numerical problems on hardness and alkalinity. Sewage – BOD and COD, Numerical problems, Sewage treatment. Desalination of water – Reverse Osmosis and Electrodialysis
6 Hours

ELEMENTS OF ELECTRICAL ENGINEERING

PART – A
UNIT-1
1–a) D. C. Circuits: Ohm's Law and Kirchhoff's Laws, analysis of series, parallel and series- parallel circuits excited by independent voltage sources. Power and Energy. Illustrative examples.
4Hours
I–b) Electromagnetism: Faradays Laws, Lenz's Law, Fleming's Rules, Statically and dynamically induced emf's. Concept of self inductance, mutual inductance and coefficient of coupling. Energy stored in magnetic field. Illustrative examples.
3Hours
UNIT-2
2.Single-phase A.C. Circuits: Generation of sinusoidal voltage, definition of average value, root mean square value, form factor and peak factor of sinusoidally varying voltage and current, phasor representation of alternating quantities. Analysis, with phasor diagrams, of R, L, C, R-L, R-C and R-L-C circuits, real power, reactive power, apparent power and power factor.

Illustrative examples involving series, parallel and series- parallel circuits.
7 Hours
UNIT-3
3 Three Phase Circuits: Necessity and advantages of three phase systems, generation of three phase power, definition of Phase sequence, balanced supply and balanced load. Relationship between line and phase values of balanced star and delta connections. Power in balanced three-phase circuits, measurement of power by two-wattmeter method. Illustrative examples.
6 Hours
UNIT-4
4–a) Measuring Instruments: Construction and Principle of operation of dynamometer type wattmeter and single-phase induction type energy meter (problems excluded).
3 Hours
28
4–b) Domestic Wiring: Service mains, meter board and distribution board. Brief discussion on Cleat, Casing & Capping and conduit (concealed) wiring. Two-way and three-way control of a lamp. Elementary discussion on fuse and Miniature Circuit Breaker (MCB's). Electric shock, precautions against shock –Earthing: Pipe and Plate.
3 Hours
PART – B
UNIT-5
5.DC Machines: Working principle of DC machine as a generator and a motor. Types and constructional features. emf equation of generator, relation between emf induced and terminal voltage enumerating the brush drop and drop due to armature reaction. Illustrative examples.
DC motor working principle, Back emf and its significance, torque equation. Types of D.C. motors, characteristics and applications. Necessity of a starter for DC motor. Illustrative examples on back emf and torque.
7 Hours
UNIT-6
6. Transformers: Principle of operation and construction of single-phase transformers (core and shell types). emf equation, losses, efficiency and voltage regulation (Open Circuit and Short circuit tests, equivalent circuit and phasor diagrams are excluded). Illustrative problems on emf equation and efficiency only.
7 Hours
UNIT-7
7. Synchronous Generators: Principle of operation. Types and constructional features. emf equation. Concept of winding factor (excluding derivation of distribution and pitch factors). Illustrative examples on emf. equation.
6 Hours
UNIT-8
8. Three Phase Induction Motors: Concept of rotating magnetic field. Principle of operation. Types and Constructional features. Slip and its significance. Applications of squirrel - cage and slip - ring motors. Necessity of a starter, star-delta starter. Illustrative examples on slip calculations.
6 Hours

ELEMENTS OF MECHANICAL ENGINEERING

PART – A
UNIT-1
Energy and Steam
Forms, Sources and Classification of energy. Utilization of energy with simple block diagrams. Steam formation. Types of steam. Steam properties – Specific Volume, Enthalpy and Internal energy. (simple numerical problems) Steam boilers – classification, Lancashire boiler, Babcock and Wilcox boiler,

Boiler mountings, Accessories, their locations and applications. (No sketches for mountings and accessories)

7 Hours

UNIT-2

Turbines

Steam turbines – Classification, Principle of operation of Impulse and reaction. Delaval's turbine, Parson's turbine. Compounding of Impulse turbines.

Gas turbines – Classification, Working principles and Operations of Open cycle and Closed cycle gas turbines.

Water turbines –Classification, Principles and operations of Pelton wheel, Francis turbine and Kaplan turbine

7 Hours

UNIT-3

Internal Combustion Engines

Classification, I.C. Engines parts, 2/4 – Stroke Petrol and 4-stroke diesel engines. P-V diagrams of Otto and Diesel cycles. Simple problems on indicated power, Brake power, Indicated thermal efficiency, Brake thermal efficiency, Mechanical efficiency and specific fuel consumption.

6 Hours

UNIT-4

Refrigeration and Air conditioning

Refrigerants, Properties of refrigerants, List of commonly used refrigerants. Refrigeration - Definitions - Refrigerating effect, Ton of Refrigeration, Ice making capacity, COP, Relative COP, Unit of Refrigeration. Principle and working of vapor compression refrigeration and vapor absorption refrigeration. Principles and applications of air conditioners, Room air conditioner.

6 Hours

22

PART – B

UNIT-5

Lathe and Drilling Machines

Lathe - Principle of working of a centre lathe. Parts of a lathe. Operations on lathe - Turning, Facing, Knurling, Thread Cutting, Drilling, Taper turning by Tailstock offset method and Compound slide swiveling method, Specification of Lathe.

Drilling Machine – Principle of working and classification of drilling machines. bench drilling Machine, Radial drilling machine. Operations on drilling machine -Drilling, Boring, Reaming, Tapping, Counter sinking, Counter boring and Spot facing. Specification of radial drilling machine.

7 Hours

UNIT-6

Milling and Grinding Machines

Milling Machine – Principle of milling, Types of milling machines. Principle & working of horizontal and vertical milling machines. Milling Processes - Plane milling, End milling, Slot milling, Angular milling, Form milling, Straddle milling and Gang milling. Specification of universal milling machine.

Grinding Machine – Principle and classification of Grinding Machines. Abrasives- Definition, Types and applications. Bonding materials. Type of Grinding machines, Principle and working of surface grinding, Cylindrical grinding and Centerless grinding.

7 Hours

UNIT-7

Joining Processes, Lubrication and Bearings

Soldering, Brazing and Welding

Definitions. Classification and method of Soldering, Brazing and welding and differences. Brief description of arc welding and Oxy-Acetylene welding

Lubrication and Bearings

Lubricants-Classification and properties. Screwcap, Tell-Tale, Drop feed, Wick feed and Needle lubricators. Ring, Splash and Full pressure lubrication. Classification of bearings, Bushed bearing, Pedestal bearing, Pivot bearing, Collar bearings and Antifriction bearings.
6 Hours
23
UNIT-8
Power Transmission
Belt Drives - Classification and applications, Derivations on length of belt. Definitions - Velocity ratio, Creep and slip, Idler pulley, stepped pulley and fast & loose pulley.
Gears - Definitions, Terminology, Types and uses. Gear drives and
Gear Trains – Definitions and classifications, Simple problems.
6 Hours

Elements of Civil Engineering

PART - A
UNIT-1
1. Introduction to Civil Engineering, Scope of different fields of Civil Engineering - Surveying, Building Materials, Construction Technology, Geotechnical Engineering, Structural Engineering, Hydraulics, Water Resources and Irrigation Engineering, Transportation Engineering, Environmental Engineering.
Infrastructure: Types of infrastructure, Role of Civil Engineer in the Infrastructural Development, Effect of the infrastructural facilities on socio-economic development of a country.
4 Hours
2. Roads: Type of roads, Components and their functions.
2 Hours
3. Bridges and Dams: Different types with simple sketches.
1 Hour

A) Basic concepts in major subject such as Fluid Mechanics, Water resource Engineering. Structural Engineering Transportation Engineering Geo – Technical Foundation Engineering, Quantity surveying .
B) Various Civil Engineering Structures, Their uses & types such as bridges, Dams, Canals, ESR, GSR,
Unit –II
05 Hrs.
(Marks : 5)
Chain tape correction for absolute length , Compass, Bearings, W.C.B. & R.B. system, local attraction, its detection and correction.
Unit –III
05 Hrs.
(Marks : 5)
Vertical Measurements :- Definitions , Bench Marks their types, Leveling Instruments calculation of, R.L. Line of collim
Unit –IV
05 Hrs.
(Marks : 10)
A) Types of structures, load bearing, farmed and composite structure, Industrial structures, Principal of planning for Residential & Industrial Buildings
B) Rules and Regulations Regarding height of Building, Set Back, Building Line, F.S.I / F.A.R. foundations and its board classification, and introductions to various parts of superstructures

Unit –V
05 Hrs.
(Marks : 10)
Engineering properties and used of stone, bricks, lime, cement, mortar and – concrete, tiles, timber, Steel, aluminum, glass, tar, and bitumen, rubber, plastic.

Term Work.

- **Chaining and ranging a line with location sketches and stations**
- **Observation of bearing and calculation of included angles.**
- **Levelingby rise and fall or collimination method.**
- **Five Assessments one based on each unit**

TODO: Add the above incomplete details from VTU website/ Syllabus Book

Engineering Mechanics

UNIT -2
4. Introduction to Engineering mechanics: Basic idealisations - Particle, Continuum and Rigid body; Force and its characteristics, types of forces, Classification of force systems; Principle of physical independence of forces, Principle of superposition of forces, Principle of transmissibility of forces; Newton's laws of motion, Introduction to SI units, Moment of a force, couple, moment of a couple, characteristics of couple, Equivalent force - couple system; Resolution of forces, composition of forces; Numerical problems on moment of forces and couples, on equivalent force - couple system.
7 Hours
UNIT -3
5. Composition of forces - Definition of Resultant; Composition of coplanar - concurrent force system, Principle of resolved parts; Numerical problems on composition of coplanar concurrent force systems.
3 Hours
16
6. Composition of coplanar - non-concurrent force system, Varignon's principle of moments; Numerical problems on composition of coplanar non-concurrent force systems.
5 Hours
UNIT -4
7. Centroid of plane figures; Locating the centroid of triangle, semicircle, quadrant of a circle and sector of a circle using method of integration, Centroid of simple built up sections; Numerical problems.
6 Hours
PART - B
UNIT -5
8. Equilibrium of forces - Definition of Equilibrant; Conditions of static equilibrium for different force systems, Lami's theorem; Numerical problems on equilibrium of coplanar – concurrent and non concurrent force systems. **6 Hours**
UNIT -6
9. Types of supports, statically determinate beams, Numerical problems on support reactions for statically determinate beams and analysis of simple trusses (Method of joints and method of sections).

6 Hours
UNIT -7
10. Friction - Types of friction, Laws of static friction, Limiting friction, Angle of friction, angle of repose; Impending motion on horizontal and inclined planes; Wedge friction; Ladder friction; Numerical problems.
6 Hours
UNIT -8
11.Moment of inertia of an area, polar moment of inertia, Radius of gyration, Perpendicular axis theorem and Parallel axis theorem; Moment of Inertia of rectangular, circular and triangular areas from method of integration; Moment of inertia of composite areas; Numerical problems.
6 Hours

TODO: Add missing data

Engineering Drawing

1. Introduction to Computer Aided Sketching
Introduction, Drawing Instruments and their uses, BIS conventions, Lettering, Dimensioning and free hand practicing.
Computer screen, layout of the software, standard tool bar/menus and description of most commonly used tool bars, navigational tools. Co-ordinate system and reference planes. Definitions of HP, VP, RPP & LPP. Creation of 2D/3D environment. Selection of drawing size and scale. Commands and creation of Lines, Co-ordinate points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints viz. tangency, parallelism, inclination and perpendicularity. Dimensioning, line conventions, material conventions and lettering.
12 Hours

2. Orthographic Projections
Introduction, Definitions - Planes of projection, reference line and conventions employed, Projections of points in all the four quadrants, Projections of straight lines (located in First quadrant/first angle only), True and apparent lengths, True and apparent inclinations to reference planes (No application problems).
12 Hours
3. Orthographic Projections of Plane Surfaces
(First Angle Projection Only)
Introduction, Definitions–projections of plane surfaces–triangle, square, rectangle, rhombus, pentagon, hexagon and circle, planes in different positions by change of position method only (No problems on punched plates and composite plates).
12 Hours
4. Projections of Solids
(First angle Projection only)
Introduction, Definitions – Projections of right regular tetrahedron, hexahedron (cube), prisms, pyramids, cylinders and cones in different positions (No problems on octahedrons and combination solid).
24 Hours
25
5. Sections And Development of Lateral Surfaces of Solids
Introduction, Section planes, Sections, Section views, Sectional views, Apparent shapes and True shapes of Sections of right regular prisms, pyramids, cylinders and cones resting with base on HP. (No problems on sections of solids)
Development of lateral surfaces of above solids, their frustums and

truncations. (No problems on lateral surfaces of trays, tetrahedrons, spheres and transition pieces).
12 Hours
6. Isometric Projection (Using Isometric Scale Only)
Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric projection of tetrahedron, hexahedron(cube), right regular prisms, pyramids, cylinders, cones, spheres, cut spheres and combination of solids (Maximum of three solids).
12 Hours

TODO: Check if complete

Additional Mathematics

Additional Physics

Additional Chemistry

Physics lab(Check if complete)

Sub Code : 10 PHYL17/10 PHYL27 IA Marks : 25
Hrs/ Week : 03 Exam Hours : 03
Total Hrs. : 10 (To be completed) Exam Marks : 50
EXPERIMENTS :
1. Series & Parallel LCR Circuits.(Determination of resonant frequency & quality factor)
2. I-V Characteristics of Zener Diode.(determination of knee voltage, zener voltage & forward resistance)
3. Characteristics of a Transistor.(Study of Input & Output characteristics and calculation of input resistance, output resistance & amplification factor)
4. Photo Diode Characteristics.(Study of I-V characteristics in reverse bias and variation of photocurrent as a function of reverse voltage & intensity)
5. Ultrasonic Interferometer (Measurement of velocity of sounds in solids/liquids).
6. Dielectric constant (Measurement of dielectric constant).
7. Magnetic properties (Study of retentivity and coercivity by B-H graph method).
8. Diffraction (Measurement of wavelength of laser / Hg source using diffraction grating).
9. Planck's constant (Using the principle of photoelectric effect/LED's).
10. Electrical Resistivity (Determination of resistivity in semiconductor by Four probe method).
11. Verification of Stefan's law.
12. Determination of Fermi energy.(Measurement of Fermi energy in copper)
13. Uniform Bending Experiment.(Determination of Youngs modulus of material bar)
14. Newtons Rings.(Determination of radius of curvature of planoconvex lens)

Chemistry lab

Sub Code : 10CHEL17/10CHEL27 IA Marks : 25
Hrs/ Week : 03 Exam Hours **: 03**
Total Hrs. : 42 Exam Marks : 50
PART – A

1. Potentiometric estimation of FAS using standard K2Cr2O7 solution
2. Colorimetric estimation of Copper
3. Conductometric estimation of an Acid mixture using standard NaOH solution
4. Flame Photometric estimation of Sodium and Potassium in the given sample of Water
5. Determination of pKa of a weak acid using pH Meter
6. Determination of Viscosity co-efficient of a given liquid using Ostwald's Viscometer.

PART – B

1. Determination of Total Hardness of a sample of Water using Disodium salt of EDTA.
2. Determination of CaO in the given sample of Cement by Rapid EDTA method.
3. Determination of Percentage of Copper in Brass using standard Sodium thiosulphate solution.
4. Determination of Iron in the given sample of Haematite ore solution using Potassium dichromate Crystals by external indicator method.
5. Determination of COD of the given Industrial Waste water sample.
6. Determination of Total Alkalinity of a given Water Sample using standard Hydrochloric acid.

Electrical lab

Mechanical Engineering lab

Civil Engineering lab

Workshop

Sub Code : 10 WSL 16/ 10 WSL 26 IA Marks : 25
Hrs/ Week : 03 Exam Hours : 03
Total Hrs. : 42 Exam Marks : 50

1. Fitting

i. Study of fitting tools
ii. Study of fitting operations & joints
iii. Minimum 5 models involving rectangular, triangular, semi circular and dovetail joints.

2. Welding

iv. Study of electric arc welding tools & equipments
v. Minimum 4 Models- electric arc welding-Butt joint, Lap joint, T-joint & L-joint.

3. Study and demonstration of Sheet metal and soldering work.
4. Study & demonstration of power Tools in Mechanical Engineering

Scheme of Examination:
Fitting 30 Marks
Welding 10 Marks
Viva Voce 10 marks

BE II year

Mathematics –II

Number of periods: 4 hours per week, max marks: 100 exam duration 3 hours

Section-A

Calculus

Partial Differentiation – Euler's theorem, Total differentials – Differentiation of composite and Implicit functions – Applications to Errors and Approximations

Taylor's Theorem for a function of two variables- Extreme values of a function of two variables – Lagranges method of undetermined multipliers, Multiple integrals- Change of order of Integration in a double Integral, Change of co-ordinates – Jacobians- Beta Gamma functions, Differentiation under the Integral sign Elementary treatment without proof of theorems) – 25 hrs

Vector Calculus

Scalar and Vector points functions – Differentiation, Partial Differentiation of scalar and vector point functions, Gradient, Divergence and Curl- Formulae for products of points function, Line and Surface integrals, Divergence and Stoke's theorem and applications – 20 Hrs

Section –B

Differential Equations

Formation, Various methods of solutions of Ist Order and Ist Degree equations, Linear differential equations with Constant co-efficients, applications to L-R-C circuits, Homogeneous Linear equations, Simultaneous Linear equations. – 20 hrs

Fourier series

Periodic functions, Eule's formula, Fourier series for even, odd functions of arbitrary periods, Half range expansions, Practical harmonic analysis. – 10 hrs

Matrices

Various types of matrices- Addition and Multiplication, Transpose, Adjoint, Inverse and Rank, Application to solutions of Linear simultaneous equations. – 10 hrs

Section – C

Operational method and elementary notion of special functions

Definition of Laplace transform and inverse transform of simple functions, application to solution of differential equations- Heavyside's unit step function and Direca Delta function and their transform, Simple applications to electric circuits, control systems and feedback theory

Infinite series, definition of Jn(x) and Pn(X) – their values for positive integral ‘n’. 14 hrs

Complex Analysis

Uniform functions of complex variables- Analytic function conformal mapping, Bilinear, Exponential, Sine and Cosine mappings. – 13 hrs

CIRCUIT THEORY

Section 1

Introduction

Circuit variables, RLC parameters and sources, conventions for describing networks.

Network topology: Classification of networks, branches, nodes, graph tree, tie-set and cut-set schedules – 10 hrs

Network equilibrium equations

Formulation of equations on the basis of loop current and node voltages, solution of circuit equations using matrix methods – 4 hrs

Reduction of Networks and Theorems

Star-Delta conversion, Bridged-T and Lattice Networks, Super-position reciprocity, Thevenin’s, Norton, Millman’s and maximum power transfer theorems, Source transformations, driving point and transfer impedance, Dcality – 12 hrs

Transient response of simple networks

Laplace transforms- basic theorems and properties, Transforms of standard signals- step, exponential, pulse, impulse, ramp, sinusoidal and periodic functions.

Step and impulse response of simple RLC circuits. Response of RLC Circuits to non sinusoidal periodic waveforms. - 14 hrs

SECTION II

Network functions

Driving point impedence and admittance,transfer functions, two-port network parameters- Z,Y,H and transmission parameters and their interrelations; poles and zeros of network functions, restrictions on their locations; time domain behaviour from pole zero plot; network stability, RH criteria - 6 hrs

Sinusoidal steady analysis

AC Sinusoidal voltages and current phase of notation, solution of simple RLC series and parallel circuits using complex and exponential notations, power and energy considerations, frequency and magnitude scaling.

Resonance

Series and parallel resonance conditions and frequency response, Q factor, BW, universal resonance curves. Resonance present in both brances of parallel circuits, antiresonance at all frequencies, variable phase angle circuits, First and second order contic forms of Foster and Cauer reactance networks. – 8hrs

Coupled Circuits

Self and mutual inductance in frequency and time domain, coefficient of coupling, image impedence, transformers- ideal and real; single and double tuned circuits, BW and selectivity considerations – 6 hrs

Resistance attenuators

Analysis of symmetrical lattice, T, Pie, Twin T networks, cascading of attenuators - 4 hrs

ELECTRONIC CIRCUITS – I

Section –I

Electron Dynamics

Motion of charged particles in an electronic and magnetic field. Influence under simultaneous electromagnetic fields. - 5 hrs

Application in electron devices- CR tubes, construction features, electron guns, Electrostatic and magnetic deflection and focussing of electron beams; various aberralins, phosphorous electrode, Potentials and limitations. - 4 hrs

Storage type CRTS: Brief ideas of storage type CRT. - 1hr

Rectifiers and Filters

Rectifiers: Half wave, Full wave and Bridge rectifiers- Constructional features of different types of rectifiers and their applications – 3 hrs

Filters: Capacitance input, Inductance input, L and ∏ sections, their characteristics, regulation and ripple factor and their design considerations - 4hrs

Polyphase rectifiers: Brief ideas – 1hr

Voltage regulators

Regulators – VR tube and Zener diode regulators, their characteristics and limitations, Electronic voltage regulators and their design considerations.

Brief introductory ideas about IC regulator chips and their applications, Potential – 1 hr

Biasing and Thermal stabilisation

Way bias stabilisation, Operating point - 1hr

Methods of biasing and their analysis- Emitter degenerative feedback, Voltage feedback, Current feedback, Combination of Voltage and Current Feedback, Comparison of various schemas – 5 hrs

Thermal stability: Thermal runaway and protections – 2 Hrs

Small signal united amplifier

Basic transistor amplifier, classification, Common Base, Common Emitter, Common Collector configurations.

FET amplifier, CS, CG, CD Configurations.

Analysis and design considerations of transistor amplifiers, R-C, L-C, transformer and direct couplings, frequency response distortion, G.B.W products.

Cascading of amplifiers

Broadband amplifiers, low and hi frequency compensation, practical application, - 4 hrs

Small signal tuned RF amplifiers

Analysis and Design of Single, Double and Stagger tuned amplifiers, frequency response, stability and neutralisations -- 8 hrs

Video amplifiers - 1 hr

Audio Power amplifiers

General Configurations: Class A, Class B and Class C amplifiers. - 1 hr

Class A Single ended amplifiers: Different configurations and their limitations

Push Pull amplifiers: Class A, Class AB and Class B amplifiers, Phase inverters - 2 hrs

Feedback amplifiers

Concepts of feedback, voltage and current feedbacks - 2hrs

Effects of negative feedback on gain bandwidth and input resistance, distortion and noise considerations – 2hrs

Stability and compensation, criteria of stability gain and phase margin – 2hr

Various Feedback configurations and their performance factors - 3 hrs

Feedback in cascaded amplifiers - 1 hr

Sinusoidal oscillators

Loopgain and Bark hausen criteria - 1 hr

Analysis and design aspects of:

- L.C. Oscillators, tuned collector,tuned base colpitts, Hartly and Clapp oscillators – 2hr
- R.C. Oscillators: Phase shift and Wien bridge oscillators - 2hrs
- Crystal oscillator – 1 hr

Practical considerations and synchronisation in oscillators

ELECTRO MAGENTIC THEORY

Section – I

Vector Analysis and Co-ordinate transformation

Scalars and Vectors, Vector algebra, Cartesian Coordinate systems, Vector components, unit vectors and fields, Vector Operations, Dot and Cross Product in rectangular, cylindrical and spherical co-ordinate systems, transformation between co-ordinate systems, Vector identities and Physical interpretation of vector operations – 10 hrs

Electrostatics

Coulomb's law, Electric field intensity, Field due to several points charges and superposition principle, field due to a Continuous charge distribution, a linear chargesheet of field, Gauss's law and applications-electric flux, Flux density, Divergence theorem, Energy and Potential energy considerations in moving point charge in a field line integral, potential field of a point charge and system of charges, conservative property, dipole and energy density in electrostatic fields. Equipotential lines and surfaces, current density induced charge, dielectrics and polarization,

boundary conditions, capacitance energy stored in a capacitor, Possion's and Laplace's equation solutions in the three co-ordinate systems – 20 hrs

Magnetostatics

Magnetic flux,flux density, magnetic intensity, magneto motive force and energy stored in inductance, mutual inductance,Ampere's work law, Stoke's theorem- magnetic vector potential boundary conditions – 10 hrs

Section 2

Time varying fields

Faraday's law, displacement current, Maxwell's Hypothesis and equation in point and integral from related potentials, boundary conditions, comparison of B and H field relations, interrelation between field theory and circuit theory, Maxwell's equations- applications and comparison of Maxwell's equations, free space and harmonically time varying fields – 18 hrs

Plane wave

Wave equations in free space, perfect dielectric medium, lossy dielectrics, polarisation of plane waves in conducting media, Skin effect, surface impedance and boundary conditions, energy relations in travelling waves, poynting vector, considerations in good conductors – 12 hrs

Reflection and refraction of plane waves

Reflection of normally incident plane waves from conductors and dielectrics. Voltage standing waves, S.W.R. Linearly polarised and elliptically polarised planewaves, Oblique incidence, Huy-gen's principle and concepts of physical optics in ECM wave theory - 10 hrs

ELECTRON DEVICES

Section - I

Electronic materials

Electronic properties of dielectrics – polarisation, permittivity, losses and breakdown. Baic ideas of organic and inorganic dielectrics, magnetic materials, magnetisation, dia, para,ferro, anti ferro and ferric magnetism, magnetostriction, properties of hard and soft magnetic materials, Alloys, Magnetic dielectrics and ferrites. Electrical and Electronics engineering applications of magnetic and dielectric materials, Preparation of different types of resistors, capacitors, transformer cores, ferrite cores and deflection yokes – 10 hrs

Electron emission

Types of emission, Thermionic emission, photo, secondary and field emission, different types of emitters used in electron devices, their characteristics and applications – 6 hrs

Electrical conduction in solids

Modern atomic physics, concepts and wave equations, energy band theory, Fermi level, work function, conduction and band theory classification of solids – 6 hrs

Semiconductors

Germanium and Silicon crystal structure and their properties, crystal growing techniques, photon, phonon electron and hole defects and impurities, Intrinsic and extrinsic semiconductor, carrier concentration, donor and acceptor impurities, life time of carriers, Continuity equation. Mobile and immobile carriers, Hall effect, contacts and junctions, metal to metal , metal to semiconductor and ohmicontacts. Measurement of semiconductor parameters – resistivity, Drift and Hall mobility, life time of carriers, PN Junction – methods of preparation of different types of junctions, energy band diagram of junctions with and without applied bias, junction capacitance and current flow across a junction, diode current equation, solution of continuity equation with and without bias temperature, dependency of junction characteristics, reverse bias and break down mechanism, diode resistance, junction switching parameters and characteristics

SECTION –II

Transistors

BJT(NPN and PNP transistors) action, current flow and their relations (Ebbers Moll equation), basic transistor parameters and their characteristics. Transistor as a network element, small signal z,y, and h parameters and their interrelationships, Hybrid –Pie, common emitter mode equivalent circuit and parameters from transmission line analogy and their relationship with low frequency h parameter and GBW product. FETs – Junction field effect transistor (JFET) fabrication, volt ampere characteristic, small signal model parameters, MOSFET fabrication of different types of modes and their characteristics. Different configurations of BJTs and FETs viz. CB,CE, CC and CG,CS,CD. Comparison of Unipolar Vs Bi polar transistors – Different Configuration and their frequency response, characteristics, transistor switching – storage of switching effects, steady state sitching characteristics, power transistor, thermal considerations.

Special Devices

Brief idea of constructional details, their characteristics and performance factors, UJTs, Four layer diodes,SCR tunnel diodes, zener diodes, Schottkey devices, varistors, thermistors, diacs, triacs,thyratrons and ignitrons, photo tubes, multiplier tubes, phto diodes,photo transistors, display devices – LED, LCD, NIxia,CCD – 8 hrs

Integrated Circuit fabrication and characteristics

IC technology, Monolitihic IC fabrication – Epitaxial growth, Masking photolithiography, etching and diffusion,fabrication sequences, IC Components (active and passive), resistors, diodes,capacitors,bipolar and unipolar transistors,limitations and drawbacks –Isolation techniques, thin film, thick film and hybrid techniques of IC fabrication, Bipolar Vs Non-Monolithic IC fabrication,

IC Complexities, Levels of Integration – SSI,MSI,LSI, VLSI, brief ideas about latest trends in IC technology - 20 hrs

PCB design and Technology

Brief idea of PCB layout and art work, preparation and design - 4 hrs

LINE COMMUNICATION ENGINEERING

Section – I

Telegraphy

Telegraphic codes, instruments, single current and double current working, simplex and duplex circuits

Teleprinters

Basic principles of teleprinter operation, transmitting, receiving and printing mechanism, automatic answer back unit, Automatic working Teleprinter Key Board perforators , Transmitter and Reperfortor printer, Teleprinter testing equipment for distortion margin and speed. Telex-Teleprinter exchange systems - 10 hrs

Fascimile and picture transmission

General principles of scanning – photo cell and electron multipliers, synchronism and phase considerations, Index of cooperation, Reproduction process, Transmission of facsimile telegraphic signals, radio transmission methods, merits and demerits of facsimile transmission

Automatic telephony

Strowger switching: Telephone instruments- transmitters and receivers, local line signalling, Junction and Trunk signalling, principles of strowger automatic switching tones, signalling conditions, stop by stop selection.

Traffic and Service: Director and Non Director type exchanges, Traffic and trunking – traffic, Variations, Grade service, traffic meter and recorders – 20 hrs

Section – II

Carrier communication

Frequency allocations, bandwidth and channels, Modulation and demodulation circuits, carrier working different schemes, Multichannel VFT systems and their layout, Repeaters and Micro wave carrier systems. Layout of exchanges – distribution frames, metering, modernization and servicing considerations. Brief idea of optical fibre communication systems and power line communication systems – 20 hrs

Electronic exchanges

Principles and operation of electronic switching, concepts of stored programmes, concepts used in electronic exchanges, reliability and performance factors - 20 hrs

ELEMENTS OF COMMUNICATION THEORY

Section I

Fourier theory and spectra

Analogy between vectors and signals, orthogonal functions, Fourier series – discrete spectrum, Fourier transform, Properties of F.T and spectra. F.T Vs Laplace transforms, Milbert transform, Impulse of delta functions, power and energy spectral densities, Spectral analysis, Sampling theorem-sampling criteria, Reconstruction of sampled signals, practical sampling approximations – 10 hrs

Random signal theory

Probability, basic concepts of probability, classical and axiomatic formulation of probability theory, conditional probability, independent events, random variables, probability distribution and density functions. Some important discrete and continuous probability distributions. Random variables-Joint marginal and conditional probability distribution functions of random variables and random vectors, statistical moments, Independent and uncorrelated, random variables mean square estimation and correlation, Random processes – stationary auto correlation functions and power spectral density. Transformation of random variables – 25 hrs

Section II

Signal transmission through linear networks

Convolution theorem, frequency domain analysis, band pass networks, ideal transfer functions, matched filters input output relation with random inputs, noise bandwidth envelope of sinusoidal puls narrow and noise – 10 hrs

Noise and Interference

Atmospheric noise, shot noise, thermal noise, noise figure and its minimization in networks, experimental determination of noise figure, Noise in semi conductors and temperature limited diode.

Information theory

Concepts of information, unit of information entropy, information transmission, redundancy, efficiency, channel capacity, coding theory minimum redundancy, codes, continuous channels – 25 hrs

ELECTRICAL TECHNOLOGY

Section-I

Transformers

Types, Construction and principles of operation of single phase transformers, Vector diagrams, Approximate equivalent circuits, Losses, Efficiency and regulation of transformers, Open and short circuit tests, Coupling of transformers, 3 phase connection, star, delta, open delta and Scott connections, Auto transformers, Instruments transformers – 10 hrs

Induction motors

Rotation, Magnetic field in 3 phase stator winding, constructional details and principle of operation of 3 phase induction motor, slip, power flow. Relation between rotor power, input, rotor losses and rotor power developed, shaft power, torque and efficiency- approximate equivalent circuit diagram, torque slip characteristics, maximum torque and critical slip effect of rotor resistance. Methods of starting – star delta auto transformer starters and starters for slip ring motors. No load, locked , Roor Te's circuit diagram and equivalent circuit.

Principle of operation of single phase induction motors, split phase, capacitor start, capacitor run, repulsion start and shaded pole motors – 12 hrs

Synchronous machines

Synchronous generators- Types, Construction and principle of operation, 3 phase windings, EMF equation, distribution factor, pitch factor, vector diagrams – open and short circuit tests, Regulation by Synchronous impedance and MMF methods, Synchronising of alternators.

Synchronous motors: Principle of operation, Vector diagrams, Effect of excitation, V Curves and Inverted V Curves, Methods of starting - 10 hrs

Converters, SCR and power control

Principles of mercury arc rectifiers, types, construction and control, single phase and polyphase rectifiers

SCR controlled rectification, SCR triggering methods, Single phase, 3 Phase Bridge and double start circuits - 6 hrs

Section –II

Special machines

Construction and principle of operation of – Polyphase reluctance motor, Hystersis motor, Stepping motor, Scharge motor and Liner induction motor - 4 hrs

Electric Drives

Starting and load characteristic of DC and AC motors, speed control of DC motors by armature and field control, series and parallel method of speed control of series motors, L. W. And Leonard methods of speed control, speed control of 3 phase induction motor by changing poles, frequency and rotor resistance, speed control on cascading of induction motors – 10 hrs

Electric heating

Electric heating for Industrial purpose, Resistance ovens, Induction furnaces, High frequency heating, Arc furnace and Dielectric heating – 6 hrs

Electric welding

Principles of resistance welding, Metallic arc welding, their control and welding equipments – 4 hrs

Electroplating

Principles of electroplating, polarisation, factor affecting deposits, preparation of work for electroplating, power supply and control equipment. Special features for deposition of copper nickel, chromium, zinc and silver, extracting and refining of metals by electroplating processes, anodising, principles of methods

Illumination

Distribution and control of light, laws of illumination, levels of illumination, lightning calculations for domestic and factory illumination - 4 hrs

Electrical measurements and measuring instruments

Absolute and secondary instruments, effects and principle used in indicating recording and integrated instruments. Control and damping arrangements

Permanent magnet moving coil ammeter and voltmeter. Extension of ranges. Moving iron instruments and rectifiers. Type ammeters, voltmeters

Dynamometer type ammeter, Voltmeter and wattmeter, induction type wattmeter and energy meters. Alternating current bridge methods measuring resistance, inductance and capacitance.

ELECTRONIC CIRCUITS LAB

(Term work of 25 marks and practical exam of 50 marks and 3 hours duration)

Sl.No	**List of experiments**	**No of experiments**
1	Rectifiers, filters and regulators	3 experiments
2	Biasing	2
3	Small signal amplifiers	2
4	Tuned amplifiers	2
5	Feedback amplifiers	2
6	Oscillators	2
7	Carrier communication	1
8	Electronic switching	1
9	EM radiation	2
10	Teleprinters	1
11	Strowger exchange	1

DEVICES CIRCUIT LAB

(Term work of 25 marks and practical exam of 50 marks and 3 hours duration)

Sl.No	**List of experiments**	**No of experiments**
1	KCL, KVL, network transformations theorem	3 to 4
2	Resonance and coupled circuits	2
3	Attenuators	2
4	Diodes, Transistors, FETs	4
5	UJT, SCR, Photo diodes, Zener diode and other special devices	4
6	PCB layout and art work preparation work	1

ELECTRICAL TECHNOLOGY LAB

(Term work of 25 marks and practical exam of 50 marks and 3 hours duration)

Sl.No	**List of experiments**
1	Open circuit and Short Circuit tests on single phase transformer, finding losses, Efficiency and regulation
2	Study of transformer connections, Polarity and ratio tests on single phase transformer, connection of single phase transformer into delta star and scott connections
3	Load test on 3 phase induction motor
4	No load and locked rotor tests on 3 phase induction motor. I) Equivalent diagram ii) Circle diagram
5	Study of starters for 3 phase induction motors
6	Open circuit and Short Circuit tests on 3 phase alternator and calculation of regulation by i) Synchronous impedance method and by ii) MMF method
7	Synchronising of alternators
8	Curves and inverted V Curves of synchronous motors
9	Speed control of Induction motor by pole changing
10	Speed control of Induction motors by cascading
11	Measurement of inductance AC bridge method (Maxwell's bridge)
12	Measurement of capacitance by Desauty's bridge

PROGRAMMING PRACTICE

(Term work of 50 marks and practical exam of 75 marks and 4 hours duration)

Sl.No	**List of practice**	**Hours**
1	Programming techniques: The role of programming languages, steps involved in computer programming, problem definition phase, developing algorithms, flow charts and decision tables	6
2	Programming languages: i) Detailed study of Fortran –IV language ii) Detailed study of Hi Basic language	i) 25 ii) 15 iii) 14

	iii) Detailed study of Pascal language	
3	Numerical techniques used in programming: Solution of non-linear and transcendental equations, searching, Seant and Newton's methods, Solution of Simultaneous equation-elimination methods, interaction methods(Viz. Gauss Jordon, Cronts and Gauss-Seidal methods, Interpolation, finite differences, inverse interpolation, langernain interpolation, unique interval method and error analysis, numerical differentiation and integration, Gregory newton method Trapezoidal rule and Simpsons rule, solution of ordinary differentials, differential equation, Pricards, Taylors, Culers miline, Samming hamming and Runge Kutta methods. Application of Hi level language in writing programmes using various numerical techniques for various engineering applications	20

BE III year

LINEAR CONTROL THEORY

Section-I

Introduction

Basic elements of feedback control systems, types of control systems, simple illustration of control systems- speed, voltage, position, pressure, temperature etc. - 4 hrs

System modelling

Electrical and mechanical networks, electrical analogous systems, transfer functions, Block diagrams, signal flow graphs, Mason's gain formula – 8hrs

State space analysis of control systems

Introduction to state space concept, state equation of control systems – matrix representation. Solution of state equations for linear control systems – 10 hrs

Time domain analysis

Typical test signals, order of the system, step input response of second order system, performance characteristics and specifications. Effect of amplifier gain, derivative and integral control on the response. Routh- Hurqitz stability criteria.

Steady state – static error co-efficients, dynamic error coefficients, error criteria, system optimization- 18 hrs

Section – II

Frequency domain analysis

BODE,NYQUIST and Nicol's plots, Nyquist stability criteria- relative stability and absolute stability, correlation between frequency and time response- frequency domain specifications. Conditionally stable systems, M and N circles, Closed loop frequency response.

Root locus method of analysis

Definition, construction of root loci, properties, evaluation of transient, frequency response and stability of control systems, root contours – 10 hrs

Compensation

Design considerations of control systems, lag lead, laglead cascade compensation by using bode plots – 5 hrs

Control system components

Amplifiers- electronic, magnetic, hydraulic, pneumatic, comparators- potentiometers, synchro pair modulators and demodulators, controllers – dc, ac and hydraulic servo-motors,Amplidyne, Tachometers – 10 hrs

ELECTRONIC CIRCUIT – II

SECTION – I

Switching characteristic of devices

Steady state behaviour: PN Diodes, I-V Characteristics and cut-in voltage, Zener diode, I-V Characteristics and their temperature dependence, piece-wise linearization of a diode characteristics. Transistor as a switch, cut off and saturation condition, junction break down voltage, temperature dependence of switching parameters – 5 hrs

Transient behaviour: Diode forward and reverse recovery time, storage and transistor times, minimizing storage time. Transistor switching times – delay time, rise and fall times. Charge control analysis of rise and fall times and their measurements - 4 hrs

Wave shaping

Linear wave shaping: High pass and low pass RC circuits and their response to different types of inputs. RC alternators- response to step input and compensation. R.L and R.L.C circuits – response and ringing circuits. Pulse transformers and delay lines in linear wave shaping applications, rise time and pulse response: electro magnetic delay lines – transmission and reflection of pulse wave forms and transmission – 5 hrs

Non linear wave shaping: chipping and temperature compensation. Comparators- diode and amplifiers, comparators and their applications. Clamping transient and steady state response.

Clamping circuit theorems, base circuit clamping of transistor switch, synchronised clamping, overdriven amplifier, transistor switch wire capacitive and inductive load and response. Diode clamping, collector clamping and non saturated switching – 8 hrs

Logic circuits

Logic levels, necessity of positive and negative logic, brief ideas and scope of logic circuits. Primitive and Universal logic operations. Boolean algebra theorems and identities, brief idea of realising the primitive logic gates using diodes and transistors; logic circuit conversion theorems, Brief idea of different logic families viz. RTL, DCTL, DTL and TTL families, diode matrices and decoders – 6 hrs

Multi vibrators

Bistable multivibrators- analysis and design of fixed and self bias binaries; unsymmetrical and symmetrical triggering, Direct coupled binary, schmit triggers, emitter coupled binary.

Monostable multivibrators (MMV) – analysis and design of collector and emitter couples MMV, gate width control and effect of bias emitter coupling MMV as voltage to time converter.

Astable multi vibrator analysis and deign of collector coupled, emitter coupled multies.

Operation of negative resistance devices viz. Tunnel diode, UJT, SCR for bistable, monostable and astable operations.

Section –II

Sweep Circuits

Voltage and current sweeps – analysis and design of voltage sweeps, linearization of voltage sweeps using constant current sources. Bootstrap and miller integrator circuits, phantastron circuit, current sweep linearization techniques, Applications of voltage and current sweeps. - 2 hrs

Blocking oscillator

Base timing and emitter timing blocking oscillators. Methods of controlling the pulse duration - 4hrs.

Counter and registers

Flip-flop as a storage element – RS, JK, MSJK,D type flip flops, cascading of flip flops for counting, counters using BJT, tunnel diode, UJT and SCR circuits. Divide by N counting, Sealing and feedback schemes, state diagrams and ring counters, Gas filled (dekatron) counter tubes. Basis principle of shift register – right and left shift operations and circulating registers, synchronization and frequency division in relaxation circuits, sinewave synchronisation – 10 hrs

Data converters

A/D Converters: Basic V/F converter, astable multivibrator converter, analog integrator convertor. V/T convertor – Bootstrap timer converter, single slope and dual slope converters, Qiuerate voltage comparison converters – 9 hrs

D/A Converters: Basic D/A converters, Bipolar D/A converter, High accuracy D/A Converter and sources of error, A/D converter using D/A converter –counter ramp, continuous counter ramp and successive approximation A/D converters, D/A converter application – 9 hrs

ELECTRONIC CIRCUITS – III

Section – I

Large signal amplifiers

Classification and general considerations, biasing of power transistors and thermal considerations. Analysis and design of Class A power amplifiers (CB, CE, CC circuits) shunt fed, transformer coupled configurations, load line, efficiency, power output ,power dissipation and distortion considerations, Class A Push pull power amplifiers, Analysis and design of Class B (CB, CE, CC) push pull amplifiers- efficiency ,power dissipation, power output, cross over distortion and reduction of nonlinear and amplitude distortion, impedance matching phase inverters, Complementary symmetry and single ended Class B circuits, Driver stages and driverless class B circuits, Integrated circuit power amplifiers (viz CA 3020, CA 2020)

Brief idea of vacuum tube power amplifiers (class A, B, class AB, configuration- circuits), equivalent circuits, criteria of device selection etc. - 10 hrs

Tuned RF power amplifiers (Vacuum tube circuits)

Analysis and design of Class B tuned power amplifiers- successive approximation and semigraphical analysis, power output, plate circuit efficiency, tank circuit efficiency, analysis and design of Class C power amplifier- semigraphical analysis, design criteria of tuned circuit,practical adjustments of triode, screen grid and beam power tube circuits, special considerations of modulated Class C power amplifiers and typical circuit configurations for plate , grid, cathode and screen grid modulated power amplifiers, cooling techniques, harmonic generation.

Limitation of transistors RF power amplifiers and design considerations – 10 hrs

Voltage regulators

Using DC amplifiers, analysis of series and switching regulators, Monolithic IC regulators, Simple commercial voltage regulator (Viz MC 7800 series/ CA 3085) high current, negative voltage with foldback current limiting, switching high voltage regulation and precision voltage regulation – 5 hrs

Linear circuits (Discrete and integrated circuit versions)

Micropower amplifiers: Micro power operation and broadband amplifiers- cascade and paraphrase (differential, complementary differential) amplifiers (using bipolar /Unipolar transistors) and gain bandwidth considerations and comparison with single CE transistor amplifier) – 5 hrs

Section – II

Direct coupled amplifiers

Analysis and design of (FET/BT) of differential amplifiers- equivalent circuit, common mode and differential mode gains, transfer characteristics, CMRR, Input and Output impedances, High performance amplifiers using current source biased and current mirror connections, super alpha-gm-multiplier, dynamic load connections, drift problems – analysis of input error signals, thermals, drift and compensation in differential amplifiers – 10 hrs

Operational amplifiers

Ideal op-amp characteristics, cascading of differential amplifier, input/output stages and level translator, multi stageOp-amps. Frequency response and stability- frequency and phase compensation techniques. Some commercial Op amps (A741, MC 1530,A 709, CA3033) circuit details and features. Measurement of Op-amp parameters - 12 hrs

Applications of Op-Amps

Inverting, Non inverting,differential mode and bridge amplifiers, Differentiator, Interator line drives, coupled amplifiers: V to I, I to V converters, regulators using OP Amp.

Communication application

Cascade amplifier(CA 3028 A/MC 1550) for video, RF, amplitude modulation, ACC applications, phased lock loops- brief study of PLL system, application of PLL for Am/FM detectors.

FSK decoders and frequency synthesis, commercial PLL (NE 565 and 566 circuits) Analog multipliers – 15 hrs

Non linear circuit applications

OP amp feedback limiters using diodes, zener diodes, diode function generators, log/antilog amplifiers, analog multipliers, dividers, brief concepts of active filters, sampe and hold circuits, peak detectors, comparators, zero crossing and level detectors. Wave form generators- square, triangle, pulse function generators, sine wave oscillators, mono stable multivibrators using Op-Amps – 13 hrs

SWITCHING THEORY AND LOGIC CIRCUITS

Section-I

Review of set relation, lattices and algebra concepts, Overview of switching theory and logic circuits – 2 hrs

Switching theory

Switching algebra and its applications

Switching algebra, switching functions, propositional calculus and gates, Boolean algebra – postulates and interpretation, use of Venn diagrams, fundamental theorems and their use, interpretation using truth tables, simplification of Boolean functions, Canonical Sum of product(SP) and Product of Sum (PS) forms, theorems of Boolean functions, elementary terms and functions,

Boolean functions of one two variables, different logic operations and standard symbols, synthesis of switching networks, logic levels, symmetrical Boolean functions, minimization and decomposition of switching networks,Karanugh veitch map method, don't care terms, hazards in switching networks, Quine-McClucky methods, Hardward chart method and machine limitations. Functional decomposition – N, AND, NOR synthesis, tabular minimization of multiple output circuits – 20 hrs

Introduction to sequential circuits

Mealy and Moore models, state diagrams, state tables, flow tables and their reduction, state assignment and excitation maps, analysis of memory elements, pulse and level mode asynchronous sequential circuits, pulse and level mode synchronous sequential circuits, brief ideas of synthesis of sequential circuits – 10 hrs

Section – II

Logic circuits

Logic families: Bipolar logic, Analysis of DCTL, RTL gates, transfer characteristics and performance factors viz. Calculation of fan-out, propagation delay, noise margin, speed power product, wired operation. Analysis DTL, HTL gates- transfer characteristic and performance factors. Analysis of TTL gates – transfer characteristics and performance factors, Low power and Schotlky TTL gates, wired operations and loading rules, Analysis of ECL gates – transfer characteristic and performance factors, level translation and versatility, MOS and CMOS logic: Analysis of MOS and CMOS gates- inverter and its transfer characteristics, rise and fall time. Interfacing Bipolar and CMOS gates, Comparison of Logic families 18 hrs

Designing with TTL integrated circuits

5474 series – NAND, NOR, OR, AND, Ex-OR gates, AOI, expanders, open collector gates and wired operations, Schmitt NAND and their loading rules, Expanded range and noise considerations- noise types, shielding, grounding and coupling, transmission and reflections, 54.74 series Flip-flops- RS, JK, JKMS, D type flip flops- characteristics and their applications, Decoders and arithmetic units, 54/74 series counters, ripple counters, synchronous counters, counter implementation and applications, shift registers, MOD-N counters and ring counters, multiplexers and demultiplexers – 15 hrs

Semiconductor memories

Shift registers and sequential memories, MOS shift registers, dynamic shift registers, 2 phase and 4 phase clocking, CMOS shift registers, read only memories (ROM), implementation of ROMs, PROM and EPROMs and their application. Random access memories (RAM) – RAM cell, Bipolar RAM cell, MOS-RAM and RAM organization, Brief ideas of CCDS, their working and applications.

NETWORK AND TRANSMISSION LINES

Section –I

Networks

Two terminal network synthesis

Reactance networks, separation property, forms of reactance functions, Foster and Cauer forms, synthesis of RL, RC and LC networks - 6 hrs

Four terminal networks

Equivalence theorem, Equivalence networks, star-delta transformation, Duality concepts and dual networks, Inverse network, LTH lattices, Bridged-T, Twin network, Network parameters, parameter conversion, Ladder to Lattice conversion, Bartlett bisection theorem, Matching section, Image and Iterative parameters, complex propagation constant, phase diagram, phase velocity and delay, transmission parameters, insertion loss and reflection factor – 14 hrs

Wave filters

Characteristics, impedance and propagation constant of pure reactance networks, transmission and attenuation bonds, ladder network as filter. Classification of constant low pass, high pass , band pass and band elimination filter, their attenuation and phase characteristics. Disadvantages of constant-K filters, m-derived filters, lattice design procedure, attenuation and phase characteristics, Equalisers, Bridge-T and Twin-T networks, Crystal filters - 15 hrs

Introduction to Network synthesis

Passive and active network synthesis, brief ideas of active filters and sensitivity considerations – 4 hrs

Section – II

Lines

Transmission lines: Electrically short and long line concepts, properties of networks and distributed constants, relationship between line parameters and transmission constant. Transmission line equations, infinite line primary constant and characteristic impedance, termination, reflection, reflection factor, standing wave and standing wave ratio, T and ∏ equivalent line – 16 hrs

Low frequency transmission lines

Characteristics, distortion and distortion less transmission, loading, lumped and distributed loading – 4 hrs

Radio frequency transmission lines

RF line characteristics, input impedance of lines with total and partial reflections. Attenuation and impedance measurements of lines, Lines and impedance of circuit elements- quarter wave and half wave lines, transformers. Matching – single and double stub matching, circle diagram – Smith chart development and its uses for transmission line study. Design considerations of coaxial lines – 20 hrs

ANTENNA AND PROPAGATION

SECTION – I

Radiation and antenna

Principles of radiation, retarded potential, Isotropic radiator, Hertzinn dipole, monopoles, radiation resistance, gain and beam width, radiation pattern, directivity and effective length of antenna, reciprocity theorem, receiving aeroas travelling wave antenna, Aerial as an **aspeture**, relation of operative to gain, radiation efficiency, effect of ground on radiation, folded dipoles and dipoles. Babinet's principle, Aerial feeder and matching, Baluns - 15 hrs

Antenna arrays

Linear arrays, arrays of two driven elements, Linear, Broadside and end fire arrays, directivity, gain, multiplication of patterns, effect of earth on vertical pattern, binomial arrays, dipoles with parasite elements, Yagi uda, V and Bhombic antenna, Log periodic antenna, parabolic reflectors – 25 hrs

Section – II

Antenna practice and design

Brief treatments of aerials for various frequency ranges, low frequency, medium frequency, High frequency, UHF, SHF and Turnstile antenna for various services – 10 hrs

Antenna measurement

Methods of measuring impedance, field pattern, phase and directivity – 8 hrs

Propagation

Factors involved in propagation, ground and wave space propagation- effect of earth surface, radio horizon, various consideration in space wave propagation, atmospheric effects, Ionosphere and its layers. Mechanism of radio wave propagation, reflections and their characteristics, skip distance, critical frequency and propagation characteristics at different frequency, Super refraction ducting, scattering duct propagation and Troposcatter links, Ionospheric measurements – 18 hrs

Brief idea of satellite communication and antenna practice (Viz Horizontal and stripline antenna) – 4 hrs

COMMUNICATION THEORY AND TECHNIQUES

Section – I

Modulation techniques

Amplitude modulation systems

Necessity of modulation, Definition of AM, Analysis and generation of amplitude modulated waves (AM-DSB), synchronous and envelope detection, AM-DSB/SC, SSB and VSB signal analysis, circuits for generation demodulation; comparison of various different systems, frequency translation and frequency division multiplexing - 12 hrs

Angle modulation systems

Definition of FM and PM: analysis of single tone modulated FM and PM waves, relation between FM and PM; spectra of narrow band FM, and wide band FM, multiple frequency modulation, square wave modulation , transmission bandwidth of FM signals, methods of generation and demodulation of FM and PM signals and their circuits – 15 hrs

Noise and information efficiency in AM and FM system

Block diagram of super heterodyne type AM receiver, Post detection S/N ratio for AM/DSB/SC and SSB systems. Block diagram of super hyterodyne FM receiver system, output S/N ratio, Preemphasis and De-emphasis, brief ideas of Fm threshold effect; improvement of threshold phase lock loop (PLL), analysis of PLL FMFB comparison of CW modulation system - 10 hrs

Section –II

Sampling and pulse modulation systems

Sampling theorem of band limited low pass signals, ideal and non ideal sampling, reconstruction signals and aliasing, Analog pulse modulation, modulation and demodulation of PAM, PDM and PPM wave. S/N ratio and threshold level. Pulse code modulation (PCM)- quantization and intersymbol interference; Differential PCM(DPCM), delta modulation (DM)- fixed step size and slope over load and distortion, modulator and demodulator schemes with circuits, adaptive delta modulation (ADM), PSK, DPSK, FSK schemas and systems. Time division multiplexing (TDM)- synchronous and asynchronous TDM schemes, cross talk, comparison of FDM and TDM systems – 20 hrs

Statistical theory of communication

Correlation, receiver design of matched filter, introduction to wiener's theory of smoothing and prediction of stationary inputs using infinite past.

Detection and estimation: Application of statistical concept to radio and radar systems. Testing of statistical hypotheses, likelihood test, probability of error, optimum reception of known binary signals in Gaussian noise, estimation of unknown signal parameters- random and deterministic models, maximum likelihood, estimate, maximum a posterior estimates.

ELECTRONIC MEASUREMENT AND INDUSTRIAL ELECTRONICS

Section-I

Electronic measurements

Measurement error: Definition, types of error, probability of error, limiting errors and accuracy factors – 3hrs

Standards for measurement: Classification of standards, standards for time, frequency, electrical, electronic standards – 3hrs

Voltage, Current and Power measurement

Voltage and Current: Review of methods of measurements and instruments for AC, DC voltages and current. Vacuum tube voltmeters and transistor voltmeters (with high input impedance type) for the measurement of AC, DC voltages and resistance measurements, oscilloscope techniques

Power: Power measurement using wattmeter, signal power analysis, AF and RF power measurement techniques, transmission line power measurement and power monitoring – 8 hrs

Circuit constant

Lumped circuit constants: Measurement of low, medium and high resistance, self mutual and incremental inductance, capacitance –using bridge and substitution techniques

Distributed circuit constants: Transmission line parameters, measurement using slotted line viz SWR, impedance and using Smith charts – 8 hrs

Measurement

Measurement of frequency, wave length, phase and time interval

Frequency: Frequency standards, frequency and wave meter techniques, heterodyne and CRO techniques, interpolation and resonance techniques.

Phase and Interval: CRO, voltmeter and counter techniques

Amplifier, receiver and transmitter measurement

Amplifier-gain measurement: special aspects of multistage Op-amp and tuned amplifiers- Square wave testing of amplifiers, noise figure measurements

Receiver measurements: Basic considerations, sensitivity, selectivity, fidelity, non-linear distortion measurement

Transmitter measurements: Transmitting systems in measurements viz. Stability, modulation parameters, power levels and signal to noise ratio, time delay - 8 hrs

Section – II

Digital techniques

Overview and scope of digital techniques and practice in electronic instruments, state of the art techniques – 3 hrs

Electronic instruments

General instruments: Different types of Laboratory oscillators viz. R.C tuned, phase shift, Beat frequency oscillators, inductance and capacitance timing, function generators, Q meters, field strength meters. AF and RF wave analyzers and spectrum analysis.

Display instruments: CRO –triggered, sweep and storage type: Counters – XY recorders, strip chart recorders – 12 hrs

Industrial electronics

General review of thyratrons, SCRs, photo devices for industrial control – 2 hrs

Relays: Electromechanical relays and limitations. Reed relays, Time delay circuits, AC/ DC electronic timers, photo electric relay circuits and applications - 6hrs

Industrial heating: Induction and dielectric heating and applications, RF power generator for industrial heating

Transducers: Classification of transducers, active and passive transducer for measurement of velocity, acceleration, temperature, pressure, displacement, liquid level and photo electric transducers - 10 hrs

Application of transducers in industrial instrumentation – 4 hrs

COMMUNICATION ENGG. LAB

(Term work of 50 marks and practical exam of 75 marks and 3 hours duration)

Sl.No	**List of experiments**
1	T to ∏ and ∏ to T transformation
2	Constant-K high pass, low pass and band pass filters
3	m- derived filters
4	Twin-T and Bridge-T null networks
5	Attenuators and equalizers
6	Antenna Measurements
7	Transmission line characteristics
8	Stub matching
9	Wave form analysis , analyser
10	Circuit constant determination
11	Bridge measurement
12	Amplifier measurements
13	Phase and time interval measurements
14	Receiver measurement
15	Noise figure measurement
16	AC/DC electronic timer
17	AM wave generation, measurement and detection

18	FM wave generation, measurement and detection
19	Generation and detection of pulse modulated waves
20	Phase lock loop

ELECTRONIC CIRCUITS. LAB

(Term work of 50 marks and practical exam of 75 marks and 3 hours duration)

Sl.No	**List of experiments**
1	Linear wave shaping i0 Differentiation ii) Integration and their response to different inputs and RC time constants
2	Non linear wave shaping i) Clipping ii) Clamping of wave form and iii) effect of clamping on narrow top pulse
3	Invertor design and effect of HFE and IB and on saturation
4	Design of Astable – multi vibrator and effect of base bias on saturation
5	Design of Monostable – multi vibrator and emitter coupled mono-shot as a linear V to t converter
6	Design of Bistable – multi vibrator and triggering circuits (Schmitt trigger)
7	Voltage sweep generation using gas discharge tube and synchronization of frequency
8	Linearization of voltage sweep
9	Class A single ended and push pull power amplifiers design
10	Class B push pull power amplifier design using phase inverters and complementary symmetrical transistors
11	Tuned voltage amplifier and effect of coupling
12	RF class C power amplifier
13	Application of negative resistance devices for switching circuits (UJT)
14	Blocking oscillator
15	Current sweep
16	Discrats cascade and paraphrase amplifier and comparison with CE amplifier
17	Differential amplifier using discrete circuits and transfer functions
18	Rise and fall time measurement of square wave and switching transistor

INTEGRATED CIRCUITS LAB

(Term work of 50 marks and practical exam of 75 marks and 3 hours duration)

Sl.No	**List of experiments**
1	Cascade amp (CA 3028) GBW product and comparison with CE stage
2	MC 1150 cascade block for communication applications viz. IF amp, RF amp, Oscillator, Video amp
3	Op Amp. Parameter measurement (Different OP amps)
4	Op Amp as differentiator, integrator, inverter, buffer, different stages
5	PLL applications as AM, FM demodulator and frequency scaling
6	Op Amp for wave form generation, comparator, oscillator

7	IC voltage regulator characteristics and use as series limiting and switching regulator and their characteristics
8	Logic gates, operation(Universal and Primitive gates)
9	Realisation of Logic gates (RTL, DTL, DCTL, TTL using discrete devices)
10	Minimization of Logic functions
11	Half adder/subtractor, full adder/ subtractor realization using NAND /NOR gates
12	5400/7400 series gate characteristics
13	Wired operation of open collector 7400 series logic
14	Flip – flop realization using NAND/NOR gates and IC flip-flops applications
15	Counters and shift registers
16	A/D converter
17	D/A converter
18	Digital application of linear Op amps
19	CMOS gate characteristics

ELECTRONIC DESIGN LAB

(Term work of 50 marks and practical exam of 75 marks and 3 hours duration)

Sl.No	**List of experiments (using transistors)**
1	Design of AF power amplifier(Discrete)
2	Design of cascade and Cascade amplifier(Discrete)
3	Design of tuned amplifier
4	Design of audio frequency/ Radio frequency oscillator
5	Design of push pull amplifier
6	Design of audio/ power impedance matching transformers
7	Design of Inverter
8	Design of voltage sweep circuit
9	Design of switching circuits
10	Design of active filter
11	Design of higher order filter (Butter worth and Chebyshev type)
12	Design of logic gates
13	Design of power supplies(using IC/ discrete version)
14	Design of Class C power amplifier
15	Design of Antenna (Simple type)
16	Design of modulation transformer(Am)

BE IV year

ENGG ECONOMICS AND INDUSTRIAL MANAGEMENT

SECTION – I

Nature and significance of economics – Basic economic concepts, Wants, demand supply, factors affecting demand and supply, increase and decrease in demand and supply

Cost of production – Real and opportunity – capitalism and mixed economy – factor of production, micro and macro economics, theory of prices

Money – Banking, Trade – Nature and functions of money- Commercial and central banking – problem of foreign exchange – implications of devaluation of money

Economic development of India – Structure and feature of Indian economy – Industrialisation of India – Large and small scale industries – Growth of public sector- Industrial disputes – Labour movement and social security schemes.

Ordinary term in Book keeping – auditing – preparation of ledger accounts, cash book including petty cash book and interest, preparation of trail balance – simple balance sheet – reading analysis of ordinary balance sheet.

Section II

Industrial management – Definition, principles, function and levels of management – emergence of scientific management. Plant layout – principles and types/

Stores management – Location, Layout, centralised V/s decentralised stores, stores records, pricing issue of materials –inventory control recorder point, economic order quantity- ABC analysis, remodification of materials.

Quantity control – Quality control and inspection, control charts and their applications – control charts for attributes acceptance sampling – operating characteristics curves – objectives of sampling and inspections.

Personnel management – definition , function, recruiting and training, wages, incentive wages, requirement of good incentive wage plan- straight piece rate – differential piece rate, premium plans, Halsey rowan plan, Gantt task, Bedeaux plans , bonus

Production control – stages in production control – rotating scheduling – dispatching expedition, progress control, G-Charts

CPM and PERT : Network construction – determining the critical path – a network of PERT.

SYSTEM DESIGN USING ICs AND INSTRUMENTATION

SECTION –I

Traditional design

Review of digital and analog circuits, OP amps, Comparators, controlled sources, analog multiplexers, sample and hold circuits, PID controllers, PLLs and their applications – 6 hrs

Review of traditional design of digital circuit using minimization techniques and gate oriented design – 2 hrs

Review of Engineering designing with MSI:

IEEE notation of Logic circuits and indentification of MSI chips, designing with MSI – counters, shift registers, decoders, multiplexers, arithmetic units, display devices etc. Their frequency and timing considerations, state assignments – 14 hrs

Multi Input system controllers: Multi input system controller design using SSI, MSI and ISI circuits. ROM, PROM and EPROMS and logic- different configurations and their applications

Section – II

Programmable system controllers- desirable features and general requirements, typical examples, hazards -14 hrs

Brief idea of microprogramming – 3 hrs

Display and data converters

Alpha numeric, numeric, character, console and large screen displays- their characteristics and limitations – 4 hrs

Hardware design features of different types of display systems and implementation - 6 hrs

Brief review of data converters – 1 hr

Stepper motor control and their uses. Recorders- XY, XYT and strip chart

Instrumentation

Review of signal conditioners and transducers, interfacing of transducers with the measuring and recording hardware, three case studies of simple design using analog and digital hardware(Converting the areas of computers, Process instrumentation and communication) Current trends - 6 hrs

System design consideration: transmission noise, grounding problems and thermal design – 6 hrs

ANALOG AND DIGITAL COMPUTERS

SECTION – I

Analog computers

Analog computer elements, different mathematical operations using them, their characteristics and limitation. Modelling of physical problem, scaling- amplitude and time scaling, static checks, simulation of transfer function, analog multipliers, linear function generation – 10 hrs

Digital Computers

Digital arithmetic: Number systems, number base conversion, signed binary numbers-addition, subtraction, multiplication, division by different methods and their comparisons, round off and overflow, BCD, decimal and floating point arithmetic, error checking and correcting codes – 10 hrs

Computer architecture, Hardware and organization: Evolution of digital computers and general purpose computer layout and problem solving – 2 hrs

Hardware, Memory and Input/Output units:

Main and back up memories- Magnetic core, drum, disk, semiconductor memories their characteristics and operation, Input and output units – punched cards and card readers, paper tapes and paper tape readers, hard disk and floppy disk drives and their magnetic tape units – their controllers and their characteristics and operation, Central processing unit (CPU)

Section – II

Aithmetic logic unit (ALU), carry look ahead adder (CLA), control unit and computer cycle – 18 hrs

Computer organization: Processor design – process organization, instruction set and arithmetic operations, parallel processing control circuit design, hardware and microprogrammed control, memory organization- virtual and high speed memories. Logic design of a simple computer – 20 hrs

System organization: Communication – input, output and multiple CPU communication and computer networks – 5hrs

Software : Brief ideas of languages and translators, loaders and linkers and operating systems. Multi programming and timing sharing – 8 hrs

MICROPROCESSORS HARDWARE, SOFTWARE AND APPLICATINS

SECTION – I

Introduction to Microprocessors and Microcomputer:

History, evolution of microprocessors, 4, 8, 16 bit processors, their general features and capabilities – 3 hrs

8 bit microprocessor architecture:

Brief details of general architecture and other features of Intel 8080, Motorola 6800, Mostek 6500, Zillig 80 and their comparison, state of the art and other contemporary chips and their salient features – 4 hrs

Architecture of Intel 8085 A Microprocessor:

Intel 8085 internal organization, input/output and control signals, instruction cycle and timing diagram – 2hrs

Instruction set of Intel 8085A Microprocessor:

Register structure, concepts of an instruction –Op code and Operand, addressing modes, machine cycles and states of each instruction types – data transfer group, branch group, stack I/O and machine control group instructions and their details – 5hrs

Programming Intel 8085A Microprocessor:

Language (use of coding sheets must be practised strictly) – typical exercise for moving data, addition and substitution of numbers, branching, loops, stack operations and bit manipulations – 10 hrs

Uses of Intel 8085A, address bus demultiplexing, using Intel 8212 and 74 LS 374 and the use of other pins – detailed schemas – 3 hrs

Memories and Interfacing 8085A: Address space partitioning and address decoding schemes for 8085 A using 8205 and 74LA, 138 chips, classification of memories- RAM, ROM, PROM, EPROMs and their technologies, static and dynamic memories. Typical memory chip examples and their salient features, EPROM programming examples of 2716, 2732 etc. Interfacing slow memories – synchronous and asynchronous and interrupt driven transfer, need for special peripheral chips.

Section – II

Interrupts of 8085 A: Concepts and utility of interrupts, nonvector and vectored interrupts, handling of interrupts of 8085A (hardware details) and timing diagrams, Maskable and non maskable-RIM and SIM instructions – 3 hrs

Peripheral chips and interfacing (Exercise and programming with these chips)

Peripheral interface: programmable peripheral interface (PPI) chip – Intel 8255 chip explanation, different modes and their programmability, simple exercise of interfacing 8085A with I/O deviced and using Intel 8255 under mode 0, mode-1 and programming features. Brief ideas of using mode 2 - 4 hrs

Communication interface:

Serial/parallel communication concepts, baud rates, formats, synch characters, start/stop bits etc. Synchronous and asynchronous formats, Programmable communication interface chips (UART – 51883, TMS 6011, USRT – 8251) explanation of 8251 commands, hardware interfacing schemes with 8085 A programming features and use of SID and SOD instructions – 5 hrs

Timer interface:

Necessity of timer interface and software flexibility, Hardware interface of programmable interval timer (Intel 8253 chip) and various modes of operation and software programming features – 3 hrs

Key board and display interface:

Software and hardware schemes of interfacing a key board and display using 8095A, CPU and peripheral interface. Overheads involved on the use of CPU for KBD and display process. Programmable KBD/ Display interface chip (Intel 8279) hardware and software interfacing and programming modes and features – 5 hrs

Microcomputer hardware, software design and documentation:

Specifications and selection of hardware, hardware and software tradeoffs, case studies involving A/D and D/A interfacing, wave form generation and some dedicated application using Intel hardware – 12 hrs

Brief ideas of system monitor, assembler, macro assembler, cross assembler – 5 hrs

Documentation: System description, hardware, flow charts, state diagrams and memory maps – 4 hrs

Software development aids and debugging tools – 4 hrs

MICROWAVES AND RADAR ENGINEERING

SECTION – I

Microwaves:

Guided waves and wave guides:

Rectangular wave guides, analysis of different modes(TE, TM waves), propagation and their characteristics, wave impedance, wave attenuation and power handling capacity, methods of excitation and feeds, higher order modes- elementary treatment of circular wave guides - 10 hrs

Wave guide components:

Analysis of wave guide attenuation, multiport networks (tees and directional couplers), their scattering properties, elementary treatment of flanges, bends, corners, twist diaphragms, slotted lines, terminations, tuning post tuners. Analysis of rectangular **carrty** resonators – Q factor carrity resonators configurations, frequency meters, elementary treatment of ferrite devices and horns, brief idea of transmission line analogy and equivalent circuit identification of wave guide components – 10 hrs

Microwave measurements

Measurement of guide length, impedance, SWR, Q and power – 4 hrs

Microwave devices

High frequency effects in conventional tubes – limitations due to resonance, space charge and transit time effects, constructional details of UHF tubes- Acron, miniature, disc seal and light house tubes, high frequency oscillation.

Microwave tubes

Klystron amplifier – principles of velocity modulation, calculation of bunching distance, reflex klystron oscillator –modes, admittance, spiral and repeller voltage modes.

Magnetron- Magnetron effects, types of magnetrons, Hull cutoff condition, Hartree condition, magnetron structures, performance, change and Reik diagram, magnetron pulling and pushing long line effects, travelling wave tubes – slow wave structures, wave electron interaction, gain of a TWT amplifier, forward wave and backward wave interaction, O and M carcinatron.

Microwave semiconductor devices

Gun effects and oscillators, Gunn diode as an amplifier, parametric amplifier – up and down converters, degenerative modes, tunnel diode as an amplifier and as an oscillator, IMPATT and TRAPATT devices, master as an amplifier – 16 hrs

Section – II

Radar systems

Radar equation

Prediction of range, performance, minimum detectable signal, receiver noise, SWR, integration of radar pulses, radar cross section of targets, cross section fluctuations, transmitter power, PRF and range ambiguities , antenna parameters, system losses, propagation effects – 8 hrs

CW and FW-CW radar

The Doppler effect, CW radar, frequency modulated CW radar, multiple frequency CW radar – 5 hrs

MTI and Pulse Doppler radar

Radar delay lines and cancellers, **subsulviter** visibility, MTI using range gates and filters, brief ideas of digital signal processing of radar signals, pulse Doppler radar and non-coherent MTI – 8 hrs

Radar transmitters

Application of magnetrons, Klystrons, TWTs and grid controlled tubes for transmitters and their comparison, radar modulators – 6 hrs

Radar antenna

Review of antenna parameters, radiation of pattern and aperture distribution, parabolic reflectors, cassegrain antenna, lenses, arrays and feeds, Brief ideas of electronically steered arrays and radomes – 5 hrs

Receivers and Displays

Review of Noise figure and noise temperature, radar receivers, environmental noise, low noise RF amplifiers, mixers, IF amplifiers, Displays – different types of display representation and their application, duplexers, review of signal detection(with reference to radar signals) in the presence of noise – 5 hrs

Radar beacons and radio aids to navigation – 2 hrs

COMMUNCATION ENGINEERING

SECTION –I

1) **Acoustics**

Introduction

Voice mechanism, acoustic power output of speech, mechanism of hearing and ear and its thresholds, pitch, timber, masking of puretones, masking by noise – 4 hrs

Architectural acoustics

Shine equations, classical ray theory, live room and decay of sound, influence of reverberation of time on articulation, dead room and decay of sound, effect of media on reverberation and measurement of reverberation time, acoustic materials – 10 hrs

Vibrations

Simple and forced oscillations and system resonance, plane waves – elastic behaviour of fluids, wave equation and solution , velocity , acoustic impedance standards – 6 hrs

Transducers

Different types of microphones and their characteristics, local speakers – ideal radiator characteristics of different types of baffles- cones, horns, their acoustic output and impedance – 8 hrs

2) **Radio and Television systems**

Radio systems:

Transmitting and receiving systems

Radio telegraphy and telephones, AM and FM broadcasting, block schematic approach of different systems. Feeders and antenna for transmission and reception. AM transmitters for medium and short wave communication. RF chain, master oscillators and harmonic generators, SSB and Fm transmitters – 10 hrs

Section – II

Receivers

Superheterodyne principle, AM and FM receivers using Superheterodyne principles. Analysis of typical RF, IF mixer and detector stages, AGC and AFC circuits, squelch, tracking and alignment of receivers. Limiters and discriminators, communication receivers and diversity reception, SSB receivers, PLL techniques in receivers - 10 hrs

Television systems (Black and white)

TV principles

Picture scanning – interlaced scanning, standards of transmission, composite video signal, camera, electronic scanning, photoelectric surfaces and their characteristics, iconoscope, imageorthicon and vidiocon, electronic beams for scanning – electron gun focussing using magnetic deflection, deflection yokes, deflects end distortion, synchronisation, video amplifiers – 12 hrs

TV transmission and receivers

Modulation methods, side band suppression, video and audio carriers, TV channel and bandwidth, TV transmitter and receiver configurations and their comparison with radio receiver systems, TV transmitter and receiver antenna, feeders and boosters, CCTV and monitors, interference and ghosts, TV relay links and satellite based TV broadcasting – 8 hrs

Colour TV system

Brief ideas of colour TV transmission and reception. Transmitter and receiver configuration, compatibility, BW and Color receivers – 3 hrs

TV Test equipments

Brief ideas of pattern generators, sweep generators, wobulscope, sine pulse and bar generators, testing of video system – 4 hrs

COMPUTER SOFTWARE (ELECTIVE)

(PDP II and IBM 360/370 should be used as the basis for this course)

Introduction to System Software

Description and overview of assemblers, loaders, macros, linkers and compilers- their evolution and state of art – 6 hrs

Machine structure, machine language and assembly language

General machine structure, machine language, assembly language – 8 hrs

Assemblers

General design procedure, design of an assembler, table processing searching and sorting – 15 hrs

Macro language and Macro processors

Macro instructions, macro's features and implementation – 12 hrs

Loaders

Loader schemes, design of absolute loader and direct linking loader – 6 hrs

Formal system programming languages

Role of high level langauages, data types and data structure allocation and accessing. Format specifications, grammar, BNF and canonical systems – 10 hrs

Compilers

Elements of a complier and their recognition, arithmetic statements and storage allocation, code generation phase of compilation – lexical syntax, and interpretation phases, optimization, storage assignment, code generation and assembly phase – 20 hrs

Structure of operating system

Brief description of OS design – 5 hrs

POWER ELECTRONICS (ELECTIVE) : Get syllabus from VTU site or elsewhere

Subject Code	: **10EC73**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

UNIT - 1
Introduction, Applications of power electronics, Power semiconductor devices, Control characteristics, Types of power electronics circuits, Peripheral effects.

UNIT - 2
POWER TRANSISTOR: Power BJT's, Switching characteristics, Switching limits, Base derive control, Power MOSFET's, Switching characteristics, Gate drive, IGBT's, Isolation of gate and base drives.

UNIT - 3
INTRODUCTION TO THYRISTORS: Principle of operation states anode-cathode characteristics, Two transistor model. Turn-on Methods, Dynamic Turn-on and turn-off characteristics, Gate characteristics, Gate trigger circuits, di / dt and dv / dt protection, Thyristor firing circuits.

UNIT - 4
CONTROLLED RECTIFIERS: Introduction, Principles of phase controlled converter operation, 1φ fully controlled converters, Duel converters, 1 φ semi converters (all converters with R & RL load).

UNIT - 5
Thyristor turn off methods, natural and forced commutation, self commutation, class A and class B types, Complementary commutation, auxiliary commutation, external pulse commutation, AC line commutation, numerical problems.

UNIT - 6
AC VOLTAGE CONTROLLERS: Introduction, Principles of on and off control, Principles of phase control, Single phase controllers with restive loads and Inductive loads, numerical problems.

UNIT - 7
DC CHOPPERS: Introduction, Principles of step down and step up choppers, Step down chopper with RL loads, Chopper classification, Analysis of impulse commutated Thyristor chopper (only qualitative analysis).

UNIT - 8

INVERTORS: Introduction, Principles of operation, Performance parameters, 1φ bridge inverter, voltage control of 1φ invertors, current source invertors, Variable DC link inverter.

COMPUTER AND MICROPOREOCESSOR LAB

(Term work of 50 marks and practical exam of 75 marks and 4 hours duration)

Sl.No	**List of experiments**
	Analog and digital computers:
1	Analog computer components and their applications
2	Simulation of Physical problem with amplitude and time scaling
3	Function generation
4	Binary arithmetic using ICs, signed, unsigned, BCD, Excess -3 arithmetic
5	Carry look ahead adder
6	Analog to digital converter (ADC)
7	Digital to Analog Converter (DAC)
8	Interfacing Analog and Digital circuits
	Microprocessors : Hardware, Software and Application
1	Software programming based on 8085 – dealing with different types of instructions(direct addressing, indirect addressing, I/O post/ device addressing
2	Hardware implementation of microprocessor hardware, dealing with address, memory I/O,decoding schemes and interfacing the microprocessor for simple applications

ELECTRONICS AND COMMN. ENGG. LAB

(Term work of 50 marks and practical exam of 75 marks and 4 hours duration)

Sl.No	**List of experiments**
	Microwaves and radar engineering
1	Microwave sources and their characteristics
2	Measurement of frequency, wave length, power, impedance
3	Performance criteria of different microwave component as attenuators, liners, E,H and EHTES. Circulators, couplers etc.
4	Use of Schmitt charts for the study of microwave – component testing
5	Magnetron as a source and its characteristics
6	Miscellaneous experiments pertaining to Radar
	Communication Engineering
1	TV receiver alignment and characteristics
2	Testing and design of different stages of a TV receiver
3	TV signal transmission – modulation and demodulation using a UHF line or microwave line

4	Demonstration of CCTV black and White and colour systems

PROJECT WORK

(Term work of 50 marks and practical oral and sketching exam of 100 marks and 4 hours duration)

Sl.No	Project work Guidelines
1	Individual or 2/3 students put together will be assigned a project work at the beginning of the year in his area of Engineering
2	Design and fabrication of project has to be undertaken by the group
3	The project work will be examined for practical – oral and sketching and the project work carried out for its performance. Final valuation will be done based on the oral and sketching as well as the work carried out
4	The examiners for the project work must be invariably one internal and one external. The project work examination must be conducted independently on the above steps

SEMINAR AND INDUSTRIAL VISIT

Sl.No	Guidelines
	SEMINAR (Term work of 40 marks)
	Each student has to select a specific topic in consultation with the HOD and deliver a seminar for 45 minutes to 1 hour. A seminar report has to be submitted to the Department for the valuation of the term work
	INDUSTRIAL VISITS (Term work of 10 marks)
	Each student has to submit a tour report for term work evaluation. The tour report should consist of a Technical report on a specific aspect that might be assigned by the college concerned or a overall report covering the entire technical tour

ABSTRACT FROM PROJ FILE and WORKSHOP