

Bachelor of Engineering
III & IV Semester

Prospectus No. 121741

संत गाडगे बाबा अमरावती विद्यापीठ
SANT GADGE BABA AMRAVATI UNIVERSITY

(Faculty of Engineering & Technology)

PROSPECTUS

Prescribed for
Four Year Degree Course
Bachelor of Engineering

BRANCHES

- 1) Civil Engineering
- 2) Mechanical Engineering
- 3) Electrical Engineering (Electronics & Power)
- 4) Electrical and Electronics Engineering
- 5) Electrical Engineering (Electrical & Power)
- 6) Electrical Engineering
- 7) Electronics and Telecommunication Engineering
- 8) Electronics Engineering
- 9) Instrumentation Engineering
- 10) Computer Science and Engineering
- 11) Computer Engineering
- 12) Information Technology

III & IV Semester Examinations, 2011-2012

**Semester Pattern
(CREDIT GRADE SYSTEM)**



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SYLLABUS
PRESCRIBED FOR
BACHELOR OF ENGINEERING
CIVIL ENGINEERING EXAMS.
SEMESTER PATTERN (CREDIT GRADE SYSTEM)

THIRD SEMESTER

Inplant Training & Industrial Visit in the faculty of Engineering & Technology

- 1)
 - a) the inplant training shall not be compulsory,
 - b) the inplant training shall be taken by students strictly during Summer vacation. after IVth or VIth Semester examination and /or during Winter vacation after Vth or VIIth Semester examinations,
 - c) the inplant training shall not be part of examination system, however, student shall prepare and submit report after completion of training to the concerned Head of Department alongwith certificate issued by the industry,
 - d) the inplant training shall be of minimum two weeks duration,
 - e) there shall not be any liability whatsoever on the Institution with respect to inplant training of the students,
 - f) students shall undertake inplant training on their own risk and cost. An undertaking in this regards signed by student and parents shall be submitted before proceeding for training to the concerned Head of Department/ Head of Institution.
 - g) the students shall complete inplant training under the supervision of concerned person in the industry,
 - h) Institutes shall help students to organise inplant training by way of correspondance,
- 2) Industrial Visit : Industrial visit may be organised for the students. Students should prepare & submit the report on Industrial visit to the concerned Head of Department/Head of Institution.

3CE01

MATHEMATICS-III

SECTION -A

Unit I : Ordinary Differential Equations.

Complete solution, Operator D, rules for finding the complementary function, the inverse operator, Rules for finding particular integral. Method of variation of parameters, Cauchy's and Legendre's Linear Differential equations. Simultaneous linear differential equations with constant coefficients Applications to civil engineering.

Unit II: Laplace transforms :

Definition and elementary properties, Inverse L.T. by various methods, Convolution theorem, Solution of ordinary and simultaneous differential equation using Laplace transform of periodic functions. Application to problems of beams.

Unit III Partial Differential Equations.

P.D.E. of first order and first degree of types i) $f(p,q) = 0$ ii) $f(p,q,z)=0$, iii) $f(p,q,x,y)=0$ iv) $f(p,q,x,y,z)=0$ i.e. (a) Lagrange's form $Pp + Qq = R$ (b) Clairaut's form $z=px+qy+f(p,q)$ v) Equations reducible to above standard types linear Homogeneous P.D.E. of nth order with constant co-efficients.

SECTION-B

Unit IV Numerical Methods :-

- (a) i) Solution of Algebraic and transcendental Equations by Newton Raphson method and by method of False Position.
- ii) Solution of system of linear equations by Groust's method, Gauss Seidal method and Relaxation Method.
- (b) Numerical solution of differential equations by Picard's method, Taylor's series method, Euler's method, modified Euler's method and Rungekutta forth order method.

Unit V : Complex variable :

Analytic functions, C.R.conditions, Harmonic functions. harmonic conjugate functions, Milne's method, conformal mapping, Elementary conformal mapping $w=z+c$, $w=cz$, $w+$ Bilinear transformation.

Unit VI Statistics :

Probability : Axioms, conditional probability, Baye's theorem, Mathematical Expectation and probability distributions (Binomial, Poisson and Normal) Curve fitting by method of least square only for line and parabola, Corelation regression.

Books Recommended :

- 1) Text Book of Applied Mathematics by P.N.Wartikar and J.N.Wartikar.
- 2) Advance Mathematics for Engineers by Chandrika Prasad.
- 3) Method of Applied mathematics by F.B.Hildebran.
- 4) Introductory methods of Numerical Analysis by S.S.Sasby.
- 5) Computer Oriented Numerical Method by Raja Raman.

SECTION-A

- Unit-I
1. Mechanical properties : Concept of direct, bearing and shear stresses and strains, stress-strain relations, Biaxial and triaxial loading, elastic constants and their relationship, stress-strain diagrams and their characteristics for mild steel, tor steel and concrete, Generalized Hook's law, factor of safety.
 2. Uniaxial stresses and strains : Stresses and strains in compound bars in uniaxial tension and compression, temperature stresses in simple restrained bars and compound bars of two metals only.
- Unit-II
1. Axial force, shear force & bending moment diagrams : Beams, loading and support conditions, bending moment, shear force and axial load diagrams for all types of loadings for simply supported beams, cantilevers and beams with overhangs, relation between shear force, bending moment and loading intensity.
- Unit-III
1. Stresses in beams (Bending, Shear),
 - i) Bending: Theory of simple bending, section modulus, moment of resistance, bending stresses in solid, hollow and built up section.
 - ii) Shear : Distribution of shear stresses on beam cross sections,
 - iii) Strain energy under uniaxial tension and compression, impact loads and instantaneous stresses.

SECTION - B

- Unit-IV
1. Torsion: Theory of torsion & assumptions, derivation of torsion equation, polar modulus, stresses in solid & hollow circular shaft, power transmitted by shaft, closed coiled helical spring with axial load.
 2. Thin cylinders subjected to internal pressures.
- Unit-V :
1. Principal stresses : Biaxial stress system, principal stresses, principal planes, Mohr's circle of stresses, principal strains.
 2. Combined direct & bending stresses : Combined direct and bending stresses, applications to short columns with eccentric loads, retaining walls with horizontal lateral force.
- Unit-VI
1. Slope & deflection of beams : Slope & deflection in statically

determinate beams subjected to point loads, uniformly distributed loads, moments by a) Macauley's method b) Moment Area method c) Conjugate Beam method.

2. Theory of long columns, Euler, Rankine formula.

BOOKS RECOMMENDED:

1. E.P.Popov, Mechanics of Materials, Prentice Hall of India, New Delhi.
2. S. Timoshenko and O.H.Young, Elements of Strength of Materials, East West Press Private Ltd., New Delhi.
3. Ferdinand L. Singer, Strength of Materials, Harper and Row, New York
4. Shames, I. H., Introduction to solid mechanics, Prentice Hall of India, New Delhi
5. Natarajan, Mahadeoappa, Strength of materials
6. Junnarkar, S. B., Mechanics of materials
7. Mubeen, A., Mechanics of solids, Pearson education (Singapore) Pte. Ltd.
8. Beer and Johnston, Mechanics of materials, Mc-Graw Hill.

SECTION-A

- Unit-I
- Highway : Development And Planning, Road Transport characteristics, classification of Roads, Road development plans & Salient features, Road pattern, Alignment principles, Egg. Survey for highway. Material And Testing. Various properties of aggregates and bituminous materials and Test, IRC, IS Specifications, bituminous mix design.
- Unit-II
- Geometric Design : cross sectional elements, Right of way, Camber, Gradient, Typical Highway cross section in embankment and in cutting, PIEV Theory, stopping sight distance, Overtaking sight distance, Horizontal alignment - curves, superelevation, Extra widening, transition curves, vertical alignment, Design of summit and valley curves, IRC Standards for Geometric design.
- Unit-III
- Pavement Design : Components of Flexible and Rigid pavement, Design factors, ESWL, Flexible pavement design by C.B.R. Method. Westergards analysis for wheel load & Temperature stresses in rigid pavement, Rigid pavement by IRC method (As per IRC-37), Combination of stresses, Joints in Rigid Pavement, Construction And Maintenance – WBM Surface dressing, Bituminous roads, cement concrete Pavement, construction procedure, construction of roads in expansive soil.

SECTION-B

- Unit-IV Traffic Engineering : Traffic Characteristics, Traffic studies, road parking system, accident study, traffic control devices, marking, signs, signals, island its type, At grade intersections – clover leaf, diamond, rotary intersections & design elements, 3 E's of traffic, regulation for driving motor vehicle, motor vehicle Act & Rule.
- Unit-V Bridge Engineering – Component, classification and identification, data collection, site selection, economic span, different structural form – culverts, causeways, major and minor bridges, types of foundation, abutments, piers and wing wall, bearing their types and choices, Erection of bridge superstructure.
- Unit-VI Bridge Hydrology - Estimation of flood discharge, water way, scour depth, depth of foundation, Afflux, clearance and free board. Load, Forces, Stresses – Loads, forces, stresses acting on bridges. IRC Specification and code practices, critical combination. Rating And Maintenance – Methods and techniques of rating of existing bridges, repairs, maintenance, corrosion – causes and prevention, Strengthening of bridge superstructure.

BOOKS RECOMMENDED :-

- 1) Khanna S.K. & Justo C.E. : Highway Engineering
- 2) Rao G.V. : Principles of Transportation & Highway Engg.
- 3) Dr.Kadiyali L.R. : Traffic Engg. & Transport Planning.
- 4) Sharma S.K. : Principles, Practice & Design of Highway Engg.
- 5) Bindra S.P. : Principles & Practice of Bridge Engg.
- 6) Bindra S.P. : A Course in Highway Engg.
- 7) Duggal A.K. & Puri V.P. : Laboratory Manual in Highway Engg.

3CE04 BUILDING CONSTRUCTION & MATERIALS**SECTION - A**

- Unit- I Introduction : Definition, types of buildings as per national building code, components of buildings and their functions, Types of structure – load bearing structure & framed structures, their relative advantages & disadvantages, load bearing walls and partition walls, HDPE Wall panel.
Foundation :- Definition and necessity, loads of foundation, Bearing Capacity soil, SBC values based on IS code, field methods of improving bearing capacity.
Types of foundation – shallow foundation & deep foundations for buildings, spread footings for walls &

columns, Raft foundations, Foundations in black cotton soils, under-reamed pile foundation, precautions to be taken. Causes of failure of foundations. Setting out for foundation, excavation for foundation.

- Unit-II Stone Masonry – Technical terms, General principles to be observed during construction, random rubble masonry, coursed and un- coursed rubble masonry, Selection of stone for masonry.

Brick Masonry – Classification of bricks, manufacturing of clay bricks, tests on bricks, properties of burnt bricks, new trends in brick manufacturing such as use of fly ash, stabilized mud blocks.

Brick masonry construction – Technical terms, general principles, commonly used types of bonds such as stretcher, header, English bond and Flemish bond, their suitability. Earthquake force, various features for making load bearing structure earthquake resistant.

- Unit-III Floors – Types of Floors – Basement floor, ground floor and upper floors, Types of upper floors – R.C.C. slab floor, R.C.C. slab & beam floor, R.C.C. ribbed floor, R.C.C. Grid floor, R.C.C. flat slab floor, Floor finishes – Types of flooring material, Sahabad, Kotta, Granite, Ceramic tiles, plain tiles, mosaic tiles, glazed tiles, different types of floor finishes, their suitability, method of construction, criteria for selection.

Roofs – Flat & pitched roof, steel roof trusses – types and suitability, fixing details at supports, types of roof covering, AC & GI sheets, acrylic sheets, fixing details of roof covering. Formwork – Different types, their relative merits & demerits, period for removal of formwork for different members.

SECTION - B

- Unit-IV Doors & Windows – Different forms of commercial wood-plywood, particle-board, batten-board, block-board, novapan, sunmica, veneer sheets.

Doors : Purpose, criteria for location, size of door, door frames & its types, methods of fixing, T Types of door shutters and their suitability, HDPE door shutter.

Windows – Purpose, criteria for location, no. sizes & shapes of Windows, types of windows & their suitability.

Ventilators – Types and their suitability. Fixtures & fastening for doors & windows.

Glass – Types of glass & their suitability.

Arches & lintels – Types & their suitability, details of R.C.C.

lintels & chajja, precast lintels & arches.

Unit-V Stairs – Function, technical terms, criteria for location, types of staircases, their suitability, principle of stair layout design. Lifts, ramps & escalators – suitability. Plastering & pointing- Necessity, types, processes of different types of plastering, defects in plastered work. Painting & Colouring – Necessity, types, processes of painting & colouring to wall surfaces, wooden surface, iron & steel surfaces, types of paints and their uses. Scaffolding – Purpose, types, suitability.

Unit-VI Special Aspects of Construction – Damp proofing – causes of dampness, its effects, various methods of damp proofing, material used for damp proofing, details of cavity wall construction. Fire proof construction – Points to be observed during planning & construction. Fire protection requirements for a multistoried building. Sound proof Construction – Sound absorbants and their characteristic, factors affecting the acoustical design of an auditorium. Joints – Expansion & construction joints necessity, details of expansion joint at foundation level & roof level of load bearing structure and framed structure. Provision of construction joints in slabs, beams & columns.

BOOKS RECOMMENDED :

- 1) Mackay W.B. : Building Construction, Vol. I, II, III, Longmans.
- 2) Sushilkumar : Building Construction, Standard Publishers Distributors.
- 3) Deshpande R.S. and Vartak C.V. : A Treatise on Building Construction.
- 4) Sharma S.K. Kaul B.K. : A. T.B. of Building Construction, S. Chand & Co.
- 5) Gurucharan Sing : Building Construction Engg., Standard Book House, Delhi-6
- 6) Sane L.S. : Construction Engg., Manak Talas, Mumbai.
- 7) Chudley R. : Construction Technology, Vol. I, II, III & IV, Longmans Group Ltd.
- 8) ISE National Building Code of India, 1970.
- 9) Punmia B.C. : Building Construction.
- 10) A Manual of Earthquake Resistant, Non-Engineered Construction Indian Society of Earthquake Tech.

ENGINEERING GEOLOGY

3CE05

Unit-I: Introduction - Different branches of Geology and importance of Geology in Civil Engineering. Mineralogy - Study of common rock forming and ore minerals with reference to its physical properties. Petrology - rock cycle, rock weathering and soil formation, origin, classification and textures of igneous sedimentary and metamorphic rocks, study of common rock types.

Unit II: Structural Geology - outcrop, dip strike, elementary ideas about folds, faults, joints and unconformity, effect of these structures in foundation. Earthquake Engineering - earthquake waves, causes and effects, magnitude and intensity, earthquake zones of India, seismic coefficient. Geological investigation - surface and sub-surface investigation, direct and indirect.

Unit-III: Rock as a material of construction. Study of engineering properties of rocks and soils. Geological studies related to site selection for dams and reservoirs, tunnel alignment, hydroelectric plants, bridges, roads, air fields etc. Case histories of some major projects of tunnels, dams and reservoirs.

BOOKS RECOMMENDED :-

- 1) Singh Parbin : General & Engineering Geology.
- 2) Mukharjee : A Text Book of Geology.
- 3) Tuyrell G.W. : The Principle of Petrology.
- 4) Wadia D.N. : Geology of India.
- 5) Krishan M.S. : Geology of India.
- 6) Date S. Y. & Mukharjee D.M. : Geological Maps.
- 7) Deshmukh D.N. & Mukharjee D.M. : Engineering Geological Maps.
- 8) Gupte R.B. : Geology of Engineering.
- 9) Reddy Venkata : Engineering Geology.

3CE06

STRENGTH OF MATERIALS-LAB

PRACTICALS:

Minimum seven out of following:

1. Tension test on metals.
2. Compression test on metals.
3. Shear test on metals.
4. Impact test on metals.
5. Hardness test on metals.
6. Torsion test on metals.

7. Deflection of beams.
8. Modulus of rupture test.
9. Buckling of columns.
10. Deflection of springs.

A journal/report on experiments conducted shall be submitted by each student. Practical examination shall be viva-voce based on above practical and the syllabus of the course.

3CE07 TRANSPORTATION ENGINEERING-I-LAB PRACTICALS

Based on above syllabus, following practical are required to be performed and a laboratory report be submitted by every student. Practical examination will be viva based on above system.

List of Experiments (Any Eight)

1. Determination of Los Angeles value
2. Determination of Abrasion value of Aggregates by the use of devil machine
3. Determination of Aggregate Impact value
4. Determination of Aggregate Crushing value
5. Determination of Flakiness and Elongation Index of Aggregate.
6. Determination of perforation value of Bitumen
7. Determination of Viscosity of Bituminous material
8. Determination of softening point of bituminous material.
9. Determination of ductility of bitumen.
10. Determination of flash point and fire point of Bituminous material
11. Determination of marshal stability value

3CE08 BUILDING CONSTRUCTION & MATERIALS - LAB PRACTICALS –

1. Drawing of following building elements on A-2 size sheet.
 - a) Panelled door, flush door, glazed window.
 - b) Steel truss with details of joints, details & support, details of fixing of roof covering.
2. Planning & drawing of a staircase for the given data. [On A-2 size sheet, Design calculations, plan & section.]
3. Preparation of foundation plan from the given line plan of a two room building [On a A-2 size sheet.]
4. Layout of the above, in field.
5. Fields visits to building under construction and its report writing including material of construction, construction processes, Human

recourses required, construction details.

6. Sketch book containing Free hand sketches of following
 - i) Different types of foundations.
 - ii) Bonds in brick masonry
 - iii) Types of floors. [sections]
 - iv) Types of stairs. [plans and side view]
 - v) Line sketches of different types of steel roof trusses.
 - vi) Details of expansion joints.
 - vii) Details of damp proofing for basement.
 - viii) Fixtures & fastenings of doors & windows.

3CE09 ENGINEERING GEOLOGY - LAB LABORATORY WORK :-

- 1) Megascopic study of common rock forming and ore minerals.
 - 2) Megascopic study of the common igneous, sedimentary and metamorphic rocks.
 - 3) Geological map reading and construction of sections from simple geological maps with engineering problems (about 8 maps)
- A report/journal on above practical conducted shall be submitted by each student. Practical examination shall be based on practical and viva-voce conducted on the above syllabus.

SEMESTER: FOURTH

4CE01 GEOTECHNICAL ENGINEERING – I SECTION – A

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| Unit- I | History of development of soil mechanics , formation of soil, its significance to the field problems.
Soil properties and its classification, system: Definition of soil, soil as a three phase system, weight – volume relationship
Density of Soil, relative density, in-situ density, specific gravity of soil solids, soil solids index and simple soil properties, void ratio, porosity, degree of saturation and functional relationship. Grain size analysis, Mechanical and Sedimentation analysis, consistency limits and their determination, liquidity idea, activity, sensitivity etc. Criteria of classification of fine grained and coarse grained soil IS soil classification |
| Unit-II | Concept of clay mineral, major soil minerals, Kaolonite, Illite, Montmorillonite, its structural formation and properties. Mechanics of compaction, factors affecting compaction, standard and modified Proctor test, OMC, their field determination, zero air-void line, concept of wet of optimum and dry of optimum, different structures of soil, field method |

	of compactions and quality control. Mechanical stabilization and CBR test & its application.
Unit-III	Absorbed water, surface tension, capillarity and its effect on soil properties permeability of soil, Darcy's law and validity, Discharge and seepage velocity, factors affection permeability, determination of coefficient of permeability laboratory and field methods. IS procedure for determination of coefficient of permeability for stratified deposits. Drainage and dewatering of soil, various methods, deciding different drainage system.
	SECTION – B
Unit-IV	Laplace equation, its derivation in Cartesian co-ordinate system, its application for the computation of discharge seepage, seepage pressure, quick sand condition, concepts flow net, method to draw flow nets, characteristics and use of flow net, preliminary problem of discharge, estimation of discharge through homogenous earthen embankment, concept of effective neutral and total stress in soil mass, method of arresting seepage, design of graded filter, Terzaghi's criteria, protection filter, requirement of ideal filter material, concept of piping and criteria of stability against piping.
Unit-V	State of stress at a point, Mohr's stress circle, stress distribution in soil mass, Boussinesq's theory and its applications, point load, uniformly loaded rectangular and circular area New-marks chart, its preparation and use, equivalent point load to deleted. Compression of laterally confined soil, e-p virgin compression curve, compression index, swelling index, coefficient compressibility, concept of consolidation spring analogy Terzaghi's theory of one dimensional consolidation. Mathematical treatment). Consolidation meter-test, coefficient consolidation, time factor curve fitting methods, consolidation. Cassagrandes method for determination of pre-consolidation pressure.
Unit-VI	A physical concept of shear strength, Introduction of Mohr's stress diagram, Mohr's failure criterion, Mohr-Coulomb's theory and development of failure envelopes, Laboratory measurement of shear strength for different drainage, conditions by direct shear test, Unconfined compression test, Triaxial and vane shear test, concept of pore pressure coefficients and their significance on strength of soil, overconsolidation ratio, shear characteristics of sand, NC

and OC clays and partially saturated soil: Influence of soil structure and strain rate on shear strength, Merits and demerits of various shear strength tests.

BOOKS RECOMMENDED :

- 1) Craig R.F. : Soil Mechanics, ELBS, 1983.
- 2) Lambe T.W. & Whitman R.V. : Soil Mechanics, John Wiley and Sons, 1969.
- 3) Terzaghi K. & Peck R.B. : Soil Mechanics in Engg. Practice, John Wiley & Sons, 1967.
- 4) Gulhati S.K. : Engg. Properties of Soils, Tata McGraw Hill, New Delhi, 1978.
- 5) Singh A. : Soil Engg. in Theory and Practice, Asia Publishing House, Mumbai.
- 6) Venkateswaramiah C. : Soil Mechanics and Foundation Engg.

4CE02

**FLUID MECHANICS – I
SECTION - A**

Unit I :	Introduction: Definition of Fluid, physical properties of fluid mass density, unit weight, specific Gravity, dynamic viscosity, Kinematic Viscosity, Newton's law of viscosity, Rheological classification of fluids. Adhesion, Cohesion, surface tension, capillarity, pressure inside droplet & jet of liquid. Fluid Statics I : Pressure at a point, Pascal's law, Equation of fluid static's & its integration, Measurement of pressure, absolute & gauge, types of manometers.
Unit II :	Fluid Statics II : Forces on immersed areas – plane and curved, Buoyancy, equilibrium of floating bodies, metacenter, metacentric height, its determination by analytical method only. Kinematics : types of Flow – Eulerian approach of describing fluid motion, streamline, stream tube, streak line, Path line, substantive, local, convective acceleration, velocity potential, stream function, continuity equation of 2D & 3D flow in Cartesian coordinates.
Unit III :	Fluid Dynamics : Eulers equation of motion along a streamline and its integration to prove Bernoulli's equation, HGL, EGL, velocity distribution, Average velocity, Kinetic – Energy correction factor, momentum correction factor (Definition only) Momentum equation (Statement Only) Forces on pipe bends.

SECTION - B

Unit IV :	Fluid Measurement – I : Venturimeter, Orificemeter, Pitot tube, Prandtl Pitot tube, circular orifices & mouthpieces, time of
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emptying rectangular tanks by orifices at bottom & sides.

Fluid Measurement – II: Notches & weirs, Definition, Types rectangular, triangular, trapezoidal, Cipolletti weir, end contractions, velocity of approach, Francis equation.

Unit V: Laminar flow through circular pipes, velocity distribution, Hagen-Poiseuille equation with Proof. Reynold's number, Boundary layer, definition, development along a flat plate, Nominal thickness, energy thickness, Momentum thickness, displacement thickness.

Unit VI: Flow around immersed bodies, drag, lift, different forms of drag, calculations of drag & lift on cylindrical bodies only. Pipe flow Darcy – Weisbach equation $h_f = fL v^2 / 2gd$ (no proof) major & minor losses, pipes in series, pipes in parallel, equivalent pipe, pipe Network (Hardy – Cross method only)

Books Recommended :

- 1) Modi P.N. & Seth S.M. : Hydraulics & Fluid Mechanics, SI Edition.
- 2) Dr. Jain A.K. : Fluid Mechanics.
- 3) Subramanya K. : Fluid Mechanics.
- 4) Streeter : Fluid Mechanics.
- 5) Garde & Mirajgaonkar : Fluid Mechanics.

4CE03 THEORY OF STRUCTURES – I SECTION – A

Unit-I 1. Classification of Structures, Concept of statically indeterminate beam and frame, Analysis of fixed beam and propped cantilever, Rotation and sinking of support.
2. Analysis of Continuous beam by theorem of three moments, sinking of support.

Unit-II 1. Castigliano's theorem I, Unit load method, slope and deflection in determinate beams and portals.
2. Deflection in determinate trusses.

Unit-III 1. Influence line diagrams for reactions, bending moment and shear force for determinate beams.
2. Rolling loads on simply supported beams, concentrated and uniformly distributed loads, maximum shear force and bending moment, focal length.

SECTION B

Unit-IV 1. Rolling loads on trusses, Influence line diagrams for forces in members of simple trusses.
2. Three hinged arches subjected to static loads, Bending moment, radial shear and axial thrust.

Unit-V Slope deflection method:

1. Analysis of continuous beams with and without sinking of support.
2. Analysis of portal frames without side sway.

Unit-VI Moment Distribution method:

1. Analysis of continuous beams with and without sinking of support.
2. Analysis of portal frames without side sway.

BOOKS RECOMMENDED:

1. Junnarkar, S. B., Mechanics of Structure, Volume I and II
2. Jain and Arya, Theory and Analysis of Structures
3. Reddy. C. S., Basic Structural Analysis, Tata – McGraw hill
4. Wang, C. K., Elementary Analysis of Structures
5. Norris and Wilbur, Elementary Structural Analysis.

4CE04 SURVEYING – I SECTION-A

Unit-I 1. Introduction Surveying – Necessity & purpose, Geodetic & plane surveying, classification of survey, principles of surveying.
2. Instruments for measurement of distance, linear measurements, corrections to field measurements, ranging out, direct and indirect ranging. Use of distomat.
3. Chain surveying: basic definition, principle, selection of survey stations, offsets for locating details, limiting length of offsets, degree of accuracy of offsets, use of cross staff, optical square, prism square, obstacles in chaining, plotting of chain survey work, cross staff survey.

Unit-II 1. Instruments for measurement of angles: Prismatic compass, surveyor's compass, their use and adjustments. Vernier and microscopic theodolite, their temporary adjustment. Permanent adjustment of vernier theodolite. Introduction and uses of Total Station.
2. Traversing with chain and compass, Reference meridians, bearing and azimuths. Local attraction, magnetic declination and its variation. Open & closed traverses. Adjustment of closed traverse - Bowditch's Graphical method.

Unit-III 1. Instruments for measurement of elevation : Dumpy levels tilting and automatic levels. Details of their construction.
2. Temporary and permanent adjustments of Dumpy and tilting levels.

SECTION - B

- Unit-IV: 1. Measurement. of Horizontal and Vertical angles with theodolite by different methods. Other uses of theodolite.
2. Theodolite traverse, latitude and departure, Gale's traverse table.
- Unit-V 1. Leveling: Definition of terms, Principle, leveling methods, leveling staves, Booking and reduction of field notes, curvature and refraction.
2. Contouring: Definition, Characteristics and uses of contour maps, methods of contouring. Refraction, reciprocal leveling plotting of profiles. Errors in leveling.
- Unit-VI: 1. Plane tabling : equipments, methods, two point and three point problems, Advantages & disadvantages of plane tabling, Lehman's rules.
2. Construction and use of minor instruments such as Abney level, Box sextant, Plan i meter, Tangent clinometer, Ghat Tracer.

BOOKS RECOMMENDED:

1. D.Clark : Plane and Geodetic Surveying, Vol. I & II Aisa Publication House.
2. P.B.Sahani : T.B. of Surveying, Vol. I & II, Oxford B.H.B.H.
3. T.P.Kanetkar & Kulkarni : Surveying and Leveling, Part I & II, Pune Vidharthi Griha Prakashan, Pune.
4. B.C.Punmia : Surveying I & II, Standard Book House Delhi.
5. R.C.Brinker and P.R.Wolf, Harper and Row : Elementary Surveying

4CE05 REINFORCED CEMENT CONCRETE-I**SECTION -A**

- Unit-I Cement: Physical properties of Portland cement, laboratory tests, special types of cements.
Aggregate: Classification of aggregate, physical properties, bulking and moisture content, specific gravity, bulk density, laboratory tests.
Properties of fresh concrete: Workability of concrete, methods of measuring workability, nominal mix, mixing, centering & formwork, placing, compaction and curing of concrete
- Unit II Properties of hardened concrete: Grades of concrete, properties of concrete, compressive, tensile, and shear strength, modulus of elasticity, creep, shrinkage and durability, laboratory tests on concrete.

Pozzolana and Admixtures: Plasticizer, retarders, accelerators, water proofing agents, mineral admixtures, IS code provisions.

- Unit-III Special concrete: Light weight concrete, fibre reinforced concrete, Roller compacted concrete, self compacted concrete, high strength concrete, high performance concrete, high volume fly ash concrete.
Special concreting techniques: Guniting, grouting and shotcreting concrete, introduction & application of Ferrocement.

SECTION-B

- Unit-IV Introduction of mix design, factors governing mix design, IS code method of mix design (IS: 10262 – 1982) and Indian Road Congress (IRC) – 44 methods.
- Unit-V Basic elastic theory and concept of reinforced concrete, types of reinforcement.
Analysis of rectangular sections by working stress method, modes of failure, design of singly reinforced beams, one-way slabs (simply supported), lintels, and chajjas.
- Unit-VI Analysis and design of doubly reinforced rectangular beam by working stress method section for simply supported span. Shear and Bond: Shear stress in reinforced concrete beam section, shear reinforcement, bent up bars and stirrups, bond stress, local and average bond stress, and development length.

Students must be shown video CD, slides, transparencies, and photograph of actual structures.

BOOKS RECOMMENDED:

1. Lea, F. M. The Chemistry of Cement and Concrete, Edward Arnold (Publishers) Ltd.
2. Neville, A. M. : Properties of Concrete, Pitman Publishing Company.
3. Neville, Brooks : Concrete Technology, ELBS
4. Gambhir, M. L. : Concrete Technology, Dhanpat Rai and Sons
5. Orchard D. F. : Concrete Technology, Applied Science Pub Ltd.
6. Shetty, M. S. : Concrete Technology, S. Chand
7. Varshney, R. S. : Concrete Technology, Oxford Pub. house.
8. IS: 456 – 2000,
9. IS: 10262 – 1982,
10. Krishna Raju : Design of Concrete Mixes, Mc – Graw Hill.

11. Shah and Kale : Reinforced Cement Concrete Design,
12. Sushil Kumar : Treasure of Reinforced Cement Concrete

4CE06 GEOTECHNICAL ENGINEERING – I-LAB

PRACTICALS :-

Based on above syllabus, following ten practical are required to be formed and a laboratory report be submitted by every student. Practical-examination will be viva based on above syllabus.

EXPERIMENTS :-

1. Determination of specific gravity of soil solids by Pycnometer, density bottle.
2. Determination of moisture content by oven drying method.
3. Determination of field density of the soil by sand replacement / core cutter method.
4. Determination of grain size distribution by mechanical sieve analysis.
5. Determination of Atterberg's limits (LL, PL and SL)
6. Determination of Compaction properties (Standard Proctor Test)
7. Determination of permeability of falling head test
8. Determination of shear strength parameters by direct shear test
9. Determination of unconfined compressive strength of soil.
10. Determination of shear strength parameters by Triaxial of UU type
11. C.B.R. test.
12. Consolidation test

4CE07 FLUID MECHANICS – I - LAB

PRACTICALS :-

Minimum 8 practical out of the list given should be carried out. The practical examination shall consist of viva-voce based on theory & practical. Graphs are to be drawn wherever necessary.

1. Verification of Bernoulli's theorem.
2. Reynolds experiment to determine type of flow.
3. Determination of coefficient of discharge for Venturimeter
4. Determination of coefficient of discharge for Orificemeter
5. Determination of hydraulic coefficients of orifice.
6. Determination of metacentric height.
7. Determination of friction factor for GI pipe
8. Determination of coefficient of discharge for rectangular notch .
9. Determination of coefficient of discharge for triangular notch.
10. Determination of coefficient of discharge for trapezoidal notch.
11. Determination of coefficient of discharge for mouthpiece.
12. Determination of Viscosity of fluid at different temperatures.

4CE08

SURVEYING – I-LAB

PRACTICALS –

Any 7 practicals mentioned below shall be performed by each student, Observations, calculations and relevant work to be submitted in the form of field book and 4 drawing in A-1 size sheet as a sessional work.

1. Measurement of length – use Distomat.
2. Chain and Compass surveying.
3. L Section & C/section of road.
4. Plane table survey.
5. Theodolite traverse.
6. Study and use of minor instruments.
7. Measurement of area of a irregular figure by digital planimeter.
8. To find corrected bearing using prismatic compass (local attraction).
9. To find R.L. of given point (differential levelling)

Practical examination shall consist of field exercise and viva-voce based on the above syllabus and practical work.

4CE09 REINFORCED CEMENT CONCRETE – I-LAB

PRACTICALS:

- Compulsory site visit and submission of site visit report.
- Minimum seven out of following list:
 1. Fineness of cement:
 2. Soundness of cement
 3. Consistency and setting time of the cement
 4. Compressive strength of cement
 5. Sieve analysis of aggregate.
 6. Bulking of sand (fine aggregate).
 7. Silting of sand.
 8. Workability by slump cone test.
 9. Workability by compaction factor test.
 10. Workability by flow table method.
 11. Compressive strength of concrete.
 12. Mix Design (Compulsory) by IS method.

A journal/report on experiments conducted shall be submitted by each student. Practical examination shall be viva-voce based on above practical and the syllabus of the course.

***Content of the Compulsory Subject
“Environmental Studies” are given on Page
Nos. ES-1 to ES-4 i.e. at the end of this syllabus.***

**SYLLABUS PRESCRIBED FOR
FOUR YEAR DEGREE COURSE IN
BACHELOR OF ENGINEERING
MECHANICAL ENGINEERING
SEMESTER PATTERN
(CREDIT GRADE SYSTEM)
SEMESTER : THIRD**

3ME01

MATHEMATICS-III**Section-A**

UNIT-I : **Ordinary differential equations:-** Complete solution, Operator D, Rules for finding complementary function, the inverse operator, Rules for finding the particular integral, Method of variations of parameters, Cauchy's and Legendre's linear differential equations. (10 Hrs)

UNIT-II **Laplace transforms :** Definition, standard forms, properties of Laplace transform, inverse Laplace transform, initial and final value theorem, convolution theorem, Laplace transform of impulse function, Unit step function, Laplace transforms of periodic function. Solution of Linear differential equations. (10 Hrs.)

UNIT-IIIa) Partial differential equation of first order of following form- (i) $f(p,q)=0$; (ii) $f(p,q,z)=0$; (iii) $f(x,p)=g(y,q)$; (iv) $Pp+Qq=R$ (Lagrange's form); (v) $z=px+qy+f(p,q)$ (Clairaut form)

b) Statistics : Curve fitting by method of least squares (Straight and parabola only), Correlation, Regression.

c) Probability Distribution:- Binomial distribution, Poisson and normal Distribution. (10 Hrs.)

Section-B

UNIT-IV **Complex Analysis :-** Functions of complex variables, Analytic function, Cauchy-Reimann conditions, Harmonic function, Harmonic conjugate functions, Milne's method, conformal mappings (translation, rotation, magnification, inversion, bilinear transformation), singular points, expansion of function in Taylor's and Laurent's series. Cauchy's integral theorem and formula, Residue theorem. (12 Hrs.)

UNIT-V **Numerical Analysis :** Solution of algebraic and transcendental equations by Newton-Raphson method & method of false position. Solution of system of linear equations by Gauss-Seidel method, Relaxation method. Solution of first order ordinary differential equations by Picard's, modified Euler's, Runge-Kutta and Taylor's method. (10 Hrs.)

UNIT-VI **Vector Calculus :-** Scalar and vector point functions, Differentiation of vectors, Gradient of a scalar point function,

Directional derivatives, Divergence and curl of a vector point function and their physical meaning, line, surface, volume integrals, irrotational and solenoidal vector fields, Stoke's and Divergence theorem (without proof). (10 Hrs.)

Books Recommended:-**Text Books:**

1. Text book on Applied Engineering Mathematics, Vol. II, J.N. Wartikar and P.N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune.
2. Higher Engineering Mathematics, B.S Grewal, Himalaya Publishing House.
3. Applied Mathematics, Vol. III, J.N. Wartikar and P.N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune.

Reference Book :

1. Advanced Engineering Mathematics, Erwin Kreyzig, John Wiley.

**3ME02/ 3PE02 MECHANICS OF MATERIALS/
STRENGTH OF MATERIALS
SECTION-A**

- Unit-I**
1. Mechanical properties: Concept of direct, bending and shear stresses and strains, stress-strain relations, Biaxial and triaxial loading, elastic constants and their relationship, stress-strain diagrams and their characteristics for mild steel, and other metals, factor of safety,
 2. Uniaxial stresses and strains: Stresses and strains in compound bars in uniaxial tension and compression, temperature stresses in simple restrained bars and compound bars of two metals only.

- Unit-II**
1. Axial force, shear force & bending moment diagrams : Beams, loading and support conditions, bending moment and shear force for all types of loadings for simply supported beams, cantilevers, relation between shear force, bending moment and loading intensity.
 2. Simple or pure bending theory: Theory of simple bending, section modulus, moment of resistance, bending stresses in solid, hollow and built up section, leaf springs.

- Unit-III**
1. Torsion: Theory of torsion & assumptions, derivation of torsion equation, polar modulus, stresses in solid & hollow circular shaft, power transmitted by shaft, closed coiled helical spring with axial load.
 2. Shear stress distribution on beam rectangular and circular cross sections.

SECTION – B

- Unit-IV** Thin and thick cylinders and thin spherical shells subjected to internal pressures.
- Unit –V** 1. Strain energy under uniaxial tension and compression impact loads and instantaneous stresses.
2. Principal Stresses : Biaxial stress system, principal stresses, principal planes, Mohr's circle of stresses.
- Unit-VI** Deflection of beams
Deflection in statically determinate (simply supported) beams subjected to point loads, uniformly distributed loads, moments by Macauley's method.

Books Recommended:**Text Books :**

1. F. L. Singer : Strength of Materials, Harper and Row Publication, New York .
2. Ramamruthm : Strength of Materials, Danpat Rai and Sons, New Delhi .

Reference Books :

1. E.P.Popov : Mechanics of Materials, Prentice Hall of India, New Delhi.
2. S. Timoshenko and O.H.Young : Elements of Strength of Materials, East West Press Private Ltd., New Delhi.
3. Shames, I. H. : Introduction to Solid Mechanics, Prentice Hall of India, New Delhi, 1990.
4. Beer and Johnston : Mechanics of Materials, McGraw Hill.
5. D. S. Prakash Rao : Strength of Material : A Practical Approach, 1ed, University Press, Hyderabad.

3ME03**FLUIDPOWER-I****Section - A**

- UNIT-I** : - 1) Introduction to the study of fluid motion. Mechanical properties of fluids and their influence on flow characteristics.
2) Fluid Statics:- Fluid pressure, pressure variation in fluids, manometers, forces on plane and curved surface buoyancy. (12 Hrs)
- UNIT-II:-** Buoyancy, stability of floating bodies. Kinematics and dynamics of fluid flow:- Types of flows, Stream lines, potential lines, flow net, continuity equation. One and two dimensional motion, one dimensional method of flow analysis. Bernoulli's

equation. Venturimeter, Momentum equation for steady flow. Vortex motion. (8 Hrs)

- UNIT-III:-** Dimensional analysis: Dimensional homogeneity and dimension less ratios. Dimensionless parameters. Similitude and model studies. (6 Hrs)

Section - B

- UNIT-IV:-** Motion of viscous fluids:-Introduction to laminar and Turbulent flows. Boundary layer concept. Separation. Drag lift on immersed bodies. Reynolds number and its significance. (7 Hrs)

- UNITV:-** Darcy weisbach equation i.e. Equation of pipe flow, friction charts and its use, Minor losses in pipes and fittings, losses due to sudden enlargement and contraction, Hydraulic and energy gradient lines, pipes in series and parallel. Elementary concept of water hammer. (8 Hrs)

- UNITVI:-** 1. Principles of fluid machinery: Dynamic action of fluid force exerted by fluid jet on plane, curved, stationary and moving vanes. Velocity diagrams, Work done by impact, pressure due to deviated flow.
2. General Theory of Hydrodynamic Machines:- Eulers equation, Degree of reaction, classification of machines according to degree of reaction. Efficiencies: Volumetric efficiency, Hydraulic efficiency, mechanical efficiency and overall efficiency. (7 Hrs)

Books Recommended :-**Text Books:-**

1. CSP Ojha, R. Berndtsson, Fluid Mechanics and Machinery; Oxford university.
2. Bansal R.K., Fluid Mechanics and Fluid Machines; Laxmi publications.

Reference Books:-

1. R.K.Rajput; Engineering Fluid Mechanics; S. Chand publications.
2. Dr. Mody & Seth; Hydraulics and Fluid Mechanics; Standard book house
3. S. Ramamrutham, Hydraulic, Fluid Mechanics & Fluid Machines, Dhanpatrai publishing company.
4. Streeter, Fluid Mechanics, Tata McGraw Hill.

3ME04**ENGINEERING THERMODYNAMICS****Section-A**

- Unit-I** Introduction to basic concepts of thermodynamics,

Macroscopic and microscopic approaches, properties of system, state and equilibrium, processes and cycle. Temperatures and Zeroth law of thermodynamics, Quasi-static process, Forms of energy and its conversion.

Gas Laws and Ideal gas equation of states, difference between gases and vapours, equation of state, gas constant and universal gas constant. (08 hrs)

Unit-II Work and Heat: Definition of work, thermodynamic work, displacement work and other forms of work, Definition of Heat, Work and heat transfer as path function, comparison of work and heat, work done during various processes, P-V diagrams.

First law of thermodynamics: Energy of a system, classification of energy, law of conservation of energy law applied to closed system under going a cycle, Joules experiment. Energy a property of system, internal energy-a function of temperature, Enthalpy, specific heat at constant volume and constant pressure. Change in internal energy and Heat transfer during various non-flow processes. (10 hrs)

Unit-III First Law applied to flow processes: Steady state, steady flow process, mass balance and energy balance in steady flow process, steady flow energy equation and its application to nozzles and diffusers, turbine and compressor pumps, heat exchangers, Throttle valve etc. work done and Heat transfer during steady flow processes. (9Hrs)

SECTION - B

Unit-IV Second Law of thermodynamics: Limitations of Ist law, Thermal energy reservoir, heat engines refrigerator and heat pumps. Kelvin-Planck and Clausius statements, their equivalence, reversible and irreversible processes, Carnot cycle, two propositions regarding the efficiency of Carnot cycles. The thermodynamic temperature scale. Reverse Carnot cycle. COP of heat pump and refrigeration. Inequality of Clausius. (7 Hrs)

Unit-V Entropy: Entropy-a property of system, entropy change for ideal gases, entropy change of a system during irreversible process, lost work. Principle of increase of entropy. Availability and irreversibility:- Available energy referred to cycle, decrease in available energy with heat transfer through a finite temperature differences. The Helmholtz and Gibbs functions, Availability, Irreversibility and effectiveness. (8 Hrs)

UnitVI a) Air Standard Cycles: Otto, diesel, semidiesel, sterling and joule cycles etc., their efficiencies and mean effective pressure.

b) Vapour Cycles:- Rankine and Modified Rankine Cycle. Comparison of Rankine and Carnot cycle, representation on P-V, T-S and H-S diagram. (No numerical on this unit) (8 Hrs)

Books Recommended

Text Books

1. Engineering Thermodynamic - by P.K.Nag.
2. Thermodynamics Volume: I & II; R. Yadav;

Reference Books

1. Basic Engineering Thermodynamics - by Reyner Joel
2. Thermodynamics - by C.P. Arora.
3. Fundamentals of Classical Thermodynamics - by G.J. Vanwylen.
4. Engineering Thermodynamics; P. Chattopadhyay; Oxford
5. Engineering Thermodynamics; Gordon Rogers, Yon Mayhew; Pearson

3ME05

MANUFACTURING PROCESSES-I

Section - A

Unit-I:- Introduction to manufacturing processes & classification; Introduction to pattern making- Pattern materials, pattern making tools, allowances, Types of patterns, functions of patterns, General properties of moulding sands, Mold hardness. Preparation of sand moulds of different types, Moulding processes, core making, core prints, core boxes. Sand casting Processes - Basic principle and Terminology of sand casting, gating system, types of gate, risers, etc. (9Hrs)

Unit-II:- Technology of melting and casting - Melting furnaces, crucibles, pit, open hearth, gas fired cupola, cupola operation and electric hearth furnaces, Electric furnaces - Direct Arc, Indirect arc and electric induction furnace. Defects in castings and its types, Causes and remedies of casting defects. Origin and classification of defects, shaping faults, Inclusion and sand defects, Gas defects, shrinkage defects, contraction defects, dimensional errors. Inspection and testing of castings:- Radiography, ultrasonic, Eddy current testing, fluorescent penetrant test. (7 Hrs)

Unit III:- Casting processes and their principle of operation and applications permanent mold casting, slush casting, shell

molding, Investment or lost wax casting, vacuum process, centrifugal casting, continuous casting, Die casting equipment and processes for Gravity, pressure and vacuum casting methods, cleaning of castings, Modernisation & Mechanisation of Foundries. (8 Hrs)

Section - B

Unit IV :- Mechanical working of metals: Principle of hot and cold working process and its types, Extrusion, piercing, pipe and tube production, manufacture of seamless pipe and tubing. Shearing operations, tube drawing, wire drawing, spinning, embossing and coining, squeezing and bending operations, rotary swaging, Rolling, types of rolling mills, forging operations, upset forging. (8 Hrs)

Unit V:- Joining processes:- Mechanical joining processes, Mechanical fastening, riveting, soldering, brazing Welding, Types of welding processes-Arc welding: principle and working, Gas welding- principle and working Types and purpose of Electrodes, Electrode coatings(flux). TIG & MIG processes – Working principles and its applications, shielding gases, MIG-Spray transfer and dip transfer processes. (6 Hrs.)

Unit VI:- Submerged arc welding & resistance welding :- Heat generation in resistance welding, operational characteristics of resistance welding processes such as spot welding, projection welding, butt welding. Principle of operation of friction welding, forge welding, plasma arc, thermit welding. Welding defects, Testing and Inspection of welds, Ultrasonic, Electroslag, Electron Beam, laser welding, weldability. Surface Treatment-Electroplating, electroforming, and iodising, metal spraying, shot peening, polishing, mechanical cleaning. (9 Hrs)

Books Recommended

Text Books:-

1. Workshop Technology Vol. I by Bawa, Tata McGraw Hill Publication.
2. Workshop Technology Vol I by Hajra Chaudhary, Dhanpat Rai & Sons 2001.

References:-

1. Workshop Technology Vol I by Raghuvanshi.
2. Manufacturing Processes by J.P. Kaushish; PHI
3. Processes and Materials of Manufacture by R.A.Lindberg, PHI Pub 2001.

4. Foundry Technology by Goel Sinha.

3ME06/3PE06 MECHANICS OF MATERIAL-LAB. / STRENGTH OF MATERIALS-LAB.

Practicals:

Minimum Six to Eight out of following:

1. Tension test on metals.
2. Compression test on materials.
3. Shear test on metals.
4. Impact test on metals.
5. Hardness test on metals.
6. Torsion test on metals.
7. Deflection of beams.
8. Modulus of rupture test.
9. Deflection of springs.

Practical examination shall be viva-voce based on above practical and the syllabus of the course.

3ME07

FLUID POWER-I-LAB.

Practical Term Work:-

At least six practical's (study/Trials) based on above syllabus, as given below shall be performed and a report there of submitted by the students.

1. Study of Manometers.
2. Measurement of fluid pressure by manometer.
3. Determination of metacentric height.
4. Verification of Bernoulli's equation.
5. Flow measurement by venturimeter.
6. Study of venturimeter.
7. Determination of Reynolds number.
8. Velocity distribution in Boundary layer & thickness of B.L.
9. Determination of co-efficient of friction for pipes.
10. Determination of head loss due to sudden enlargement.
11. Determination of head loss due to sudden contraction.
12. Determination of losses in bends.
13. Determination of losses in elbows.
14. Study of flow through pipes in series & parallel.
15. Verification of momentum equation.

Note :- Practical examination shall consist of oral or Experimentation based on above term work.

3ME08 MANUFACTURING PROCESSES-I-LAB.

Practice:-

1. Study of safety precautions in workshop practices.
2. Foundary:- Any two of the following jobs Sand preparation and practice in moulding of various types of patterns:- Pattern making 1 job, Moulding 1 job Casting 1 job.
3. Joining Processes:- 2 composite jobs involving electric welding, gas welding and resistance welding process.

A journal should be prepared and submitted on above term work.

The practical examination shall consist of a job preparation and college assessment should be based upon the jobs, termwork and viva examination.

SEMESTER : FOURTH**4ME01 /4PE01 BASIC ELECTRICAL DRIVES & CONTROL****Section-A**

Unit I: Concept of general electric drives, classification and comparison of electrical drive system, Cooling and heating of electric motors. Introduction to mechatronics, Theory and principle of Power Transistor, SCR

Unit II: Basic characteristics of D.C. motor, Torque equation, Modified speed – Torque characteristics. Starting and braking of Electrical D.C. motors, comparison of mechanical and electrical braking methods. Introduction, Principle, construction and working of Servo motors, stepper motors, Brushless D.C. motors.

Unit III: Classification of A.C. motors, construction, types, principle of working and characteristics of 3 phase Induction motors, applications. Starting and braking of 3 phase induction motors. Classification of single phase induction motors. construction, principle and working and applications. Principle and working of universal motor.

Section-B

Unit IV: Conventional methods of speed control of A.C. and D.C. motors. Thyristorized stator voltage control of 3 phase induction motor, (v/f) control method, slip-power recovery scheme. Thyristorized armature voltage control of D.C. motors using phase control & Thyristorized chopper.

Unit V: Basic principle, construction & applications of sensors and transducers, contact - non- contact type, optical proximity

sensors. Switches, contact type, magnet type, electromagnetic type, sound, light, pressure, vibration transducers, Hall effect-sensors A.C./D.C. Tachogenerators.

Unit VI: Industrial applications - classes of duty selection of an electric drive for particular applications such as steel mill, paper mill, cement mill, textile mill, sugar mill, electric traction, coal mining, etc. Induction heating, surface hardening & Dielectric heating.

Books Recommended**Text Books:-**

1. A First Course on Electrical Drives - S.K. Pillai.
2. Basic Electrical Technology (Vol. 11) - B.L. Theraja

Reference Books :

1. Drives and Control - N. Dutta
2. Mechatronics - W.Bolton, Addison Wesley, Longman Ltd., 1997.
3. A Course in Electrical, Electronics Measurement and Instrumentation, By A.K.Sawhney, Dhanpat Rai & Sons, 2006

4ME02 ENGINEERING METALLURGY**Section - A**

Unit I :- Introduction to metallurgy: Basic concept of process metallurgy, physical metallurgy, and mechanical metallurgy, Classification of materials & their application, Structure of metals and alloys, formation of Alloys, Solid solutions, types and their formation, lever rule for phase mixtures. Solidification of pure metals, nucleation and growth, ingot structure, dendritic solidification (8)

Unit II : Study of binary equilibrium diagram and invariant reactions, Construction and study of Iron-carbon Equilibrium Diagram, Critical temperatures, Microstructure of slowly cooled steel, Estimation of carbon from microstructure, structure property relation, Introduction to composite materials, advantages and applications. (8)

Section-B

Unit IV: Cast irons : Factors governing condition of carbon in cast iron, Maurer's diagram, Solidification of grey and white cast iron, Malleabilizing, Constitution and properties of white, gray, Nodular and Malleable cast irons, their applications, Alloy cast irons.

Non Ferrous Metals and Alloys : Types, Properties and uses of Brasses and Bronzes. Important alloys of

Aluminium, Lead, Tin and Zinc, their applications. Bearing materials, Season cracking, precipitation hardening. (8)

Unit V : Principles of Heat Treatment: - Annealing, Normalizing, Tempering Iso-thermal transformation diagrams(S-curve), super imposition of continuous cooling curves on 's' Curve, pearlite, bainite and martensite transformation, Quenching media, severity of quench, Austempering, Martempering and patenting, Retained austenite and sub-zero treatment. Hardenability. (8)

Unit VI: Methods of surface hardening: Carburizing, Nitriding, Cyaniding, Flame and Induction Hardening.

Mechanical working of Metals: - Hot and cold working, Relative advantages and disadvantages, study of stress strain curve, Luder's bands, Work hardening, strain Ageing; Recovery, Recrystallization and grain growth.

Metallurgical factors affecting various Mechanical working processes, preferred orientation, Deformation mechanisms-Slip & twinning, critical resolved shear stress.

Powder Metallurgy: Concept, Methods of Manufacture of metal powders, compaction Process- Single die and double die, sintering, stages of sintering, Manufacture of porous bearings & cemented carbide tip tools by P.M.T. Advantages, limitations and applications of powder metallurgy. (8)

Book Recommended:-

Text Books:-

1. Introduction to physical metallurgy ;Sidney H Avner, TATA Mc-Graw hill
2. Engineering materials & metallurgy R.K.Rajput, S chand publication

Reference Books:

1. Mechanical Metallurgy, G. E. Dieter, Mc- Graw Hill International, London 3rd Edn. 1999
2. Physical metallurgy for engineers, Clarke and Varney, second Edn.,1987.
3. Power metallurgy, A.K Sinha First Edn. 1991.
4. Material Science and Metallurgy; V.D. Kodgire; Everest Publishing House
5. Engineering physical Metallurgy, Y Lakhtin, Mir Publications. Second Ed. 1999
6. Material Science and Metallurgy- C Daniel Yesudian, Scitech Publication

ENERGY CONVERSION-I

Section - A

4ME03

Unit I Properties of Steam: Triple point and critical point, Sensible heat, latent heat, superheat and total heat of steam. Wet steam, dryness fraction, Internal energy of steam, External work of evaporation, Specific volume, enthalpy, internal energy and entropy of steam. T-S diagram Mollier chart, Steam tables and their use. Work done and heat transfer during various thermodynamics processes with steam as working fluid. Throttling of steam, determination of dryness fraction using various calorimeters. (8 Hrs)

Unit II Flow diagram for steam power plant with basic units such as steam generator, turbine, condenser and pump. Boilers: Introduction to water tube boilers used in thermal power plants, packaged Boilers (fire tube), High pressure boilers; Loeffler, Benson, Lamont Boilers, Boiler mountings and accessories—devices for improving Boiler efficiency. Principle of fluidized bed combustion. Boiler draught; Types of draught, expression for diameter & height of chimney, condition for maximum discharge, efficiency of chimney, reasons for draught loss. (7 Hrs)

Unit III FUEL & ASH HANDLING : Elementary treatment on coal, coal transportation from mine to site and site to boiler house. Fuel bed firing and suspension firing, Equipments of Mechanical grate firing, pulverised coal firing including crushers & pulverisers and burners. Oil handling system, and burner equipment, Elementary treatment on ash handling. Type of dust collectors and disposal of dust. Boiler performance:- Boiler rating, boiler power, equivalent evaporation, efficiency. Effect of accessories on boiler efficiency and heat balance. (8 Hrs)

Section - B

Unit IV Steam power plant: General features, representation of Ranking cycle on phasediagrams. layout, site selection, concept of co-generation. CONDENSERS : Need, Types of condensers, quantity of cooling water required. Dalton's law of partial pressure, condenser and vacuum efficiency. Sources of air in condensers and its effect on performance. Condensate pump and air extraction pumps, air ejectors Cooling water system: cooling ponds, spray tanks, cooling towers: Natural and mechanical wet type cooling tower. (7 Hrs)

UNIT V Steam nozzles : Flow of steam through nozzles & diffusers, Maximum discharge, critical pressure ratio, Effect of friction. Determination of throat & exit areas, Nozzle efficiency, no

numerical on concept of super saturated flow & wilson line
 Steam Turbines:- Principle of working, Types of steam turbines such as impulse, reaction, axial & radial flow, back pressure & condensing turbines. Compounding. Reheat, regenerative cycles, bleeding. Analysis limited to two stages only. (7 Hrs)

UNIT VI Analysis of steam Turbines : Flow of steam through impulse & impulse reaction turbine blading. Velocity diagrams. Graphical & analytical methods for work & power developed, axial thrust and efficiency. Height of turbine blades. LOSSES IN STEAM TURBINES:- Nozzle losses:- blade friction, partial admission, disc friction, gland leakage losses and velocity losses. Governing of steam turbines. (10 Hrs)

Recommended Books:

Text books

1. Thermal engineering; Mahesh M Rathore; Tata McGraw-Hill
2. Thermal Engineering R.Yadav; Central publication

Reference books:

1. Steam Turbine; Kearton; Oscar *Publications*
2. Thermal Power Engineering; Mathur Mehta; Tata McGraw-Hill
3. Power Plant Engineering; R.K.Rajput; Laxmi Publications
4. Thermal Engineering, P.L.Ballaney; Laxmi *Publications*

4ME04 MANUFACTURING PROCESSES-II

Section - A

UNIT I:- Theory of Metal cutting: Mechanics of Metal cutting, Tool material, Tool Geometry, Cutting tool classification, Tool life, Tool wear, Cutting forces and power consumption, Machinability, Cutting fluids, Machine Tool classification. (8 Hrs)

UNIT II:- Construction, Operations and accessories of centre lathe, introduction of capstan & turret lathe, indexing mechanism, bar feeding mechanism, introduction to Automatic screwmachines & Single spindle and multi-spindle automat. (10 Hrs)

UNIT III:- a) Drilling M/cs general purpose, Mass production and special purpose drilling M/cs.
 b) Boring M/c :- Horizontal, Vertical and jig Boring M/c.
 c) Introduction to Broaching and its types, reaming operation. (8 Hrs)

Section - B

UNIT IV:- a) Milling M/c :- Types, Types of Milling Cutters, Dividing head, Compound and differential indexing.
 b) Gear producing M/cs.
 c) Study of various parts and operations of power hack saw. (6 Hrs)

UNIT V:- a) Grinding Machines: Bench grinders, surface grinders, centreles grinders, types of bonds & Abrasive modification of grinding wheels.
 b) Study of various part & Operation of Shaper, Planer, Slotter. (6 Hrs)

UNIT VI:- Unconventional Machining Processes:-

- a) Mechanical Processes:- Ultrasonic Machining - principle and applications. process parameters; Abrasive and water parameters involved.
- b) Thermal processes:- Election Beam Machining – Generation of beam, principle and applications : Laser Beam machining applications : Plasma-arc machining- Concept and generation of plasma, principle of PAM, applications.
- c) Electro Chemical Machining- Classification, fundamentals: Electro mechanical milling.
- d) Electric discharge Machining - Types dis-sie-onking, wire EDM, Mechanism of material removal, process parameters, advantages and applications. (8 Hrs)

Books Recomended:

Text Books:

1. Manufacturing Technology-Vol 1 & 2; R.L.Timings, S.P. Wilkinson; Pearson Publication.
2. Workshop Technology - By Hajra Choudhauri Vol II.

References:-

1. Pandya & Shah, Modern Machining process, Tata McGraw Hill 1998.
2. Workshop Technology, O.P. Khanna, Dhanpatrai & Sons.
3. Workshop Technology - By Raghuwanshi. Vol II.

4ME05 MACHINE DESIGN & DRAWING-I

Section - A

Unit I- a) Sectional Views

Conversion of pictorial view in to sectional orthographic projections, Sectional views with different types of projections, Missing views (12 Hrs)

Unit II- a) Development of surfaces

- Development of surfaces of cubes, prisms, cylinders, pyramids, cones & their cut sections
- b) Intersection of solids-prism and prism, cylinder and cylinder, cylinder and prism, cone and cylinder, cone and prism.
(12 Hrs)

Section B

- Unit III- a) Meaning of Design, Phases of Design, Design considerations
- b) Simple stresses, Thermal stresses, Torsional Stress, stresses in straight & curved beams and its application- hooks, c-clamps
- c) Design & drawing of riveted joints- Caulking & fullering, failures, strength & efficiency of riveted joints.
- d) Welded joints- Symbolic representation, Strength of transverse & parallel fillet welded section
- e) Design & drawing of Knuckle Joints (12 hrs)
- Unit IV-a) Design of Helical springs- Types of springs, stresses in helical springs, Wahl's stress factor, Buckling & surge, tension spring
- b) spiral & leaf springs
- c) Design of power screw-Torque required to raise loads, efficiency & helix angle, overhauling & self locking of screw, acme threads, stresses in power screw. (12 hrs)

Books Recommended

Text Books :

- 1) Machine Drawing by N. D. Bhatt, Charator Publication
- 2) Machine Design by R. S. Khurmi & J. K. Gupta, S. Chand Publication

Reference Books :

- 1) Machine Design by Dr. P. C. Sharma & Dr. D. K. Agrawal, Katsons Books publication
- 2) Design of Machine elements by C. S. Sharma, Kamlesh Purohit, PHI publication
- 3) Design of Machine elements by V. B. Bhandari, Tata McGraw Hill Publication
- 4) Machine Design, Jindal, Pearson publications
- 5) Design Data Book by- P.S.G. Koimbatore
- 6) Design Data Book by Mahadevan,
(Use of any data book from the above will be permitted during the examination).

4ME06 / 4PE06 BASIC ELECTRICAL DRIVES & CONTROL-LAB.

List of Experiments

Any eight practicals from the following list:

1. To study the Specification of Various Electrical Machines.
2. To study the D.C. Motor Starters.
3. To study the Running and Reversing of D.C. Motor.
4. Speed Measurements using Magnetic Pick-up.
5. To study the Speed reversal of counter Current Breaking of 3-phase Induction Motor.
6. To control the speed of D.C. Motor by a) Armature Control b) Field Control.
7. To perform Load Test on Induction Motor.
8. To study Dynamic/Rheostatic Breaking of D.C. Motor.
9. To study Characteristics of Thyristor.
10. To study the speed -Torque Characteristic of Servo Motor.

4ME07 ENGINEERING METALLURGY-LAB.

List of Practicals: - (At least eight practicals out of the following list.)

1. Study of metallurgical microscope.
2. Preparation of specimen for micro-examination.
3. Moulding of specimen for micro-examination.
4. Study of micro structures of Annealed and normalized plain carbon steels.
5. Study of micro structures of alloy steels and H.S.S.
6. Study of micro structures of various cast irons.
7. Study of micro structures of non ferrous metals.(brasses, bronzes)
8. Study of micro structures of hardened and tempered steels.
9. Study of Iron carbon Equilibrium diagram & Allotropic forms of iron.
10. Study different Heat Treatment Process for steel.
11. Study of different surface Hardening processes for steels.
12. Study of effect of alloying elements on the properties of steels.
13. Measurement of hardenability by Jominy end quench test apparatus.
14. Study of hardness tester and conversion of Hardness number
15. Industrial visit to study heat treatment plant.
16. Measurement of particle size, grain size, nodularity, coating thickness etc. by using some software like Metzer Microcam 4.0

Practical Examination:

Practical examination shall consist of viva voce/performance based on the above syllabus and practical work.

4ME08 ENERGY CONVERSION-I-LAB.

Practical Term Work:-

At least six practicals (Study/trials) based on above syllabus, as given below shall be included in the report by the students.

1. Study of a water tube boiler (Babcock Wilcox boiler)
2. Study of a locomotive boiler.
3. Study of a high pressure boiler.
4. Study of boiler accessories.
5. Trial on a boiler and heat balance sheet.
6. Study of boiler mountings.
7. Study and trial on a steam turbine.
8. Study of condensers.
9. Study of condensate and air extraction pumps.
10. Study of steam power plant.

Practical Examination:- Shall consist of based on above term work and syllabus.

4ME09 MANUFACTURING PROCESSES-II-LAB.

Practicals:-

1. Demonstration of operations related to lathe, shaper, slotter, drilling & grinding m/cs.
2. One job on lathe covering taper turning and threading.
3. One job on shaping covering plane and inclined surfaces.
4. One job on milling machine.

The above jobs should include drilling, grinding, tapping etc.

Term work should be submitted in the form of journal.

N.B. :- The practical examination shall consists of preparation of practical jobs and assessment by external and internal examiner.

4ME10 MACHINE DESIGN & DRAWING-I-LAB.

List of Practical's

Any Six of the following

- 1) Sectional views & missing views of objects
- 2) Development of surfaces
- 3) Intersection of Solids
- 4) Conventions for various components like bearing, gears, springs, key & key ways, threads, tap holes and materials, Surface roughness etc
- 5) Design & Drawing of cotter joint
- 6) Design & drawing of screw jack
- 7) Design & drawing of flywheel
- 8) Design & drawing of helical spring

Any one practical from the above list should be done using software.

***Content of the Compulsory Subject
“Environmental Studies” are given on Page
Nos. ES-1 to ES-4 i.e. at the end of this syllabus.***

SYLLABUS
PRESCRIBED FOR
FOUR YEAR B.E. DEGREE COURSE IN
ELECTRICAL ENGINEERING
(ELECTRONICS & POWER) /
ELECTRICAL & ELECTRONICS ENGINEERING /
ELECTRICAL ENGINEERING
(ELECTRICAL & POWER) /
ELECTRICAL ENGINEERING
SEMESTER PATTERN
(CREDIT GRADE SYSTEM)
THIRD & FOURTH SEMESTER

SEMESTER: THIRD

BRANCH ABBRIVIATIONS :-

EP : Electrical Engg. (Electronics & Power)

EX : Electrical & Electronics Engg.

EL : Electrical Engg. (Electrical & Power)

EE : Electrical Engg.

3 EP01/3EX01/3EL01/3EE 01 MATHEMATICS-III

SECTION-A

- UNIT-I:** Ordinary differential equations:- Completer solution, Operator D, Rules for finding complementary function, the inverse operator, Rules for finding the particular integral, Method of variations of parameters, Cauchy's and Legendre's linear differential equations. Simultaneous linear differential equations with constant co-efficient, Applications to electrical circuits.
- UNIT-II:** Laplace transforms: definition, standard forms, properties of Laplace transform, inverse Laplace transform, initial and final value theorem, Convolution theorem, Laplace transform of impulse function, Unit step function, Laplace transforms of periodic function.
- UNIT-III:** a) Application of L.T. to linear differential equations with constant coefficients & Simultaneous linear differential equations.
- b) Fourier transforms- Definition, standard forms, inverse Fourier transform, Properties of Fourier transforms, Convolution theorem, Fourier sine and Fourier cosine transforms and integrals.

SECTION-B

- UNIT-IV:** a) Difference equation:- solution of difference equations of first order, Solution of difference equations of higher order with constant co-efficients.
- b) Z-transform: Definition, standard forms, Z-transform of impulse function, Unit step functions, Properties of Z-transforms (Linearity, shifting, multiplication by k, change of scale), initial and final values, inverse Z-transforms (by direct division and partial fraction), Solution of difference equation by Z-transforms.
- UNIT-V:** Vector calculus: Scalar and vector point functions, Differentiation of vectors, Curves in space, Gradient of a scalar point function, and their physical meaning, expansion formulae (without proof).
- UNIT-VI:** Line, surface, volume integrals, irrotational and solenoidal vector fields, Stoke's and Divergence theorem (without proof).

BOOKS RECOMMENDED:-

- 1) Advanced Engineering Mathematics, 3 edi – Potter, Oxford University Press, 2008
- 2) Mathematical Techniques – Jordan and Smith 4/e – Oxford University Press, 2008
- 3) A Mathematical Companion for Science and Engineering Students – Brettenbach, Oxford University Press, 2008
- 4) Elements of Applied Mathematics by P.N. Wartikar and J.N. Wartikar
- 5) Advancing Engg. Mathematics by E.K. Kreyzig.

3 EP02/3EX02/3EL02/3EE 02 NETWORK ANALYSIS

SECTION-A

- Unit I:** a) **Terminal Element Relationships:** V-I relationship for Inductance and Capacitance- Constant Flux Linkage Theorem and Constant Charge Theorem- v-i relationship for Independent Voltage and Current Sources - v-i relationship for dependent voltage and current sources- Source Functions: unit impulse, unit step, unit ramp and inter relationship, sinusoidal input ,generalized exponential input.
- b) **Basic Nodal and mesh Analysis:** Introduction, Nodal analysis, the super node, mesh analysis, the super mesh, nodal vs mesh analysis
- Unit II:** **Network Theorems :** Linearity and superposition, source transformations, Thevinin's theorem , Norton's theorem, Maximum power transfer theorem, Delta-wye transformations Reciprocity theorem, Milliman's theorem, Substitution

theorem, Compensation theorem, Tellegen's theorems

Unit III: **Time Domain Analysis of Circuits:** Linear Differential Equations for Series RC, Parallel RC, Series RL, Parallel RL, Series RLC, Parallel RLC and Coupled Circuits-Complete Solution for step/impulse/sinusoid voltage/current inputs-Natural Response-Transient Response-Time Constant-Rise and Fall times-Concept of d.c steady state and sinusoidal steady state-Frequency Response of simple circuits from steady state solution-Solution of two mesh circuits by differential equation method-Determination of initial conditions.

SECTION-B

Unit IV : a] **Review of Laplace Transforms:** Laplace Transform-Transform Pairs-Gate Functions-Shifting Theorem-Solution of Differential Equations by Laplace Transforms-Initial and Final Value Theorems-Laplace Transforms of periodic signals-Inversion of transforms by partial fractions-Convolution Theorem and Convolution Integral. (*Review to be done by students. No class hour will be spent for this review.*)

b] **Transformation of a Circuit into s-domain:** Transformed equivalent of inductance, capacitance and mutual inductance -Impedance and admittance in the transform domain - Node Analysis and Mesh Analysis of the transformed circuit - Nodal Admittance Matrix and Mesh Impedance Matrix in the s-domain - Solution of transformed circuits including mutually coupled circuits-Input and transfer immittance functions - Transfer functions - Impulse response and Transfer function - Poles and Zeros - Pole Zero plots,

Unit V : a] **Sinusoidal Steady State analysis: Introduction,** characteristics of sinusoids, forced response to sinusoidal functions, the complex forcing function, The phasor, phasor relationships for R L C, impedance and admittance , sinusoidal steady state analysis with phasors.

b] **Fourier Series:** Fourier Series representation of non-sinusoidal periodic waveforms - Fourier Coefficients-Determination of Coefficients-Waveform Symmetry-Exponential Fourier Series-Discrete Amplitude and Phase Spectra-Steady State Solution of Circuits with non-sinusoidal periodic inputs by Fourier Series

Unit VI: **Two Port Networks:** two port networks-characterizations in terms of impedance, admittance, hybrid and transmission parameters-inter relationships among parameter sets-Reciprocity Theorem-Interconnection of Two port networks: Series, Parallel and Cascade - Network Functions-Pole Zero

plots and steady state response from pole-zero plots.

Books Recommended :-

- 1) Engineering Circuit Analysis 6/e By Hayt & Kemmerly TataMcgraw Hill 2004
- 2) Network Analysis, By M.E. Van Valkenberg PHI 2005
- 3) Electrical Linear Circuits – David Bell Oxford University Press 2008
- 4) Linear Circuit Analysis 2/e – DeCarlo and Lin Oxford University Press 2009
- 5) Network Analysis, P.Ramesh babu, SCITECH Publications, Chennai 2009
- 6) Circuit and Network Analysis By Sudhakar Shyammohan Tata Mc Graw Hill 2005
- 7) Circuits & Networks – Analysis, Design & Synthesis by M.S.Sukhija, T.K.Nagasarkar, Oxford University Press, 2010

3 EP03/3EX03/3EL03/3EE 03 ENERGY RESOURCES AND GENERATION SECTION A

Unit I: **Thermal and Hydro Power plant:** Selection of site, working of various parts: Economizer, air preheater, condenser, cooling tower, coal handling system, ash handling system, Classification of hydro power plant according to available head, nature of load, functions of different components and their working.

Unit II: **Nuclear and Diesel Power plant:** Methods of producing nuclear reactions, functions of different components of nuclear plant, functions of different components of diesel plant

Unit III: **Solar Energy and its measurement:** Solar constants, solar radiation at earth's surface, solar radiation geometry, solar radiation measurement, estimation of average solar radiation, solar radiation on tilted surface, principle of solar energy conversion in to heat, flat plate collectors, energy balance equation and collector efficiency

SECTION B

Unit IV : a] **Fuel cells:** Chemistry applied to fuel cells, principle and operation ,classification and types of fuel cells, performance characteristics of fuel cells, classification of fuel cells system

b] **Wind Energy:** Basic principle of wind energy conversion, wind data and energy estimation, selection of site, basic components of wind energy conversion system (WECS), classification of WEC systems, generating system, energy

storage, application of wind energy.

Unit V : **Ocean and tidal energy:** Ocean energy resources, ocean energy routes, ocean thermal energy conversion, progressive wave, wave data collection, Basic principle of tidal power, components of tidal power plants, operation methods of utilization of tidal energy, estimation of power and energy in simple single basin tidal system

Unit VI: **Other non- conventional energy resources:** Operating principle of energy from biomass, energy from biogas, geothermal energy, MHD power generation, energy from urban and rural waste, mini and micro hydroelectric power generation, principle and operation of fuel cells, classification and types of fuel cells, performance characteristics of fuel cells.

Books Recommended :-

- 1) Energy Science, Principles Technologies & Impacts, John Andrews & Nick Jelley, Oxford University Press, 2009
- 2) Renewable Energy – Power for Sustainable Future, Godfrey Boyle, Oxford University Press, 2004
- 3) Conventional Energy Technology By S.B.Pandya, Tata McGrawHill, 2005
- 4) Non Conventional Energy Resources By G.D.Rai, Khanna Publishers, 2001
- 5) Energy and Atmosphere By I.M.Campbell, Wiley, New York, 2006
- 6) Solar Energy By S.P.Sukhatme, Tata Mc-GrawHill, 2006
- 7) Conventional Energy Resources By B.H.Khan, Tata McGrawHill, 2003.

3EP04/3EX04/3EL04/3EE 04 ELECTRONIC DEVICES AND

**CIRCUITS
SECTION-A**

UNIT-I: P-N Junction diode theory, Rectifiers - Half wave, full wave and bridge rectifier. Filters-C, LC and their analysis, Zener diode and its applications.

UNIT-II: Theory and Analysis of Bipolar Junction transistor, 'H' Parameter, methods of biasing, their needs, 'Q' and stability factors, compensation techniques.

UNIT-III Study of typical transistor amplifier circuits

- i) Emitter follower,
- ii) Darlington emitter follower.
- iii) Bootstrap emitter follower,
- iv) RC coupled amplifier,

- v) Transformer coupled amplifier,
- vi) Cascaded amplifier,
- vii) Direct coupled amplifier,
- viii) Cascade stage.

SECTION-B

UNIT-IV: Class 'A' 'B' 'AB' and 'C' amplifiers, configuration of audio amplifiers, Calculations of power gain, efficiency, dissipation and distortion, oscillators, their criteria, Hartley, Collpit and R-C oscillators, Crystal oscillator.

UNIT-V: Theory, construction and applications of Schottky diode, Tunnel diode, Varactor diode, Selenium diode, LED, Photo diode, PIN diode, photo-transistor.

UNIT-VI: FETs (JFET & MOSFET) : Types, Characteristics and parameters (u , g_m & R_{ds}), Applications of FET amplifiers, UJT: Characteristics, working, UJT as relaxation oscillator.

BOOKS RECOMMENDED:

- 1) Millman's Electronic Devices & Circuits by J.Millman, C.Halkias, Satyabrata Jit TMH 3rd ed, 2nd reprint 2011
- 2) Electronic Devices and Circuits 5/e – David Bell Oxford University Press
- 3) Microelectronic Circuits 5/3 – Sedra nad Smith Oxford University Press
- 4) Boylestad R. and "Electronics Devices & Circuits", Prentice Hall of India Private Limited, New Delhi (Fifth Edition), 1993.

3EP05/3EX05/3EL05/3EE 05 ELECTRICAL MEASUREMENT AND

**INSTRUMENTATION
SECTION A**

Unit I: **Measuring Instruments:** Classification, deflecting, controlling, damping, breaking torques. Basic principles of operation of Ammeter & Voltmeter: PMMC, MI, Electro dynamic, Electrostatic: construction, Principle of operation, torque equation, Scale shape, errors, merits & demerits of each type.

Unit II: **Watt meters & Energy meters:** Electro dynamic & Induction type: construction, theory of operation, torque equation, errors & demerits, Electronic energy meter.

Analysis of three phase balanced load, Blondel's Theorem, Measurement of active & reactive power & energy in single phase & three phase circuits.

Unit III : a) **Instrument Transformer:** Need of extension of range: extension using shunt & multipliers Instrument transformers:

CT & PT, Theory & construction, Phasor diagram, Ratio & Phase angle error, causes of error, applications Hall effect sensors for voltage and current measurement.

- b) Special Measuring Instruments** :- Maximum demand indicator, Trivector meter, Frequency meter, P.F. meter, Phase sequence indicator, Synchroscope, stroboscope, potentiometers.

SECTION B

Unit IV : **Measurement of circuit parameters:** Different methods of measurement of low, medium & high value of resistance, sensitivity & accuracy of different methods.

AC & DC bridges : Wheatstone, Kelvin, Maxwell, Wein, Hay, Desauty, Anderson, Schearing

Unit V : **Generalized instrumentation system** , characteristics of measurement & instrumentation system Transducers : Definition, classification, specification, selection & loading effect, Displacement, Velocity, force, & Torque transducers, Resistive, Inductive, capacitive, Strain gauge, Piezoelectric, current & voltage transducers.

Unit VI : **Transducers for pressure & temperature:** Manometer, Elastic members (Bellows, Bourdon tube, Diaphragm), RTD, Thermocouple, Thermister, Infrared & Crystal Cathode ray oscilloscope: Time, frequency & phase angle measurement using CRO. Spectrum & Wave analyzer.

Books Recommended

- 1) Electronic Measurement & Instrumentation by Oliver – cage, TMH 4th reprint 2010
- 2) Electronic Instrumentation by H.S Kalsi, TMH 3rd edition, 2nd reprint 2011
- 3) Instrumentation for scientists and Engineers – Turner Oxford University Press 2008
- 4) Electronic Instrumentation & Measurement , David Bell Oxford University Press 2nd Ed
- 5) A course in Electrical, Electronics measurement and Instrumentation, By A.K.Sawhney Dhanpat Rai & sons 2006
- 6) Electrical measurement and measuring Instruments By Golding Wheeler Publishing 2003
- 7) Electronic measurement and measuring Instruments By Co.

3 EP06/3EX06/3EL06/3EE 06 NETWORK ANALYSIS LAB

Any TEN experiments based on contents of 3 EP02/3EX02/3EL02/3EE02 NETWORK ANALYSIS

3 EP07/3EX07/3EL07/3EE 07 ELECTRONIC DEVICES AND CIRCUITS LAB

Any TEN experiments based on contents of 3 EP04/3EX04/3EL04/3EE04 ELECTRONIC DEVICES AND CIRCUITS

3 EP08/3EX08/3EL08/3EE 08 ELECTRICAL MEASUREMENT AND INSTRUMENTATION LAB

Any TEN experiments based on contents of 3 EP05/3EX05/3EL05/3EE05 ELECTRICAL MEASUREMENT AND INSTRUMENTATION

SEMESTER: FOURTH

4EP01/4EX01/4EL01/4EE 01 ELECTRICAL MACHINES-I SECTION A

Unit I: D.C. Machines

Construction, principle of operation, Emf equation, torque equation. Armature winding – Lap, wave, single layer, double layer. Armature reaction and commutation, method of improving commutation.

Unit II : D.C. Generators.

Types, characteristics and applications of d.c. shunt, series and compound generators.

Parallel operation of d.c. shunt, series and compound generators. Introduction for conducting and reporting the test on d.c. machines as per Indian standard.

Unit III: D.C. Motors

Characteristics, applications of d.c. shunt, series and compound motors, starting and speed control, losses, efficiency and testing.

SECTION-B

Unit IV: Single phase Transformer.

Heat run test, separation of core losses in to its component, parallel operation, equivalent circuit. Autotransformer - construction, working, merits, demerits and application.

Introduction for conducting and reporting the test on transformer as per Indian standard.

Unit V: Three phase Transformer:

Construction, working, types, connections, applications, testing, parallel operation, open delta, power transformer, distribution transformer construction.

Unit VI: Three phase to single phase, two phase, six phase, twelve phase conversion. Three-winding transformer and tap

changing transformer. Wave forms of no-load current and inrush current phenomenon.

Books Recommended

Electrical Machines by D.P.Kothari, I.J.nagrath TMH 4th edition, 2nd reprint 2011

ELECTRIC MACHINERY and Transformer, 3E – Bhag S Guru Oxford University Press

Advance Electrical Technology By H.Cooton. 1999

Substation Equipment By Satnam and Gupta 2003 .

4EP02/4EX02/4EL02/4EE 02 ELECTROMAGNETIC THEORY

SECTION A

Unit I : Review of Vector Analysis :cartesian, cylindrical and spherical co-ordinate systems, vector algebra and vector calculus. Line integral and multiple integrals. Gauss theorem.

Unit II : Electrostatics : Coulomb's law, electric field, Gauss flux theorem in integral and differential form. Electrostatics potential, Poisson and Laplace equations.

Unit III: Electrostatics fields in dielectrics : electric dipole, polarization. P and D vectors, boundary conditions. Capacitance and electrical energy.

SECTION-B

Unit IV: Magnetic fields : Biot-Stewart law, Ampere's law in integral and differential form. Continuity equation, time of relaxation. Vector and Scaler magnetic potential, electric current, J vector.

Unit V : Magnetic fields in materials : magnetic dipole equivalent volume and plane section curve. H vector, magnetization vector M, boundary conditions between magnetic materials, inductance, Electromagnetic Energy.

Unit VI: Maxwell equations and wave equations : Displacement current, time varying fields and Maxwell's equations, plane uniform magnetic waves. Depth of penetration poynting vector.

Books Recommended

- 1) Engineering Electromagnetics by W.H.Hayt, J.A.Buck, TMH 7th edition 2010
- 2) Foundation of Electromagnetic Theory, John Reitz, F.J.Milford, R.W.Christy, Pearson education, 4th edition 2010
- 3) Elements of Engineering Electromagnetics, Nannapaneni Narayana Rao, Pearson education, 2006
- 4) Principles of Electromagnetics 4/e Mathew Sadiku Oxford University Press

- 5) Field Theory, D. Ganesh rao, C.K.Narayanapa PEARSON education ,2010

4EP03/4EL03/4EE 03 ANALOG AND DIGITAL CIRCUITS

SECTION-A

Unit I : Introduction to IC's : Characteristics of IC components, Operation amplifier; Block schematic internal circuits, Level shifting, overload protection, study of IC 741 op-amo, Measurement of op-amp parameter.

Unit II : Linear and Non-linear Application of Op-amp:- Inverting and noninverting amplifiers, voltage follower, integrator, differentiator differential amplifier, Sinusoidal RC-phaseshift and Wein bridge oscillators, clipping, clamping and comparator circuits using op-amps. Astable, bistable and monostable multi vibrator using op-amps.

Unit III : Other linear IC's : Block schematic of regulator IC 723, and its applications, study of 78 **, 79 ** and its applications, SMPS, Block schematic of timer IC 555 and its applications as a timer, astable, mono stable, bistable multivibrator and other applications, Operation of phase lock loop system and IC 565 PLL, its application.

SECTION-B

Unit IV : Basic Logic Circuits : Logic gate characteristics, NMOS inverter, propagation delay, NMOS logic gate, CMOS inverter, CMOS logic gates, BJT inverter, TTL, NAND gate, TTL output, state TTL logic families, ECL circuits, composition logic families.

Unit V : Combinational Digital Circuits: Standard gate assemblies, Binary adder, Arithmetic functions, Digital comparator, Parity check generator, Decoder / demultiplexer, Data selector / multiplexer, Encoder, ROM, Two dimensional addressing of ROM,ROM applications, PROM,EPROM,PAL AND PLAS.

Unit VI : Sequential Circuits and Systems: Bistable Latch, Flip-Flop clocked SR,J-K, T, D type shift Registers, counter. Design using filp-flops, Ripple and synchronous types, application of counters, Dynamic MOS shift registers, RAM, Bipolar RAM Cells.

BOOKS:-

1. Millman, Microelectronics, 2nd Ed., McGraw Hill.
2. Gayakwad, Op-Amp & LLG, 2nd Ed.
3. Malvino & Leach, Digital Principles & Applications, 4th Ed., McGraw Hill.

4. K.B.Botkar, Integrated Electronics (Khanna Publishers.)

4EP04/4EL04/4EE 04 MATHEMATICS-IV

SECTION-A

- Unit I : a) Complex variables : analytic functions, Cauchy-Riemann conditions. Harmonic function, Harmonic conjugate functions, Milne's method.
- b) Confirmed mapping : mapping by elementary functions of the type $W=z+c$, $W=cz$, $W=1/z$, $W=z^2$, $W=e^z$, $W=z+1/z$ and bilinear transformation. (10 Hrs.)
- Unit II : Complex Integral : singular points, Taylor's series, Laurent's series, Cauchy's integral theorem and Cauchy's integral formula.
- Residue : Cauchy's residue theorem. Contour integrals. Integration forms : $f(x) dx$, $f(\sin x, \cos x) dx$ (10 Hrs.)
- Unit III: Partial differential equations : first order and first degree p.d. equation type.
- (i) $f(p, q) = 0$, (ii) $f(p, q, z) = 0$, (iii) $f(p, q, x, y) = 0$ (iv) $f(p, q, x, y, z) = 0$ etc.
- Lagrange's form $Pp + Qq = R$. Clairnet's form $Z = px + qv + f(p, q)$.
- Equation reducible to standard form. Homogeneous P.D.E. of nth order. (10 Hrs.)

SECTION-B

- Unit IV: Special functions : solution of Legendre's and Bessel's equations by Frobenius method, Bessel's function 1st kind generating function, recurrence relating values of $J_{1/2(x)}$, $J_{-1/2(x)}$, $J_{3/2(x)}$ etc. Legendre's function of 1st kind : generating function, Rodrigues function, recurrence relation, Legendre's polynomials and orthogonal properties. (10 Hrs.)
- Unit V : Statistics & Probability : Axioms, conditional probability, Bay's theorem, mathematical expectations, probability distributions : Binomial, Poisson and Normal. (10 Hrs.)
- Unit VI: a) Curve fittings by method of Least Squares. Correlation and regression.
- b) Matrix differential equation : solution and integrated solution, Sylvester's theorem, solution of differential equations by matrix method and Peano Baker method. (10 Hrs.)

BOOKS RECOMMENDED :

- 1) Pipes : Mathematics for Engineers and Physicist.
- 2) P.N. Wartikar and J.N. Wartikar : A Text Book of Applied Mathematics.
- 3) B.S.Grewal : Advance Engineering Mathematics.

- 4) S.G.Gupta : Statistical Methods.
- 5) Speigal : Statistics (Schaum's series)
- 6) Speigal : Complexva (Schaum's series)

4EP05/4EX05/4EL05/4EE 05 NUMERICAL METHODS AND COMPUTER PROGRAMMING

SECTION A

- Unit I :** Solution of Algebraic & Transcendental equations : Floating point number representation, errors, accuracy, stability of algorithms. Bracketing methods : bisection method and False Position method.
- Open methods : Newton-Raphson method, Secant method and Successive Approximation method.
- Comparison of different iterative methods. Implementation of these methods in C.
- Unit II :** Solution of Simultaneous Algebraic equations : Iterative methods : Jacobi's method and Gauss-Seidel method. Direct methods : Gaussian elimination method & Matrix Inverse method. Finding Eigen values of a matrix, determination of largest Eigen value. Implementation of these methods in C.
- Unit III :** Interpolation : Evenly spaced points : formation of forward & backward difference table, Newton's forward & backward difference interpolation formulae. Unevenly spaced points : divided difference table and Newton's divided difference interpolation formula, Lagrange's method. Interpolation with Cubic splines. Implementation of these methods in C.

SECTION-B

- Unit IV :** Numerical Differentiation and Integration : Numerical differentiation : Taylor's series method, Richardson extrapolation method, numerical differentiation using interpolation polynomial (first & second derivative near the beginning & end of the table). Numerical Integration : Trapezoidal Rule, Simpson's Rules, Romberg method, Gaussian quadrature method. Implementation of these methods in C.
- Unit V :** Solution of ordinary differential equations : Initial value problem : Taylor's series method, Runge-Kutta methods - second & fourth order, Euler's method, Euler's modified method. Solution of simultaneous & higher order differential equations using Runge-Kutta fourth order method. Stiff differential equations and their solutions. Boundary value problem : Finite difference method and Cubic spline method. Implementation of these methods in C.

Unit VI: Principles of Object Oriented Programming : OOP paradigm, basic concepts of OOP, benefits of OOP, basic data types, users defined data types, derived data types, operators and control statements.

Books Recommended

- 1) Numerical Methods with Programms in C by T.Veerarajan, T.Ramachandran TMH 2nd edition, 6th reprint 2011
- 2) Numerical Methods - Principles, Analysis & Algorithms Pal, Oxford University Press , 2008
- 3) Numerical Methods for Engineers and Scientists – Guha Oxfor University Press 2008
- 4) Computer Fundamentals and Programming in C – Dey and Ghosh Oxford University Press 2008
- 5) Chapra S.S. & Canale R.P. : Numerical Methods for Engineers, 4th edition, McGraw Hill.
- 6) Balguruswami E. : Object Oriented Programming with C++, Tata McGraw Hill, New Delhi.
- 7) Nakamura S. : Applied Numerical Methods in C, Prentice Hall.
- 8) Faires & Burden : Numerical Methods, 7th edition, Thomson Learning.

4EP06/4EX06/4EL06/4EE 06 ELECTRICAL MACHINES I LAB

Any TEN experiments based on contents of 4EP01/4EX01/4EL01/4EE 01 ELECTRICAL MACHINES-I

4EP07/4EL07/4EE 07 ANALOG AND DIGITAL CIRCUITS LAB

Any TEN experiments based on contents of 4EP03/4EL03/4EE 03 ANALOG AND DIGITAL CIRCUITS

4EP08/4EX08/4EL08/4EE 08 NUMERICAL METHODS AND COMPUTER PROGRAMMING

Any TEN experiments based on contents of 4EP05/4EX05/4EL05/4EE 05

NUMERICAL METHODS AND COMPUTER PROGRAMMING

***Content of the Compulsory Subject
“Environmental Studies” are given on Page
Nos. to i.e. at the end of this syllabus.***

SYLLABUS

PRESCRIBED FOR

**FOUR YEAE B.E. DEGREE COURSE IN
ELECTRICAL & ELECTRONICS ENGINEERING
SEMESTER PATTERN
(CREDIT GRADE SYSTEM)**

SEMESTER : FOURTH

BRANCH ABBREVIATION :-

EX : Electrical & Electronics Engg.

4EX03

LINEAR INTEGRATED CIRCUITS

SECTION A

Unit I :

Op-amp Fundamentals: Differential amplifiers, ac and dc analysis of differential amplifiers, review of operation amplifier- block diagram representation, basic configurations, ideal op-amp, negative feedback, non – ideal closed loop characteristics.

Unit II :

Basic op-amp Circuits: voltage follower, sign changer, adder, subtractor etc, I to V and V to I converters, current amplifiers, difference amplifiers, instrumentation amplifiers and their applications, transducer bridge amplifier.

Unit III :

Op-amp Parameters: Input bias and offset current, input offset voltage, input offset error compensation, slew rate, common mode rejection ratio etc, frequency response, input and output impedance, operation limits, compensated and uncompensated op-amps, compensation techniques.

SECTION B

Unit IV :

Non-linear Circuit Applications: Voltage comparator and its applications, Schmitt trigger and its application, precision rectifiers, limiters, analog switches, peak detectors, sample and hold circuits, integrator and differentiator, log/antilog amplifiers, practical log/antilog circuits, analog multipliers, opamp as phase detector, op-amp electronic thermometers.

Unit V :

Active Filters: Classification, transfer function, butter worth filters. low pass, high pass, band pass, band stop, notch and all pass.

Unit VI : a) Timer: IC 555, functional diagram, monostable and astable multivibrator.

b) Voltage regulators: Series op-amp regulators, IC voltage regulators, switching regulators etc, IC 723.

Text Books

- 1) Op-amps and Linear Integrated Circuits Technology, R.A.Gaikwad,

- PHI publication, 1999
- 2) Design of Operational Amplifier and Analog Integrated Circuits, S.Franco TMH Publication, 2002

References

- 1) Linear Integrated Circuits, D.Roy Chaudhari ,New Age International Publisher, 2005
- 2) Operational Amplifiers & Linear ICs by David A.Bell , Oxford University Press,2011

4EX04 SIGNALS AND SYSTEMS

SECTION A

Unit I : **Introduction to Signals and Systems:** Signals and Systems, Classification of Signals Classification of Systems, Systems Modeling Some Ideal Signals, Energy and Power Signals Frequency Response, Discrimination of Continuous-Time Signals Topological Models, Analysis of Continuous-Time Systems Time Domain and Frequency Domain, Properties of Elementary Signals Linear Convolution Integral, Response of Continuous-Time Systems.

Unit II : **Fourier series and Its Properties** Fourier Transform Properties of Fourier Transform, Tables of Fourier Transform Pairs Fourier Transform of Periodic Signals, Ideal Low-Pass Filter Frequency-Domain Analysis of Systems Fourier analysis of Sampled Signals

Unit III : **Analysis of LTI Discrete-Time Systems:** Time Domain and Frequency Domain, Properties of Discrete-Time Sequences Linear Convolution, Discrete-Time System Response.

SECTION B

Unit IV : **Sampling:** Representation of a continuous-Time Signal by its Samples; The Sampling Theorem; Reconstruction of Signals from its Samples using Interpolation; Effect of Under Sampling (Frequency Domain Aliasing); Discrete Time processing of Continuous-Time Signals

Unit V : **The Z Transform:** The Z Transform; The Region of Convergence for the Z- Transform; Geometric Evaluation of the Fourier Transform from the Pole-Zero Plot; Properties of Z-Transform; Analysis and Characterization of Discrete-Time LTI Systems using Z-Transform; System Transfer Function; Block Diagram Representation; The Unilateral Z-Transform; Solution of Difference Equation using the Unilateral Z-Transform.

Unit VI : **Discrete Fourier Transform and Fast Fourier Transform**

Representation of Discrete-Time aperiodic signals and the Discrete-Time Fourier Transform; Fourier Transform for Periodic Signals; Properties of the Discrete-Time Fourier Transform; Discrete-Time LTI Systems and Discrete-Time Fourier Transform. Fast Fourier Transform (FFT)

Books Recommended

- 1) Principles of Linear Systems and Signals, 2e (international version) – Lathi B. P. Oxford University Press
- 2) Signals & Systems, Smarajit Ghosh, PEARSON education, 2006
- 3) Signals & Systems, D Ganesh rao, satish Tunga, PEARSON education 2010
- 4) Principles of Signal Processing & Linear Systems (international version) Lathi B P. Oxford University Press
- 5) Signals And Systems , S.Haykin, 2nd Edition, John Wiley And Sons 1999
- 6) Analog And Digital Signal Processing , Ambardar A, 2/3; Thomson Learning-2005
- 7) Signals and systems, Oppenheim and Schaffer Prentice Hall India Of India 2nd Edition 1997

4EX07 LINEAR INTEGRATED CIRCUITS LAB.

Any TEN experiments based on contents of 4EX03 LINEAR INTEGRATED CIRCUITS

***Content of the Compulsory Subject
“Environmental Studies” are given on Page
Nos. ES-1 to ES-4 i.e. at the end of this syllabus.***

**SYLLABUS
PRESCRIBED FOR
FOUR YEAR DEGREE COURSE IN
BACHELOR OF ENGINEERING
ELECTRONICS & TELECOMMUNICATION/
ELECTRONICS ENGINEERING
SEMESTER PATTERN (CREDIT GRADE SYSTEM)**

SEMESTER: THIRD

3 XT 01 / 3 XN 01

MATHEMATICS-III

SECTION-A

UNIT-I Ordinary differential equations:- Complete solution, Operator D, Rules for finding complementary function, the inverse operator, Rules for finding the particular integral, Method of variations of parameters, Cauchy's and Legendre's linear differential equations (10 Hrs.)

UNIT-II Laplace transforms: definition, standard forms, properties of Laplace transform, inverse Laplace transform, initial and final value theorem, convolution theorem, Laplace transform of impulse function, Unit step function, Laplace transforms of periodic function, solution of Linear differential equations, Simultaneous differential equation by Laplace transform method. (10 Hrs.)

UNIT-III a) Difference equation:- solution of difference equations of first order, Solution of difference equations of higher order with constant co-efficients,
b) Z-transform:- Definition, standard forms, Z-transform of impulse function, Unit step functions, Properties of Z-transforms (linearity, shifting, multiplication by k, change of scale), initial and final values, inverse Z-transforms (by direct division and partial fraction), Solution of difference equation by Z-transforms. (10 Hrs.)

SECTION-B

UNIT-IV a) Fourier transforms- Definition, standard forms, inverse Fourier transforms, properties of Fourier transforms, convolution theorem, Fourier sine and Fourier cosine transforms and integrals.

b) Partial differential equation of first order of following form-
(i) $f(p,q)=0$; (ii) $f(p,q,z)=0$; (iii) $f(x,p)=g(y,q)$; (iv) $Pp+Qq=R$ (Lagrange's Form); (v) $Z=px+qy+f(p,q)$ (Clairaut form)
Statistics:

Binomial, Poisson and Normal Distribution. (10 Hrs.)

UNIT-V Complex Analysis :- Functions of complex variables, Analytic function, Cauchy-Reimann conditions, Harmonic function, Harmonic conjugate functions, Milne's method, conformal mappings translation, rotation, magnification, inversion and bilinear transformation), singular points, expansion of function in Taylor's and Laurent's series. Cauchy's integral theorem and formula, Residue theorem. (10 Hrs.)

UNIT-VI Vector calculus:- Scalar and vector point functions, Differentiation of vectors, Curves in space, Gradient of a scalar point function, Directional derivatives, Divergence and curl of a vector point function and their physical meaning, expansion formulae (with out proof), line, surface, volume integrals, irrotational and solenoidal vector fields, Stoke's and Divergence theorem (without proof). (10 Hrs.)

BOOKS RECOMMENDED:-

- 1) Elements of Applied Mathematics by P.N. Wartikar and J.N. Wartikar
- 2) A text book of Differential Calculus by Gorakh Prasad.
- 3) Engg. Mathematics by Chandrika Prasad.
- 4) Advancing Engg. Mathematics by E.K. Kreyzig.
- 5) A text book of Applied Mathematics by P.N. Wartikar and J.N. Wartikar.
- 6) Higher Engg. Mathematics by B.S. Grewal.
- 7) Control System by Gopal and Nagrath.
- 8) Integral Transforms by Goyal & Gupta.

3XT02/3XN02 COMPUTER PROGRAMMING AND APPLICATIONS

SECTION-A

Unit I : Principles of object oriented Programming: OOP'S paradigm, basic concept of OOP'S Benefits of OOP'S, structure of C++ Programming, Basic data types, user defined data type, derived data type operator and control statement.

Unit II : Functions classes and object in C++: Functions, Function over loading, Friend Functions, types of classes and its use, concept of object and its implementation, constructor and destructors.

Unit III: Operator's overloading:
Operator and their definition, overloading unary and binary operator, Rules for overloading operators, overloading binary operators using friends and string manipulation.

SECTION-B

Unit IV : Inheritance and Polymorphism:
Defining derived classes, single and multiple inheritance,

multilevel inheritance, member classes pointer to objects, pointer to derived classes, virtual function.

- Unit V :** Solution of Nonlinear and Polynomial Equations: False position, modified false position, secant, Newton Raphson Method.
Solution of Linear Systems of Equations: Gauss elimination method, L.U. factorization method, Gauss seidel iterative method.
- Unit VI:** Solution of differential equation: Euler's method, Runge Kutta method, Predictor Corrector method.
Numerical Integration: Trapezoidal rule, Simpson's 1/3 and 3/8 th rules.
Finite differences: Newton forward and backward interpolation formula.

Textbooks:

- 1) Object Oriented Programming with C++ -E. Balaguruswamy, Tata - Graw Hill publishing Co.Ltd., New Delhi,1995.
- 2) Introduction to method of Numerical Analysis- S. S. Shastri, Second Edition, PHI Pvt. Ltd., New Delhi.

Reference Books:

- 1) Object Oriented Programming in Turbo C++ Rober Lofore Galgotia Publications Pvt.Ltd., New Delhi,1995
- 2) The C++ Programming Language (Third Edition) Bjarne Stroustrup Pub.Co.,New York,1995 (AddisonWesley)
- 3) C++ Primer - Lipman Stanley B., (Second Edition) New York, Addison Wesley Pub. Company,1995
- 4) Computer Oriented Numerical Methods:-V. Rajaraman, Second Edition, Prentice Hall of India Pvt. Ltd., New Delhi.
- 5) Numerical Method for Mathematics Science and Engineering, John H. Mathew, PHI publication.

3XT03/3XN03 ELECTROMAGNETIC FIELDS

SECTION-A

- Unit I:** Review of Vector Analysis:
Cartesian, cylindrical and spherical co-ordinate systems, vector products, Projection of Vectors, Gradient, Divergence & Curl, Stokes & divergence theorem. (08)
- Unit II:** Electrostatics:
Coulomb's law, Electric field intensity, Evaluation of electric field intensity due to line charge, surface charge & volume charge distribution, Electric flux density, Gauss Law,

Electrostatics potential, Potential gradient, Electric dipole & Polarization . (08)

- Unit III:** Magneto statics: Amper's law of forces, Biot-Savart's law, Ampere's law in integral and differential form., Magnetic field intensity evaluation due to infinite, finite and circular current carrying conductors, Magnetic flux & flux density, Magnetic dipole moment, Magnetization. (08)

SECTION-B

- Unit IV:** Boundary conditions & Maxwell's equations:
Boundary condition of dielectric-dielctric interface, dielectric-conductor interface, boundary conditions for magnetic materials interface, Current continuity equation, Maxwell's equation for steady & time varying fields. (08)
- Unit V:** Electromagnetic wave propagation:
Electromagnetic wave equation for free space, lossy dielectrics, perfect conductors, propagation constant, attenuation constant, phase shift constant, Skin depth, Concept of power flow, Poynting Theorem, , Reflection of a plain wave in a normal incidence at dielectric-dielectric interface, dielectric-conductor interface. (10)
- Unit V:** Radiation:
Magnetic scalar and vector potential, retarded potential, Electric & Magnetic fields Power radiated & radiation resistance, due to oscillating dipole, quarter wave monopole & half wave dipole. (08)

Text Books:

- 1) Hayt W.H.: "Engineering Electromagnetic" Tata Mc Grawhill
- 2) Jordan E.C. and Balamin K.C.: "Electromagnetic Waves and Radiating System" Prentice Hall of India Private Limited (Second Edition)

Reference Books:

- 1) Mathew N.O.Sadiku "Principles of Electromagnetics" (Fourth Edition), Oxford University Press
- 2) Kranss J.D.: "Electromagnetic" Mc Grawhill Books co. (Third Edition)
- 3) Ramo S. and Whinnery R.: " Fields and Waves in Communication Electronics" John Wiley and sons, New Delhi.

3XT04/3XN04 ELECTRIC DRIVES & MEASUREMENTS

SECTION- 'A'

- Unit-I:** Measurement of resistance: Kelvin Double Bridge, Loss of charge method and megger. Measurement of Inductance and Capacitance: Maxwell's bridge, Hay's bridge, Anderson's bridge, Schering bridge, D Sautys Bridge and Carey Foster

- bridge. Measurement of Q factor and $\tan \phi$.
- Unit-II: Measurement of active and reactive power in 3-phase balanced and unbalanced load. Electrodynamometer type power factor meter, frequency meter. Watt meter, Digital Energy Meter
- Unit-III: D.C.Motors: Electrical and mechanical characteristics of motor, Speed control methods for constant torque and constant horse power. Application of D.C.motors. Braking-resistance, plugging and regenerative braking
- SECTION- 'B'**
- Unit-IV: Induction Motors: Characteristics, Speed control methods: Armature voltage, V/f control, rotor control, slip power recovery scheme and applications, plugging, Resistance braking, Regenerative Braking. Eddy current coupling and its application.
- Unit-V: Transformers: 3 phase transformers, rectifier transformers, pulse transformers. Open delta connection, Scott connection, Ferrite core transformer.
- Unit-VI: Construction, principle of operation, characteristics and applications of: Tachogenerator, (DC & AC), Stepper motor, A.C.Servo motor 1 Phase induction motors and Universal motor.

TEXT BOOKS:

- i) M.V.Deshpande:- Elements of Electrical Machines.
- ii) A.K.Sawhney:- Electrical and Electronic Measurement and Instrumentation.

REFERENCE BOOKS:

- i) E.W.Golding:- Electrical measurement and measuring Instrument, ELBS Pub.
- ii) First Course on Electrical Drives-S.K.Pillai
- iii) B.L.Theraja VOL II :- Electrical Engineering.

3XT05/3XN05 ELECTRONICS DEVICES AND COMPONENTS
SECTION A

- Unit I : Construction, selection and failures of
- Resistors: Fixed type, Variable Type, Network and Chip type
 - Capacitors: fixed and variable Type
- Unit II
- Switches & Relays: Types, Construction and Testing
 - Fuses, Cables and Connectors: Types, Construction, Specification and Application
 - Introduction to Heat sink, Choke and Transformer

- Unit III: Basics of Electronic Component layout, PCB material, Properties and specifications, Basic manufacturing process of PCB, Soldering and De-soldering Techniques.

SECTION B

- Unit IV : P-N Junction diode theory- V-I Characteristics, Temperature dependency, Diode Resistance, Zener diode: characteristics, Avalanche & Zener breakdown, Testing of diode using Ohmmeter and CRO
- Unit V: Theory, Construction, Characteristics and application of Tunnel, Varactor, Shottkey diode Opto-Devices: LED, Photo Diode, LCD
- Unit VI: Theory of PNP and NPN Transistor, Transistor Configurations, Their Characteristics and current Components. Transistor as an amplifier, Testing of Transistor using Ohmmeter and CRO

Text Books:

1. Maduri Joshi, "Electronic Component and Material" 3rd Edition, Shroff Publication
2. Millman H Halkies, "Integrated Electronics" TMH Co. New Delhi

References:

1. Bosshart, "Printed Circuit Board" TMH
2. David Bell' "Electronic Devices and Circuits" Oxford University Press, 2010
3. Boylestad R, "Electronic Devices and Circuits" Prentice Hall of India Pvt. Ltd. New Delhi.

3XT06/3XN06

COMPUTER PROGRAMMING AND
APPLICATIONS-LAB.

Minimum Eight experiments based on the 3XT2/3XN2 out of which at least four experiments should be based on the last two Units.

3XT07/3XN07 ELECTRIC DRIVES & MEASUREMENTS-LAB.

Minimum Eight experiments based on 3XT4/3XN4.

3XT08/3XN08 ELECTRONICS DEVICES AND COMPONENTS-LAB.

Minimum eight Practicals Should be conducted based on the 3XT5/3XN5. (atleast one on PCB)

SEMESTER : FOURTH**4XT01/4XN01****COMMUNICATION ENGINEERING-I****SECTION-A**

Unit I Signal and Noise : Signals: Analog & digital, Deterministic & Non-deterministic, Periodic & non periodic, Frequency response, bandwidth, bandwidth requirement for different types of signals such as telephone speech, music and video. External and Internal noise, signal to noise ratio, noise figure, noise factor measurement, equivalent noise Temperature, Friiss formula. (6)

Unit II Signal Analysis : Fourier Series, Exponential Fourier Series, Fourier Transform, Properties of Fourier Transform, Dirac Delta Function, Fourier Transform of Periodic functions, Fundamental of Power Spectral Density & Energy Spectral Density, Correlation: Auto-correlation, Cross-correlation. (9)

Unit III Probability and Random Signal Theory : Probability, Random variable, PDF Random processes, stationarity, Mean, Correlation and Covariance Functions, Ergodicity, Gaussian Process, White Gaussian Noise. (8)

SECTION-B

Unit IV Wave Propagation : Electromagnetic waves, Ground waves, Sky waves, ground waves, space waves, Ionosphere, critical frequency, maximum usable frequency, virtual height, skip distance, LOS communication, fading, single hop and multi hop propagation, duct propagation. (7)

Unit V RF Transmission Lines : Parallel and coaxial transmission line, equivalent circuit of transmission line, standing wave, characteristic (shunt) impedance, quarter wave and half wave length transform, Smith chart, Single stub (shunt) matching using smith chart, balun. (8)

Unit VI Antenna Basics & Types of Antenna : Principle of radiation, antenna power gain, beam width, polarization, bandwidth and radiation resistance, Isotropic radiator, Resonant antenna: Half wave, Folded dipole antenna, Non resonant antenna, antenna arrays, parasitic reflector, parasitic director, design of yagi-uda antenna (up to 5 elements) Long, wire, helical, rhombic, discone, log periodic, loop antenna, low, medium and high frequency antenna. (10)

Text books:-

- (1) Kennedy G. : "Electronic Communication System" Tata Mc-Graw Hill Co., New Delhi (Third Edition)

- (2) Simon Haykin : Communication System, John Wiley, Eastern Ltd., New York, (Third Edition), 1994.

Reference books

- (1) Collins Dennis, Collins John "Electronic Communications" (PHI)
- (2) B. P. Lathi : "Modern Digital and Analog Communication systems" 3rd Edition, Oxford Uni. Press, New Delhi.
- (3) Taub and Schilling D.L. : Principles of Communication Systems, Mc-Hill Co, Tokeyo, 1994 (II Ed.)
- (4) Hari Bhat: "Analog communication, 2nd Edition Pearson India, 2010"

4 XT 02/4XN02**ELECTRONIC DEVICES AND CIRCUITS-I****SECTION-A**

Unit I : Rectifiers : Half wave, full wave and bridge rectifiers and their analysis. Filters : Analysis of capacitor filter, Theory of L, LC & CLC (p) filter, Zener diode as a Voltage regulator.

Unit II : DC load line and operating point (Q point); Methods of biasing & stability factor; ac equivalent circuit and hybrid model analysis of CE configuration.

Unit III : Feed back Amplifier and Oscillator : Classification of amplifier: Voltage current, trans-conductance, Trans-resistance amplifier, feedback concept, effect of negative feedback in amplifier, Methodology of feedback in amplifier and analysis. Oscillators : Barkhausen's criterion for sustained oscillations; study of Harley, Collpit, RC oscillators and crystal oscillator.

SECTION-B

Unit IV : Study of multistage transistor amplifier circuit

- i) RC coupled amplifier,
- ii) Transformer coupled amplifier,
- iii) Direct coupled amplifier,
- iv) Emitter follower; Darlington emitter follower, Bootstrapping principle,
- v) Cascade stage.

Unit V : Power Amplifier : Transformer coupled Class A amplifier, Transformer coupled Class B amplifier & transformer coupled Class AB amplifier, capacitor coupled and direct coupled output stages, modifications to improve power amplifier performance, Class C amplifier and analysis.

Unit VI : JEET : Theory, Construction and Characteristics; parameters (m , g_m & r_{ds}); Biasing of JEET amplifiers, MOSFET : Theory, Construction and Characteristics of enhancement & depletion type MOSFET

UJT: Theory, Construction and Characteristics; UJT as relaxation oscillator.

Text Books :

- 1) David Bell : Electronic Devices and Circuits, Oxford University Press, 2010.
- 2) Milliman H. and Halkies : Integrated Electronics, Tata McGraw Hill, New Delhi.

Reference Books :

- 1) Mottershead Allen : Electronics Devices & Circuits, Prentice Hall of India Pvt. Ltd., New Delhi, 1986
- 2) Boylestad R. : Electronics Devices & Circuits, Prentice Hall of India Pvt. Ltd., New Delhi, V Edi. 1993
- 3) Ramanan K.V. : Functional Electronics, Tata McGraw Hill, New Delhi, 1989
- 4) Milliman S., Taub H and Halkies : Electronics Devices and Circuits, McGraw Hill Int. Co., Auckland, 1982

4 XT 03 / 4 XN 03

NETWORK ANALYSIS

SECTION-A

- Unit I : a) Terminal Element Relationships: V-I relationship for Inductance and Capacitance- Constant Flux Linkage Theorem and Constant Charge Theorem- v-i relationship for Independent Voltage and Current Sources - v-i relationship for dependent voltage and current sources- Source Functions: unit impulse, unit step, unit ramp and inter relationship, sinusoidal input ,generalized exponential input.
- b) Basic Nodal and mesh Analysis: Introduction, Nodal analysis, the super node, mesh analysis, the super mesh, nodal vs mesh analysis
- Unit II : Network Theorems : Linearity and superposition, source transformations, Thevinin's theorem , Norton's theorem, Maximum power transfer theorem, Delta-wye transformations Reciprocity theorem, Milliaman's theorem, Substitution theorem, Compensation theorem, Tellegen's theorems.
- Unit III : Time Domain Analysis of Circuits: Linear Differential Equations for Series RC, Parallel RC, Series RL, Parallel RL, Series RLC, Parallel RLC and Coupled Circuits-Complete Solution for step/impulse/sinusoid voltage/current inputs- Natural Response-Transient Response-Time Constant-Rise and Fall times-Concept of d.c steady state and sinusoidal steady state-Frequency Response of simple circuits from steady state solution-Solution of two mesh circuits by

differential equation method-Determination of initial conditions.

SECTION-B

- Unit IV : a) Review of Laplace Transforms: Laplace Transform-Transform Pairs-Gate Functions-Shifting Theorem-Solution of Differential Equations by Laplace Transforms-Initial and Final Value Theorems-Laplace Transforms of periodic signals-Inversion of transforms by partial fractions-Convolution Theorem and Convolution Integral. (*Review to be done by students. No class hour will be spent for this review.*)
- b) Transformation of a Circuit into s-domain: Transformed equivalent of inductance, capacitance and mutual inductance -Impedance and admittance in the transform domain - Node Analysis and Mesh Analysis of the transformed circuit - Nodal Admittance Matrix and Mesh Impedance Matrix in the s-domain - Solution of transformed circuits including mutually coupled circuits-Input and transfer immittance functions - Transfer functions - Impulse response and Transfer function - Poles and Zeros - Pole Zero plots,
- Unit V : a) Sinusoidal Steady State analysis: Introduction, characteristics of sinusoids, forced response to sinusoidal functions, the complex forcing function, The phasor, phasor relationships for R L C, impedance and admittance , sinusoidal steady state analysis with phasors.
- b) Fourier Series: Fourier Series representation of non-sinusoidal periodic waveforms - Fourier Coefficients-Determination of Coefficients-Waveform Symmetry-Exponential Fourier Series-Discrete Amplitude and Phase Spectra-Steady State Solution of Circuits with non-sinusoidal periodic inputs by Fourier Series
- Unit VI : Two Port Networks: two port networks-characterizations in terms of impedance, admittance, hybrid and transmission parameters-inter relationships among parameter sets-Reciprocity Theorem-Interconnection of Two port networks: Series, Parallel and Cascade - Network Functions-Pole Zero plots and steady state response from pole-zero plots.

Books Recommended :-

- 1) Engineering Circuit Analysis, 6/e By Hayt & Kemmerly, TataMcgraw Hill, 2004
- 2) Network Analysis, By M.E. Van Valkenberg, PHI, 2005
- 3) Electrical Circuits – David Bell, Oxford University Press, 2008
- 4) Linear Circuit Analysis, 2/e – De Carlo and Lin, Oxford University Press, 2009

- 5) Network Analysis, P. Ramesh babu, SCITECH Publications, Chennai, 2009
- 6) Circuit and Network Analysis By Sudhakar Shyammohan, Tata Mc Graw Hill, 2005
- 7) Circuits & Networks – Analysis, Design & Synthesis by M.S.Sukhija, T.K.Nagasarkar, Oxford University Press, 2010.

4XT04/4XN04 INDUSTRIAL MANAGEMENT & QUALITY CONTROL

SECTION-A

UNIT- I **Principles and Techniques of Management** : Meaning of and differences among business, management, administration and organisation, Principles of management, functions of management, planning, organisation structure and relationships, direction, co-ordination, control, motivation, delegation and decentralisation, communication, leadership and decision making. (7)

UNIT- II Market and Materials Management :

A) Marketing strategy, market research, consumer behaviour, advertising and sales promotion, channels of distribution, pricing of products.

B) Classes of material, scope of material control, scope of purchasing department, purchasing procedures, order procedures, inventory control, introduction to production, planning and control. (9)

UNIT- III **Personnel Management** : Meaning and functions of personnel management, recruitment, selection, promotion, wages and salary administration, training and development, functions and scope of trade unions in Indian industries. Welfare of labour, Problems of labour turn over & retention. **Merit Rating**: Job evaluation, different methods of merit ratings, wage incentives, different types of wage incentive schemes. (9)

SECTION-B

UNIT- IV Project and Financial Management :

A) Case studies of project report, preparation of profit and loss statement and balance sheet, ratio analysis.

B) Principles of costing , cost sheet preparation, variance analysis, meaning and application of various budgets, types of budgets and their importance. (9)

UNIT- V **Quality Control** : Concept of quality and quality control, elements of quality, factors controlling quality of design and conformance, process control, inspection planning and scheduling, 7QC (Seven Quality Control) techniques, vendor

inspection, sampling inspection, sampling plans, Quality audit system. (8)

UNIT- VI **Quality Management** : Concepts and applications of Kaizen, quality circle, ISO 9000 series, just-in-time, quality planning and total quality management, elements of TQM, Quality Circles. (8)

TEXT BOOKS:

1. INDUSTRIAL ENGINEERING AND MANAGEMENT ,OP Khanna ,2011 ,JAIN BOOK DEPOT,Post Box No. 51, New Delhi - 110001 (INDIA),81-899-2835-3.
2. INDUSTRIAL & BUSINESS MANAGEMENT ,Telsang Mertand.T, S.Chand & Company Limited, NEW DELHI. ,81-219-2056-6.
3. MANAGEMENT : PRINCIPLES, PROCESSES, AND PRACTICES, Anil Bhat, Arya Kumar , 2008 , Oxford University Press, NEW DELHI., 978-01-956-9445-1.
4. TOTAL QUALITY ,BHARAT WAKHLU ,2/e, 2007 ,S.Chand & Company Limited, NEW DELHI. ,81-219-2866-4.
5. TOTAL QUALITY CONTROL, 4TH ED. ,Armand V. Feigenbaum, 2005 ,Tata McGraw-Hill Education, New Delhi. ,978-00-702-2003-4.

REFERENCE BOOKS:

1. PRINCIPLES OF BUSINESS MANAGEMENT ,Dr. Virendra Sharad Sherlekar ,Prof.S.A.Sherlekar ,3/e, 2009 ,Himalaya Publishing House Pvt. Ltd, MUMBAI. ,978-81-8488-082-3 .
2. FUNDAMENTALS OF FINANCIAL MANAGEMENT ,BOSE, D. CHANDRA ,2/e ,PHI Learning Private Limited, NEW DELHI. ,978-81-203-4074-9.
3. PRINCIPLES OF MANAGEMENT AND ADMINISTRATION • ,Chandra Bose , ,PHI Learning Private Limited, NEW DELHI. ,978-81-203-1929-5.
4. PROJECT MANAGEMENT ,Prof. Abdul Matheen ,2/e, 2009 ,LAXMI PUBLICATIONS(P) LTD, NEW DELHI . ,978-81-318-0694-4.
5. TOTAL QUALITY MANAGEMENT • ,Suganthi & Samuel , ,PHI Learning Private Limited, NEW DELHI. ,978-81-203-2655-2.
6. TOTAL QUALITY MANAGEMENT ,Dr. S. Kumar ,1/e, 2006 ,LAXMI PUBLICATIONS(P) LTD, NEW DELHI . ,978-81-318-0568-8.
7. QUALITY MANAGEMENT, Kaniska Bedi ,2006 ,Oxford University Press, NEW DELHI . ,978-01-956-7795-9.
8. TQM : PLANNING, DESIGN & IMPLEMENTATION, Khanna, V.K., 1/e, 2009, New Age International (P) Ltd., Publishers, NEW DELHI., 978-81-224-2233-7.

9. Fundamentals of Quality Control and Improvement, Mitra Amitava, 2/e, 2009 ,PHI Learning Private Limited, NEW DELHI. ,978-81-203-2377-3.

4XT05/4XN05 INSTRUMENTATION

SECTION-A

- Unit I:** Transducer & Instrumentation systems (1) Transducer classification: Active/Passive. Primary/Secondary. Analog/Digital and transduction Principles. Basic Signal conditioning Circuits. Resistive/Capacitive/Inductive reactance bridge. Current/Voltage Sensitive Wheatstons bridges & Generalized instrumentation system with particular examples (9 Hrs)
- Unit II:** Static characteristics, errors & statistical parameters: (1) Static characteristics: Accuracy, Precision, Sensitivity, Threshold, Resolution, Repeatability and Hysteresis. Errors: Gross error, Systematic error, Random error, Limiting error. Statistical Parameters: Arithmetic mean Average deviation Standard deviation. Probable error, Histogram, Normal & Gaussian curve of errors. (7 Hrs)
- Unit III:** Electronics Instrumentation: (1,2,3): Analog & Digital data acquisition system, Analog electronic multimeter, Introduction to digital voltmeter & universal counter. Stripchart & X-Y recorders. Optical Encoders. Siesmic mass vibration transducer. (3) Introduction to microphones & loud speaker. (9 Hrs.)

SECTION-B

- Unit IV:** Measurement of Temperature & Strain (1,3) Temperature Sensors: LM335, RTD. THERMISTORS, Thermocouples, Thermocouples laws & its compensation methods. Pyrometers: Total/Partial radiation & optical pyrometers. Strain Gauges, Gauge factor. Strain measurement & temperature compensation methods.
- Unit V:** Measurement of Displacement. Pressure & Level. Displacement Measurement: (1) using resistive, capacitive, inductive (LVDT & RVDT) & Eddy current. Pressure Measurement: (1) Elastic, Inductive, Peizelectric & capacitive transducers, Low pressure measurement using ionization gauge, pirani gauge, thermocouple vacuum gauge. Level Measurement: (1, 3) Using ultrasonic, capacitive, inductive, resistive with float, gamma rays & eddy currents techniques. (8 Hrs.)
- Unit VI:** Measurement of Flow, Humidity, Velocity (1) Flow Measurement: using ultrasonic, electronaquatic & hotwire

Anemometer. Humidity Measurement : using resistive, Capacitive & Crystal transducers. Velocity Measurement: Using photo detectors (both linear & angular velocity). Introductory block diagram of smart sensors , Wave analyzer & spectrum analyzers.

Books Recommended:

- 1) Sawhney A.K.: A course in Electrical/Electronics Measurement & Instrumentation, Dhanpat Rai & Sons., Delhi.
- 2) Rangan C.S., Sharma G.R. , & Mani V.S.V.: Instrumentation Devices & System, Tata Mc-Graw Hill.
- 3) R. K. Rajput: Electrical & Electronics Measurement & Instrumentation.

Reference Books :

- 1) Patranbis D. : ‘ Sensors & Transducers’, A.H.Wheeler & Company, Prayag, India.
- 2) H. S. Kalsi : Electronics Instrumentation, Tata McGraw Hill, 2nd Edition
- 3) U.A. Bakshi & A. V. Bakshi : Electronics Instrumentation, Technical Publication
- 4) Robert A. Witte: Electronics Test Instrumentation : Analog & Digital Measurement.

4 XT 06/4 XN 06 ELECTRONIC DEVICES AND CIRCUITS-I-LAB.

Any TEN experiments based on contents of 4 XT 02/4XN 02
ELECTRONIC DEVICES AND CIRCUITS-I

4 XT 07/4XN 07 NETWORK ANALYSIS - LAB.

Any TEN experiments based on contents of 4 XT 03 / 4 XN 03 NETWORK ANALYSIS

4 XT 08/4XN 08 INSTRUMENTATION-LAB.

Minimum Eight experiments based on 4XT 05/4XN 05
INSTRUMENTATION

***Content of the Compulsory Subject
“Environmental Studies” are given on Page
Nos. ES-1 to ES-4 i.e. at the end of this syllabus.***

**SYLLABUS
PRESCRIBED FOR
FOUR YEAE.B.E. DEGREE COURSE IN
INSTRUMENTATION ENGINEERING
SEMESTER PATTERN
(CREDIT GRADE SYSTEM)
THIRD & FOURTH SEMESTER
THIRD SEMESTER**

3IE 01 / 3 XT 01 / 3 XN 01 MATHEMATICS – III

SECTION-A

- UNIT-I Ordinary differential equations:- Complete solution, Operator D, Rules for finding complementary function, the inverse operator, Rules for finding the particular integral, Method of variations of parameters, Cauchy's and Legendre's linear differential equations (10 Hrs.)
- UNIT-II Laplace transforms: definition, standard forms, properties of Laplace transform, inverse Laplace transform, initial and final value theorem, convolution theorem, Laplace transform of impulse function, Unit step function, Laplace transforms of periodic function, solution of Linear differential equations, Simultaneous differential equation by Laplace transform method. (10 Hrs.)
- UNIT-III a) Difference equation:- solution of difference equations of first order, Solution of difference equations of higher order with constant co-efficients,
b) Z-transform:- Definition, standard forms, Z-transform of impulse function, Unit step functions, Properties of Z-transforms (linearity, shifting, multiplication by k, change of scale), initial and final values, inverse Z-transforms (by direct division and partial fraction), Solution of difference equation by Z-transforms. (10 Hrs.)

SECTION-B

- UNIT-IV a) Fourier transforms- Definition, standard forms, inverse Fourier transforms, properties of Fourier transforms, convolution theorem, Fourier sine and Fourier cosine transforms and integrals.
b) Partial differential equation of first order of following form-
(i) $f(p,q)=0$; (ii) $f(p,q,z)=0$; (iii) $f(x,p)=g(y,q)$; (iv) $Pp+Qq=R$ (Lagrange's Form); (v) $Z=px+qy+f(p,q)$ (Clairaut form)
Statistics:

- Binomial, Poisson and Normal Distribution. (10 Hrs.)
- UNIT-V** Complex Analysis :- Functions of complex variables, Analytic function, Cauchy-Reimann conditions, Harmonic function, Harmonic conjugate functions, Milne's method, conformal mappings translation, rotation, magnification, inversion and bilinear transformation), singular points, expansion of function in Taylor's and Laurent's series. Cauchy's integral theorem and formula, Residue theorem. (10 Hrs.)
- UNIT-VI** Vector calculus:- Scalar and vector point functions, Differentiation of vectors, Curves in space, Gradient of a scalar point function, Directional derivatives, Divergence and curl of a vector point function and their physical meaning, expansion formulae (with out proof), line, surface, volume integrals, irrotational and solenoidal vector fields, Stoke's and Divergence theorem (without proof). (10 Hrs.)

BOOKS RECOMMENDED:-

- 1) Elements of Applied Mathematics by P.N. Wartikar and J.N. Wartikar
- 2) A text book of Differential Calculus by Gorakh Prasad.
- 3) Engg. Mathematics by Chandrika Prasad.
- 4) Advancing Engg. Mathematics by E.K. Kreyzig.
- 5) A text book of Applied Mathematics by P.N. Wartikar and J.N. Wartikar.
- 6) Higher Engg. Mathematics by B.S. Grewal.
- 7) Control System by Gopal and Nagrath.
- 8) Integral Transforms by Goyal & Gupta.

3 IE 02 ELECTRONIC DEVICES AND CIRCUITS

- UNIT-I:** P-N Junction diode theory, Rectifiers - Half wave, full wave and bridge. Filters-C, LC and their analysis, Zener diode and its applications.
- UNIT-II:** Theory and Analysis of BI Junction transistor, 'H' Parameter, Methods of biasing, their needs, 'Q' and stability factor.
- UNIT-III:** Study of typical transistor amplifier circuits:
- i) Emitter follower,
 - ii) Darlington emitter follower.
 - iii) Bootstrap emitter follower,
 - iv) RC coupled amplifier,
 - v) Transformer coupled amplifier,
 - vi) Cascaded amplifier,
 - vii) Direct coupled amplifier,
 - viii) Cascade stage.
- UNIT-IV:** Class 'A', 'B', 'AB' and 'C' amplifiers, Configuration of audio

amplifiers, Calculations of power gain, efficiency, power dissipation and distortion, Oscillators, their criteria, Hartley, Colpitt and R-C oscillators, Crystal oscillator.

- UNIT-V:** Theory, construction and applications of Schottky diode, Tunnel diode, Varactor diode, Selenium diode, LED, Photo diode, PIN diode, photo-transistor.
- UNIT-VI:** FETs (JFET & MOSFET): Types, Characteristics and parameters (u , g_m & R_d), Biasing of FET Amplifiers, UJT: Characteristics, working, UJT as relaxation oscillator.

TEXT BOOK :

- 1) Mottershead Allen: "Electronics Devices & Circuits" Prentice Hall of India Private Limited, New Delhi, 1986.

REFERENCE BOOKS:

- 1) Milliman H. and Halkies: "Integrated Electronics", Tata Mc-Graw Hill Book Co., New Delhi.
- 2) Boylestad R. and "Electronics Devices & Circuits", Prentice Hall of India Private Limited, New Delhi (Fifth Edition), 1993.
- 3) Ramanan K.V.: "Functional Electronics", Tata Mc-Hill Publication Co. Ltd., New Delhi, 1989.
- 4) Milliman S., Tube H. and Halkies: "Electronics Devices & Circuits", Mc-Graw Hill Int. Co., Auckland, 1982.

3 IE 03 ELECTRICAL MEASUREMENT

- UNIT-I:** Introduction: Digital MultiMeter's, Kilowatt meter, Data types, Measurement standards for time, frequency, voltage, current. Introduction to reliability and safety. Response of indicating instruments for step, linear and sinusoidal inputs. General purpose, Cathode Ray Oscilloscope, front panel control, CRT Block schematic, controls on CRO panel, Measurement of phase, frequency, Time duration.
- UNIT-II:** DC Bridges: Wheatstone Bridge, Bridge sensitivity, analysis by Thevenin's theorem, Errors in bridge circuits, Null type, Current and Voltage sensitive bridges, Kelvin Bridge. AC Bridges: Inductance bridge (Maxwell's), capacitance bridge (Hay's), Wein bridge, Anderson bridge, Schering bridge, Storage & dissipation factors & their measurements. (09)
- UNIT-III:** Potentiometers: Measurement of voltage & current calibration sensitivity, self balancing techniques, Multirange potentiometers. Recorders: Curvilinear & rectilinear recording, strip-chart, X-Y recorders & Dual Trace Oscilloscopes, Synchronization, Z

modulation.

Unit-IV : Construction, working principle of AC tacho generator, DC tacho generator, Two dial DC potentiometer, Coils and chokes
Safety: safety in electrical Ckts. , fundamental safety rules and electrical system earthing

Unit- V : Arithmetic Operations & Floating point Arithmetic, Boolean Algebra, OR, AND, NOT, NOR, AND, EX-OR, EX-NOR Operation, Negative & Positive Logic, Laws of Boolean Algebra, Reduction of Boolean Functions. Different Codes and their Conversions (BCD, Octal, Hex, Excess Three, Gray),

Unit- VI : Wave and Spectrum Analyzer, Harmonic Distortion Analyzer, Heterodyne Frequency meter, Function Generator.

Text Books:

1. Electronic Instrumentation Techniques by Cooper & Helfrick.
2. Modern Digital Electronics by R.P. Jain

Ref. Book:

1. Electronic Instrumentation & Measurement by Sawhney

3 IE 04 SENSORS & TRANSDUCER

UNIT I : Transducer : Definition, Classification, Selection criteria. Errors, loading effects, Transducer specifications, calibration. Generalized Instrumentation diagram.

UNIT II : Displacement Measurement: Resistive methods, Inductive Methods, Capacitive Methods.
Force & Weight: Load cell (Electrical, Pneumatic, Hydraulic), LVDT, Piezoelectric, Vibrating wire.
Torque: Strain gauge, Inductive, Digital method.

UNIT III : Temperature Transducers: Temperature scales, Bimetallic strip, Semiconductor temperature detector (thermistor, LM 335). Resistance thermometer, Thermocouples, Thermopile, Crystal, Infrared thermometers

UNIT IV : Flow Transducers: Basic measurement principles, Bernoulli's theorem, Differential pressure type (Orifice, Venturi, Anubar Pitot tube), Variable area type, Magnetic, Ultrasonic, Positive displacement type, Mass flow meter, Anemometer, Total flow meter.

Level Transducers: - float type displacer, Diaphragm box level gauge, DP cell, Ultrasonic, Capacitive, resistive.

UNIT V : Pressure Transducers: Pressure scales, Manometers, Elastic (Bellows, Bourdon tube, Diaphragm) type, Electrical pressure sensors (LVDT, Strain gauge, load cell, Piezo-electric, Capacitive), Differential pressure sensors (Capacitive, Force

balance & vibrating cylinder type), vacuum pressure measurement, thermal conductivity & ionization type, Transducers for very high pressure measurement.

UNIT VI : Humidity Transducers: Psychrometer, Hygrometer (Hair, wire & Electrolysis type), Dew point meter. Piezo-electric humidity meter, Infrared conductance & Capacitive type probes for moisture measurement. Sound level measurement.

Text Books:

1. Sensor and Transducer by D. Patranbis
2. Sensor and Transducer by Dr. A.D. Shaligram

Ref. Books:

1. Electronics Instrumentation and measurement by A.K. Sawhney
2. Electrical and Electronics measurement and Instrumentation By R. K. Rajput
3. Process Control By B.G. Liptak
4. Industrial Instrumentation & Control By S.K. Sing.

3 IE 05 ANALYTICAL INSTRUMENTATION

Unit I : Introduction to Elements of analytical Instruments, Ultraviolet (UV) and Visible absorption instruments components, Beer-Lambert's law, monochromator : design and associated equipment, monochromator performance. UV and Visible instruments : colorimeters, spectrophotometers : single and dual beam, dual wavelength and double monochromator, Infra-Red (IR) spectrophotometers : basic components, types.

Unit II : Flame photometry : principle, constructional details, fuel gases, atomizer, burner, optical and recording systems.
Atomic absorption spectrometers: theoretical concepts, instrumentation: hollow cathode lamps, burners and flames, plasma excitation sources, optical and electronic systems.

Unit III : Nuclear magnetic resonance (NMR) spectrometry: principle, nuclear spin, nuclear energy levels, resonance condition, NMR absorption spectra, chemical shift, constructional details, spin decoupler, Fourier transform NMR spectroscopy.

Unit IV : Fluorimeters and phosphorimeters : principle, single and double beam filter fluorimeters, ratio fluorimeters, spectrofluorimeters, phosphorescence spectrometer.
Raman spectrometry : Raman effect, Raman spectrometer.
Photoacoustic and photothermal spectrometers.
Mass spectrometry : Principle & operation, basic

components, gas chromatograph mass spectrometer (GCMS) system.

Electron and ion spectroscopy : Instrumentation for electron spectroscopy ,

Unit V : Radio chemical instrumentation: radio chemical methods, radiation detectors (ionization chamber, Geiger-Muller, proportional and Scintillation counters), pulse height analyzer. X-ray spectrometry: spectrum, instrumentation, diffractometers and absorption meter.

Unit VI : Gas and liquid chromatography : classification, basic parts, carrier gas, sample injection system, thermal compartment, detectors (thermal conductivity, flame ionization, electron capture, Argon ionization), introduction to liquid chromatography.

Methods of gas analysis : oxygen, carbon monoxide, nitrogen analyzer, gas density analyzers.

Refractometry : principle, Abbe and dipping types.

Interferometry : principle, types-Rayleigh, Jamin and Twyman.

Text Books

- 1) R.S.Khandpur : Handbook of Analytical Instrumentation
- 2) Willard, Merrit and Dean : Instrumental Methods of Analysis

Ref. Book:

1. E.W.Ewing : Instrmental methods of Chemical Analysis
2. R.D.Braun : Introduction to Instrumental Analysis

3 IE 06 ELECTRONIC DEVICES AND CIRCUITS-LAB.

Students are expected to perform minimum 8 experiments based on Syllabus of 3IE02.

3 IE 07 ELECTRICAL MEASUREMENT-LAB.

Students are expected to perform minimum 8 experiments based on Syllabus of 3IE03.

3 IE 08 SENSORS & TRANSDUCER-LAB.

Students are expected to perform minimum 8 experiments based on Syllabus of 3IE04.

3 IE 09 ANALYTICAL INSTRUMENTATION-LAB.

Students are expected to perform minimum 8 experiments based on Syllabus of 3IE05.

FOURTH SEMESTER ELECTRICAL MACHINES SECTION-A

4 IE 01

UNIT-I: D.C Machines

Construction details, EMF equation, Methods of excitation, Self and separately excited generators, characteristics of series, shunt and compound generators, Principle of operation of D.C. motor, back emf and torque equation, characteristics of series, shunt, and compound motors, starting of D.C motors, types of starters, and speed control of D.C shunt motors

UNIT-II: Transformers

Construction details, Principle of operation, EMF equation, transformation ratio, Equivalent circuit, Losses in Transformers, Open and short circuits tests, Auto Transformers, Pulse transformer, Instrument Transformer (CT and PT), Condition of parallel operation, Connection of three phase Transformer-Star/Delta, Delta/Star, Scott connection (Phase inversion).

UNIT-III: Synchronous Machines

- a) **Alternator;** Construction details, synchronous speed, emf equation, winding factors, regulation by synchronous method.
- b) **Synchronous Motors:**
Concept of rotating magnetic field, principle of working, effect of variation of load.
Characteristics and applications.

UNIT-IV: Induction motor

Construction, types, principle of operation of three phase induction motor, equivalent circuit, performance characteristics, Starting and speed control, Different types of starters, and applications.

Single phase induction motor: principle of working, type applications.

UNIT-V: Special purpose machines

Principle, working, Characteristic and applications of stepper motor. Principle, working, Characteristic and applications Servomotors, and Principle, working, Characteristic and applications universal motors.

UNIT-VI: Transmission and Distribution

Structure of electric power system, Generation, transmission, Sub-transmission and distribution systems, EHVAC and EHVDC transmission systems, Substation layout, insulators and cables.

Text books:

1. Electrical Machines-Nagrath Kothari(Tata Mc Graw Hill)
2. Theory of AC Machines-Langsdrof (Tata Mc Graw Hill)
3. Electrical Engineering –Vol I,Direct Currents-C Dewes

Ref. books:

- 1 Fundamentals of Electric Machines-B.K.Gupta, Vandana Singhal
- 2 A Text Book of Electrical Engineering-B.L.Tharaja Volume II and III.
- 3 Performance and Design of DC Machine-Clayton and Hancokk

4 IE 02 COMPUTER PROGRAMMING AND APPLICATIONS

Unit I: Principles of object oriented Programming-Oops paradigm, basic concept of Oop's Benefits of Oop's, structure of C++ Programming, Basic data types, user defined data type, derived data type operator and control statement.

Unit II: Functions classes and object in C++ Functions, Function over loading, Friend and Virtual Functions, Difference between class and structures, Array of objects, object as a function argument , constructor and destructors.

Unit III: Operator's overloading Operator and their definition, overloading unary and binary operator , Rules for overloading operators, overloading binary operators using friends and string manipulation.

UNIT IV- Inheritance and Polymorphism- Defining derived classes, single and multiple inheritance, multilevel inheritance, member classes pointer to objects, pointer to derived classes, virtual base class , virtual function.

Unit V: INTRODUCTION TO SPICE/ PSPICE:-Description, types , circuit elements, sources, Types of analysis ,output commands, Format of files.

DC CIRCUIT ANALYSIS: Registers , modelling of elements, Independent & dependent sources, DC output variables, types of DC analysis.

TRANSIENT ANALYSIS - Capacitors & Inductors, modeling of transient sources, transient Response.

AC CIRCUIT ANALYSIS: AC output variables AC sources & analysis.

UNIT VI: SPICE COMMANDS & DEVICES SIMULATION : Advanced commands, modeling and analysis of diode, BJT & FET

TEXT BOOK :

- 1) Object Oriented Programming with C++ -E. Balaguruswamy, Tata Mc-Graw Hill publishing Co.Ltd., New Delhi,1995.

REFERENCE BOOKS :

- 1) Object Oriented Programming in Turbo C++ Rober Lofore, Galgretia Publications Pvt.Ltd., New Delhi,1995
- 2) The C++ Programming Language (Third Edition) - Bjarne Stroustrup Pub.Co.,New York,1995 (Addison Wesley)
- 3) C++ Primer - Lipman Stanley B., (Second Edition) New York, Addison Wesley Pub. Company,1995
- 4) SPICE FOR CIRCUITS AND ELECTRONICS USING PSPICE Muhammad H. Rashid. (PHI).

4 IE 03/4 XT 03 / 4 XN 03 / 4 BM 03 NETWORK ANALYSIS**SECTION-A**

Unit I: a) Terminal Element Relationships: V-I relationship for Inductance and Capacitance- Constant Flux Linkage Theorem and Constant Charge Theorem- v-i relationship for Independent Voltage and Current Sources - v-i relationship for dependent voltage and current sources- Source Functions: unit impulse, unit step, unit ramp and inter relationship, sinusoidal input ,generalized exponential input.

b) Basic Nodal and mesh Analysis: Introduction, Nodal analysis, the super node, mesh analysis, the super mesh, nodal vs mesh analysis

Unit II: Network Theorems : Linearity and superposition, source transformations, Thevinin's theorem , Norton's theorem, Maximum power transfer theorem, Delta-wye transformations Reciprocity theorem, Milliaman's theorem, Substitution theorem, Compensation theorem, Tellegen's theorems

Unit III: Time Domain Analysis of Circuits: Linear Differential Equations for Series RC, Parallel RC, Series RL, Parallel RL, Series RLC, Parallel RLC and Coupled Circuits-Complete Solution for step/impulse/sinusoid voltage/current inputs-Natural Response-Transient Response-Time Constant-Rise and Fall times-Concept of d.c steady state and sinusoidal steady state-Frequency Response of simple circuits from steady state solution-Solution of two mesh circuits by differential equation method-Determination of initial conditions.

SECTION-B

Unit IV: a) Review of Laplace Transforms: Laplace Transform-Transform Pairs-Gate Functions-Shifting Theorem-Solution of Differential Equations by Laplace Transforms-Initial and Final Value Theorems-Laplace Transforms of periodic signals-Inversion of transforms by partial fractions-Convolution

Theorem and Convolution Integral. (*Review to be done by students. No class hour will be spent for this review.*)

- b] Transformation of a Circuit into s-domain: Transformed equivalent of inductance, capacitance and mutual inductance - Impedance and admittance in the transform domain - Node Analysis and Mesh Analysis of the transformed circuit - Nodal Admittance Matrix and Mesh Impedance Matrix in the s-domain - Solution of transformed circuits including mutually coupled circuits-Input and transfer immittance functions - Transfer functions - Impulse response and Transfer function - Poles and Zeros - Pole Zero plots,
- Unit V : a] Sinusoidal Steady State analysis: Introduction, characteristics of sinusoids, forced response to sinusoidal functions, the complex forcing function, The phasor, phasor relationships for R L C, impedance and admittance , sinusoidal steady state analysis with phasors.
- b] Fourier Series: Fourier Series representation of non-sinusoidal periodic waveforms - Fourier Coefficients-Determination of Coefficients-Waveform Symmetry-Exponential Fourier Series-Discrete Amplitude and Phase Spectra-Steady State Solution of Circuits with non-sinusoidal periodic inputs by Fourier Series
- Unit VI: Two Port Networks: two port networks-characterizations in terms of impedance, admittance, hybrid and transmission parameters-inter relationships among parameter sets-Reciprocity Theorem-Interconnection of Two port networks: Series, Parallel and Cascade - Network Functions-Pole Zero plots and steady state response from pole-zero plots.

Books Recommended :-

- 1) Engineering Circuit Analysis, 6/e By Hayt & Kemmerly, TataMcgraw Hill, 2004
- 2) Network Analysis, By M.E. Van Valkenberg, PHI, 2005
- 3) Electrical Linear Circuits – David Bell, Oxford University Press, 2008
- 4) Linear Circuit Analysis, 2/e – De Carlo and Lin, Oxford University Press, 2009
- 5) Network Analysis, P. Ramesh babu, SCITECH Publications, Chennai, 2009
- 6) Circuit and Network Analysis By Sudhakar Shyammohan, Tata Mc Graw Hill, 2005
- 7) Circuits & Networks – Analysis, Design & Synthesis by M.S.Sukhija, T.K.Nagasarkar, Oxford University Press, 2010.

ADVANCE SENSORS AND TRANSMITTERS

4 IE 04

- Unit I:** Intelligent sensor: Introduction, Features , desirable on chip signal processing, present status.
MEMS Sensor: Introduction, MEMS sensor-Design challenges, MEMS sensor-generation & development.
- Unit II:** PH & Conductivity sensors: PH scale and standard principal of pH measurement ,different types of reference & measuring electrode .Principal of conductivity measurement, conductivity cells & bridges
- Unit III:** Digital transducer: Digital encoder, disc type, incremental shaft, linear displacement transducer, moir, fringe techniques, digital tachometer , digital torque sensor (inductive pickup, photo electric pickup, proximities sensor)
- Unit IV:** Density measurement: Introduction, various scale, hydrometer type, vibrating densitometer, gas Densitometer, ultrasonic sludge densitometer, centrifugal gas density sensor.
Viscosity measurement: Definition, capillary type, cone plate, rotameter type
- Unit V:** Vibration: Vibration measurement , accelerometer , sismic type, jerk meter.
Biosensor Technology: Introduction, Nanosensor: Nanotechnology Introduction, nanosensor development, future of nanosensor.
- Unit VI:** Transmitters: Buoyancy ,differential pressure, temoerature, electro hydraulics, 2 wire transmitters,
Converters: Resistance to current, voltage to current, pneumatic to electrical & electrical to pneumatic
Positioners : necessity, types and effect on performance of control valve, Actuators: pneumatic, hydraulic, electrical, electro-pneumatic, electro-hydraulic.

Text Books:

1. Sensors and Transducer by Dr. A.D. Shaligram First Edition
2. Sensors and Transducer by D. Pathanbis

Ref. Book:

1. Electronics Instrumentation and Measurement by A.K. Sawhney
2. Process Control By B.G. Liptak

4IE 05 TELEMETRY AND TELECONTROL

Unit I: Introduction to communication systems: Basic communication systems, interface & distortion, signal characterization in time domain and frequency domain .

Unit II: Modulation Techniques: Different kinds of SSB & FM Modulators & demodulators.

Unit III: Antenna- Principle of radiation, isotropic, radiator, resonant antenna, non resonant antenna, half wave dipole antenna, folded dipole, parasitic reflector, parasitic director, antenna arrays, yagi-uda antenna, antenna power gain, beam width, polarization, radiation resistance

Unit IV: Digital communication : Sampling theorem, Nyquist frequency, Sampling techniques, & signal reconstruction, pulse modulation-(PCM) principle of delta modulation ASK, FSK, PSK coding formats.

Unit V: Multiple access Schemes: TDMA, FDMA CDMA, spread spectrum communication, D.S. spread spectrum, Frequency hopping spread spectrum, comparison

Unit VI: Smart transmitters, typical telemetry & telecontrol schemes for industrial application telemetry errors caused by noise, telemetry & carrier communication systems

TEXT BOOKS:

- 1) Electronic Communication D Roddy and Coolen
- 2) Electronics Communication System G. Kennedy TMH
- 3) Modern Digital and Analog Communication System B.P. Lathi, Oxford University Press, New Delhi.

Ref. Books

1. Digital Communication by K. Sam Shanmugam
2. Digital Communication by J.G. Proakis, Fourth edition.

4IE06 COMPUTER PROGRAMMING AND APPLICATIONS-LAB.

Students are expected to perform minimum 8 experiments based on Syllabus of 4IE02.

4IE07/4 XT 07/4 XN 07/4 BM 08 NETWORK ANALYSIS-LAB.

Any TEN experiments based on contents of 4 IE 03/4 XT 03/4XN 03/4BM 03 NETWORK ANALYSIS

4IE08 TELEMETRY AND TELECONTROL-LAB.

Students are expected to perform minimum 8 experiments based on Syllabus of 4IE05.

**Content of the Compulsory Subject
“Environmental Studies” are given on Page
Nos. ES-1 to ES-4 i.e. at the end of this syllabus.**

**SYLLABUS PRESCRIBED FOR
FOUR YEAR DEGREE COURSE IN
BACHELOR OF ENGINEERING
COMPUTER SCIENCE & ENGINEERING/
COMPUTER ENGINEERING
SEMESTER PATTERN
(CREDIT GRADE SYSTEM)
SEMESTER: THIRD**

3KS01/3KE01

MATHEMATICS – III

SECTION-A

UNIT-I: Ordinary differential equations:- Complete solution, Operator D, Rules for finding complementary function, the inverse operator, Rules for finding the particular integral, Method of variations of parameters, Cauchy's and Legendre's linear differential equations.

UNIT-II: Laplace transforms:- definition, standard forms, properties of Laplace transform, inverse Laplace transform, initial and final value theorem, convolution theorem, Laplace transform of impulse function, Unit step function, Laplace transforms of periodic function Solution of Linear differential equations, Simultaneous differential equation by Laplace transform method.

UNIT-III: a) Difference equation:- solution of difference equations of first order Solution of difference equations of higher order with constant co-efficients b) Z-transform:- Definition, standard forms, Z-transform of impulse function, Unit step functions, Properties of Z transforms (linearity, shifting, multiplication by k, change of scale), initial and final values, inverse Z-transforms (by direct division and partial fraction), Solution of difference equation by Z-transforms.

SECTION-B

UNIT-IV: a) Fourier transforms:- Definition, standard forms, inverse Fourier transforms, properties of Fourier transforms, convolution theorem, Fourier sine and Fourier cosine transforms and integrals.

b) **Partial differential equation** of first order of following form:-
(i) $f(p,q)=0$; (ii) $f(p,q,z)=0$; (iii) $f(x,p)=g(y,q)$; (iv) $Pp+Qq=R$ (Lagrange's Form); (v) $Z=px+qy+f(p,q)$ (Clairaut form)

UNIT-V: Complex Analysis :- Functions of complex variables, Analytic function, Cauchy-Reimann conditions, Harmonic function, Harmonic conjugate functions, Milne's method conformal mappings (translation, rotation, magnification and bilinear

transformation), singular points, expansion of function in Taylor's and Laurent's series.

UNIT –VI: Vector calculus:- Scalar and vector point functions, Differentiation of vectors, Curves in space, Gradient of a scalar point function, Directional derivatives, Divergence and curl of a vector point function and their physical meaning, expansion formulae (with out proof), line, surface, volume integrals, irrotational and solenoidal vector fields.

BOOKS RECOMMENDED:-

- 1) Elements of Applied Mathematics by P.N.Wartikar and J.N.Wartikar
- 2) A Text Book of Differential Calculus by Gorakh Prasad.
- 3) Engg. Mathematics by Chandrika Prasad.
- 4) Advancing Engg. Mathematics by E.K.Kreyzig.
- 5) A Text Book of Applied Mathematics by P.N.Wartikar and J.N.Wartikar.
- 6) Higher Engg. Mathematics by B.S.Grewal.
- 7) Control System by Gopal and Nagrath.
- 8) Integral transforms by Goyal & Gupta.

3KS 02/3KE02 PROGRAMMING METHODOLOGY

Objectives:

- Study of the basic concepts of Java such as operators, classes, objects, inheritance, packages and exception handling.
- Study of concepts like enumerations, generics, logging, API, assertions, Applets, AWT.
- Preparing the students to learn Object Oriented Programming Methodology.

SECTION A

Unit I: Introduction to Object Oriented Programming: Introduction, Need of OOP, Principles of Object-Oriented Languages, Procedural Language Vs OOP, Application of OOP, Java Virtual Machine, Java features, Program Structures. **Java Programming Constructs:** Variables, Primitive data types, Identifier, Literals, Operators, Expressions, Precedence Rules and Associativity, Primitive Type Conversion and Casting, Flow of Control.

Unit II: Classes and Objects: Classes, Objects, Creating Objects, Methods, Constructors, Cleaning up Unused Objects, Class Variable and Methods, this keyword, Arrays, Command Line Arguments.

Unit III: Inheritance: Inheritance vs. Aggregation, Method Overriding, super keyword, final keyword, Abstract class.

Interfaces, Packages and Enumeration: Interface, Packages, java.lang package, Enum type.

SECTION B

Unit IV: Exception: Introduction, Exception handling Techniques, User-defined exception, Exception Encapsulation and Enrichment. **Input/Output:** The java.io.file Class, Reading and Writing data, Randomly Accessing a file, Reading and Writing Files using I/O Package.

Unit V: Applets: Introduction, Applet Class, Applet structure, Applet Life cycle, Common Methods used in displaying the output, paint (), update () and repaint (), More about applet tag, get Document Base () and get Code Base () methods, Applet Context Interface, Audio clip, Graphic Class, Color, Font, Font Metrics.

Unit VI: Event Handling: Introduction, Event delegation Model, java.awt.event Description, Sources of events, Event Listeners, Adapter classes, Inner Classes. **Abstract Window Toolkit:** Introduction, Components and Containers, Button, Label, Checkbox, Radio Buttons, List Boxes, Choice Boxes, Textfield and Textarea, Container Class, Layouts, Menu, Scrollbar.

Text Book:

Sachin Malhotra and Saurabh Choudhary: Programming in Java, Oxford University Press 2010.

Reference Books:

1. Herbert Schildt: Java Complete References (McGraw Hill)
2. E. Balagurusamy: Programming with Java (McGraw Hill)
3. Khalid Mughal: A Programmer's Guide to Java Certification, 3rd Edition (Pearson)
4. Liang: A text Book of Java Programming, (PHI)
5. Sharnam Shah and Vaishali Shah: Core Java for Beginners, (SPD), 2010.

3KS 03/3KE03 ELECTRONIC DEVICES AND CIRCUITS

Objectives:

- Study of the basic electronic device Semiconductor diode and zener diode and its applications.
- Study of electronic device Bipolar Junction Transistors and its applications.
- Study of electronic device Field Effect Transistors and its applications.

Study of Optoelectronic devices.

SECTION-A

Unit I: pn-Junction Diode, Characteristics and Parameters, Diode Approximation, DC load line analysis, Temperature effects, Diode AC models, Zener diodes, Half-Wave Rectifications, Full-Wave Rectifications, Half-Wave Rectifier Power Supply, Full-Wave Rectifier Power Supply, RC and AC Power Supply Filters.

Unit II: BJT operation, BJT Voltages and Currents, BJT Amplification: Current and Voltage, BJT Switching, Common-Base Characteristics, Common-Emitter Characteristics, Common-Collector Characteristics, Transistor testing.

Unit III: DC Load Line and Bias Point, Base Bias, Collector-to-Base Bias, Voltage-Divider Bias, Comparison of Basic Bias Circuits, Troubleshooting BJT Bias Circuits, Bias Circuit Design.

SECTION-B

Unit IV: Junction Field Effect Transistors, n-Channel and p-Channel JFET, JFET Characteristics, JFET Data Sheets and Parameters, FET Amplifications and Switching, MOSFETs: Enhancement MOSFET, Depletion-Enhancement MOSFET, VMOSFET, Comparison of p-Channel and n-Channel FETs.

Unit V: BJT Phase Shift Oscillators, BJT Colpitts Oscillator, BJT Hartley Oscillator, BJT Wein Bridge Oscillator, Oscillator Frequency stabilization: Frequency Stability, Piezoelectric Crystals, Crystal Equivalent Circuit, Crystals Control of Oscillators.

Unit VI: Optoelectronic Devices: Light Units, Light-Emitting Diodes, Seven-Segment Displays, Photoconductive Cells, Photodiodes and Solar Cells, Phototransistors, Optocouplers, Photomultiplier Tube, Laser Diode.

Text Book:

David A. Bell: Electronic Devices and Circuits, Fifth Edition, Oxford University Press.

Reference Books:

1. Malvino: Principles of Electronics, TMH.
2. Millman & Halkies: Electronic Devices & Circuits, McGraw Hill.
3. Millman & Halkies: Integrated Electronics, McGraw Hill.
4. Millman: Microelectronic, McGraw Hill.
5. Roberts and Sedra: SPICE, Second Edition, Oxford University Press.
6. Sedra and Smith: Microelectronic Circuits, Oxford University Press.

3KS 04/3KE04

DISCRETE STRUCTURE

Objectives:

- Learn basic terminology, formal logic, proofs, sets, relations, functions, recursion
- Use formal logic proof and logical reasoning to solve problems
- Relate the ideas of mathematical induction to recursion and recursively defined structures
- Learning graphs, trees and related algorithms
- Relate interpret and apply these concepts to various areas of Computer Science

SECTION A

UNIT I: **Mathematical Logic:** Statements & Notation, Connectives, Equivalence Formula, Duality Law, Tautological Implication, Normal forms, Parenthesized Infix notation and Polish Notations.

UNIT II: **Theory of inference:** The theory of inference for the statement calculus, Validity using truth tables, Predicate calculus, Inference theory of the Predicate Calculus.

UNIT III: **Set Theory:** Basic concepts, Venn Diagrams, Representation of Discrete Structure, Relation and ordering, Partial Ordering, Functions, Recursions, Sets and predicates.

SECTION B

UNIT IV: **Algebraic Structures:** Semi-groups and Monoids, Product & Quotients of semi-groups, Polish expression & their compilation, Groups, Product and Quotients of Groups.

UNIT V: **Lattice & Boolean Algebra:** Lattices, partially ordered sets, Boolean algebra, Functions on Boolean Algebra, Boolean Functions as Boolean Polynomials, Minimization of Boolean Functions.

UNIT VI: **Graph Theory:** Basic concepts, Paths, Reachability & connectedness, Matrix representation of graphs, Trees: tree searching, Undirected trees, Minimal spanning trees.

Text Book:

J.P.Trembley,R.Manohar: "Discrete Mathematical Structures with application to Computer Science" 1988(MCG)

Reference Books:

1. C.L.Liu : "Combinational Mathematics" Mc Graw Hill, 1988
2. Stanant "Discrete Structure" Prentice Hall.
3. C.L.Liu "Element of Discrete Mathematics" Second Edition McGraw Hill, 1987
4. Norman L.Biggs "Discrete Mathematics" Second Edition,Oxford

University Press, Indian Edition.

5. N. Chandrasekaran & M. Umavparvathi, "Discrete Mathematics" PHI (EEE)2010.
6. Purna Chandra Biswal, "Discrete Mathematics & Graph Theory" Second Edition, PHI (EEE)2009.
7. Chakraborty and Sarkar, "Discrete Mathematics" Oxford University Press, Indian Edition,2011.

3KS 05 / 3KE05 COMPUTER ORGANIZATION

Objectives:

- To understand the relationship between instruction set architecture, micro architecture, and system architecture and their roles in the development of the computer.
- Be aware of the various classes of instruction: data movement, arithmetic, logical and flow control.
- Explain how interrupts are used to implement I/O control and data transfers.
- Understand how a CPU's control unit interprets a machine –level instructions.
- Identify various types of buses in Computer systems.
- Understand memory hierarchy.
- Understand various peripheral devices.

SECTION-A

Unit-I: Basic Structure of Computer: Hardware & Software, Addressing Methods, Program Sequencing, Concept of Memory Locations & Address, Main Memory Operation, Instructions & Instruction Sequencing, Addressing Modes, Basic I/O Operations, Stacks, Queues & Subroutines.

Unit-II: Processing Unit: Fundamental Concepts, Execution of a Complete Instruction, Hardwired Control, Performance Consideration, Microprogrammed Control, Microinstructions, Microprogram Sequencing, Microinstruction Pre-fetching, Emulation.

Unit-III: I/O Organization: Accessing I/O Devices, Interrupts, Direct Memory Access, Bus arbitration, I/O Hardware, Processor Bus and Interfacing Circuits, Standard I/O Interfaces, SCSI Bus, Backplane Bus Standard.

SECTION-B

Unit-IV: Memory Unit: Basic Concepts, Semiconductor RAM Memories, Internal Organization, Static & Dynamic RAMs, ROMs, Speed, Size & Cost Considerations. Cache Memories: Performance considerations. Virtual Memories, Address Translation, Memory Management Requirements.

Unit-V: Arithmetic: Number representation, Design of Fast Adders, Signed Addition and Subtraction. Multiplication of Positive numbers, Booth's Algorithm, Integer Division, Floating-Point Numbers and related operations.

Unit-VI: Computer Peripherals: Input-Output Devices like Video displays, Video terminals, Graphics input devices, Printers. Online storage devices: Magnetic disks, Magnetic tape, Systems, CD-ROM systems. Communication devices: Modems.

Text-Book:

V.Carl Hamacher & S. Zaky: Computer Organization, Fourth Edition, McGraw-Hill (ISE).

References:

1. Stallings. W: Computer Organization & Arcitecture, Fifth Edition, Pearson Education.
2. Tenanbaum A.S: Structured Computer Organization, Fifth Edition, Pearson Education.
3. Hayes J.P: Computer Architecture & Organization, Fourth Edition, McGraw- Hill.
4. M. Mano & Kime Logie: Computer Design Fundamentals, Second Edition, Pearson Education.

3KS 06 / 3KE06 Programming Methodology Lab. : Minimum Eight experiments/programming assignments must be completed based on the respective syllabus covering each of the units.

3KS 07 / 3KE07 Electronic Devices & Circuits Lab. : Minimum Eight experiments/programming assignments must be completed based on the respective syllabus covering each of the units.

3 KS 08 / 3 KE 08 COMPUTER LABORATORY I [WEB TECHNOLOGY]

Unit I: HTML: HTML Coding, Basic Web Graphics, Web Page Design & Site Building, Adding Multimedia to the Web.

Unit II: Paint Shop Pro/Photoshop: Photoshop components, working with Photoshop, Image Basics, File Formats, color Palette, Layers, Creating New Images, Brushes, Grids & Gides, Scaling & Positioning Images, Moving & Merging Layers, Tool Palette, Screen Capturing, Grey styling, Animation.

Unit III: Image Handling: Scanning Images, Adding Text to the Images, Designing Icons, Creating Background Images, Color Models, Color Calibration, Creating Gradients, Oil Paint Effect.

Unit IV: **Multimedia:** Creating Clippings, Animation with Sound Effects, Adding Audio or Video, Windows Media Player Active x control, Agent Control, Embedding VRML in a web Page, Real Player Active x Control.

Unit V: **Applications:** Flash, Working with Layers, Working with Movies, The Drawing Tools, Color Selection, Symbols, Flash Buttons, Flash Menu Smart Clip, Interactivity with Action Script, Frame Actions and the Timeline, Exporting Animation, Applications in Flash.

TEXT BOOK:

1. Meenakshi G. M., “Web Graphics”, Scitech Publications (India) Pvt. Ltd.,2007.

REFERENCE BOOKS:

1. Joel Sklar, “Textbook of Web Design”, Cengage Learning.
2. James L. Mohler & Jon M. Duff, “Designing Interactive Web Sites”, Cengage Learning.
3. Dr. Raja Subramanian, “Creating Web Sites in Engineering”, University Science Press (An Imprint of Laxmi Publication Pvt. Ltd.).
4. Uttam K. Roy, “Web Technologies”, Oxford University Press.

Minimum eight experiments/programming assignments must be completed based on the above syllabus covering each of the units.

**SEMESTER : FOURTH
DATA STRUCTURES**

4KS01/ 4KE01

OBJECTIVES:

- Study the representation and use of primitive data types and built in data structures.
- Study how the data structures are allocated and used in memory.
- Study common applications of each of the data structures.
- Implement the user defined data structures in a high level language

SECTION A

Unit I: Data structures basics, Mathematical /algorithmic notations & functions, Complexity of algorithms, Sub-algorithms. String processing: storing strings, character data type, string operations, word processing, and pattern matching algorithms. 08Hrs

Unit-II: Linear arrays and their representation in memory, traversing linear arrays, inserting & deleting operations, Bubble sort, Linear search and Binary search algorithms. Multi-

dimensional arrays, Pointer arrays. Record structures and their memory representation. Matrices and sparse matrices. 08Hrs

Unit-III: Linked lists and their representation in memory, traversing a linked list, searching a linked list. Memory allocation & garbage collection. Insertion deletion operations on linked lists. Header linked lists, Two- way linked lists. 08Hrs

SECTION B

Unit-IV: Stacks and their array representation. Arithmetic expressions: Polish notation. Quick sort, an application of stacks. Implementation of recursive procedures by stacks, Queues. Deques. Priority queues. 08Hrs

Unit-V: Trees, Binary trees & and their representation in memory, Traversing binary trees. Traversal algorithms using stacks, Header nodes : threads. Heap and heapsort. Path length & Huffman’s algorithm. General trees. 08Hrs

Unit-VI: Graph theory, sequential representations of graphs, Warshalls’ algorithm, Linked representation, operations & traversing the graphs. Posets & Topological sorting. Insertion Sort, Selection Sort. Radix sort. 08Hrs

Text Book:

Seymour Lipschutz: Data Structures with C, Schaum’s Outline Series, Mc Graw-Hill, International Editions.

References:

1. Forouzan, Gilberg, Mahalle, Jogalekar: Data Structures and Algorithms, CENGAGE Learning.
2. Reema Thareja: Data Structures using C, Oxford University Press, 2011.
3. Arpita Gopal: Magnifying Data structures, PHI(EEE), 2010.
4. Ellis Horowitz, Sartaj Sahni: Fundamentals of Data Structures, CBS Publications.
5. Trembley, Sorenson: An Introduction to Data Structures with Applications, McGraw Hill.
6. Standish: Data Structures in Java, Pearson Education.

4KS02/ 4KE02 ANALOG & DIGITALICS

AIM To understand the functions of various digital and analog ICs and their applications in the design of electronic circuits.

OBJECTIVES:

- To get the knowledge about the characteristics and operation of

different analog ICs.

- To study the applications of the above ICs in the design of electronic circuits.
- To get basics knowledge about digital ICs and digital systems.
- To study the design of combinational circuits and sequential circuits.

Unit-I: OPERATIONAL AMPLIFIERS: Characteristics of ideal op amp, Virtual Short, differential amplifier, offset currents and voltages, Slew rate, 741 IC Specifications, inverting and non-inverting amplifiers, adder/ subtractor, integrator, differentiator, Schmitt Trigger, analog multiplier.

Unit-II: TIMERS & PHASE LOCKED LOOP:
Timers: Block schematic of timer IC 555, Application of timer 555 as astable, monostable, bistable multivibrator, Delayed timer, Saw tooth generators. Phase Locked Loops: Operation of phase lock loop system, transfer characteristics, lock range, capture range, study of PLL IC-LM 565 and its application as AM detector, FM detector and Frequency Translator.

Unit-III. NUMBER SYSTEMS:
Binary, Octal, Hexadecimal, Conversions between Number Systems, BCD, Gray and Excess 3 Representations, r s and $(r-1)$ s Complements, Subtraction using 1s and 2s. Complements, Binary to Gray, Gray to Binary Conversions, Alpha numeric codes.

Unit-IV: BOOLEAN FUNCTIONS USING GATES:
Boolean theorems, Minterm and maxterm representation, SOP and POS forms, Karnaugh maps, Tabulation methods, Logic gates – Truth tables, Realization of Boolean functions using Gates, Universal Gates.

Unit-V: COMBINATIONAL CIRCUITS:
Half and Full adders, Parallel binary adder, BCD adder, Half and Full subtractor, magnitude comparator, Decoder, Encoder, Multiplier, ROM, PLA, Boolean Expression Implementation using these ICs.

Unit-VI: SEQUENTIAL CIRCUITS:
Flip Flops – SR, JK, T, D, Characteristic equations, Excitation Tables, Design of counters using Excitation tables, Synchronous and Asynchronous Counters, 7490, 74161 Counter IC specifications, Ring and Johnson Counters, Shift Registers, 74194 Shift Register IC Specifications.

Text Books:

1. Ramakant A.Gayakwad, „OP-AMP and Linear ICs, Prentice Hall, 1994.
2. M.Morris Mano “Digital Design” (2/e) (PHI).

Reference Books :

1. R F. Coughlin;F.F.Driscoll: Operational Amplifiers & Linear Integrated Circuits, Pearson
2. Sedra & Smith : Microelectronics Circuits, 5e, Oxford University Press
3. Jain R.P. “Modern Digital Electronics” (TMH).
4. Mano M. & Kime “Logic & Computer Design Fundamentals” (2/e) (Pearson Education).

4KS03/ 4KE03 OBJECT ORIENTED PROGRAMMING SECTION A

Unit I: Objects & Classes in C++: Declaring & using classes, Constructors, Objects as function arguments, Copy Constructors, Static class data, Arrays of Objects, C++ String class.

Unit II: Operator Overloading: Overloading Unary & Binary Operators, Data Conversion, Pitfalls of Operator Overloading, Pointers & Arrays, Pointers & Functions, New & Delete Operators, Pointers for Objects.

Unit III: Inheritance in C++: Derived Class & Base Class, Derived class Constructors, Function overloading, Class hierarchies, Public & Private Inheritance, Multiple Inheritance, Containership: Classes within Classes.

SECTION B

Unit IV: Virtual Function Concepts: Abstract Classes & Pure Virtual Functions, Virtual Base classes, Friend functions, Static Functions, Assignment & copy initialization, the this pointer, Dynamic type information.

Unit V: Streams & Files in C++: Stream Classes, stream errors, disk file I/O with streams, File Pointers, Error handling in file I/O, File I/O with member functions, Overloading the extractions & Insertions operator, Memory as a Stream Object, Command Line Arguments, Multifile Programs.

Unit VI: Function Template, Class template, Exception Syntax, Multiple exceptions, Exception with Arguments, Introduction to Standard Template Library, Algorithms, Sequential Containers, Iterates, Specialized iterates, associative containers, Function objects.

Text Book:

Robert Lafore: Object Oriented Programming in C++, Galgotia Publication.

Reference Books:

1. Herbert Schildt: C++: Complete Reference, TMH.
2. Bjarne Stroustrup: C++ Programming Language, Addison Wesley.
3. Venugopal: Mastering C++, TMH.
4. Lipmann: C++ Primer, Addison Wesley.
5. Sourav Sahay: Object Oriented Programming with C++, Oxford University Press.

4KS04/ 4KE04 ASSEMBLY LANGUAGE PROGRAMMING**SECTION-A (8 hrs/unit)**

- Unit I: 8086 architecture and pin configuration, Software model of 8086 microprocessor. Memory addresses space and data organization. Data types. Segment registers, memory segmentation. IP & Data registers, Pointer, Index registers. Memory addresses generation.
- Unit II: 8086 Instruction set overview, addressing modes. 8086 instruction formats. 8086 programming : Integer instructions and computations: Data transfer instructions, Arithmetic instructions and their use in 8086 programming.
- Unit III: 8086 programming: logical instructions. Shift and rotate instructions and their use in 8086 programming. 8086 flag register and Flag control instructions, compare instruction, control flow and jump instructions, Loops & loop handling instructions. 8086 programming using these instructions.

SECTION B

- Unit IV: The 8086 stack segment and stack related instructions. 8086 I/O Address space. Subroutines and related instructions, Parameter passing, Concept of Macros, Status saving on stack. Concept of recursion at assembly program level. 8086 Programming using subroutines, recursion and macros.
- Unit V: 8086 I/O: Types of input output, isolated I/O interface, input output data transfers, I/O instructions and bus cycles. Programmable Peripheral Interface 8255 PPI: pin diagram, internal organization, modes of operation. 8086 I/O programming using 8255.
- Unit VI: 8086 Interrupts types, priority and instructions. Interrupt vector table, External hardware-interrupt interface signals & interrupts sequence. Software interrupts. Non-maskable interrupts. Programmable Interrupt Controller 8259: pin diagram, internal organization, modes of operation. 8086 Interrupt-driven programming using 8259.

TEXT BOOKS:

1. W. A. Triebel & Avatar Singh: The 8088/8086 Microprocessors (4e) (PHI /Pearson Education)
2. Liu & Gibson: The 8088/8086 Microprocessor (2/e) (PHI)

REFERENCES:

1. Barry B. Brey : The Intel Microprocessor Architecture, Programming & Interfacing (6/e)(PHI)
2. Ray & Bhurchandi: Advanced Microprocessors & Peripherals (TMH).
3. John P Uffenbeck, "8086/8088 Families: Designing, Programming and Interfacing". Prentice Hall .

4KS05/ 4KE05 THEORY OF COMPUTATION**SECTION A**

- Unit I:** Alphabet, Language, Operations, Finite State Machine, Definitions, Finite Automation Model, Acceptance of Strings and Languages. Non Deterministic Finite Automata, Deterministic Finite Automata, Equivalence between NFA and DFA. Conversion of NFA into DFA, Equivalence between two FSM's, Moore and Mealy Machines.
- Unit II:** Regular Sets, Regular Expressions, Identity Rules. Manipulation of Regular Expressions, Equivalence between RE and FA. Inter Conversion, Pumping Lemma, Closure Properties of Regular Sets (proofs not required), Regular Grammars, Right Linear and Left Linear Grammars, Equivalence between Regular Linear Grammar and FA inter conversion between RE and RG.
- Unit III:** Context Free Grammar, Derivation trees, Chomsky Normal Form, Greibach Normal Form, Push down automata, Definition, Model, Acceptance of CFL, Equivalence of CFL and PDA, Interconversion, Enumeration of properties of CFL (proofs omitted).

SECTION B

- Unit IV :** Turing Machine, Definition, Model, Design of TM, Computable Functions, Recursive enumerable language, Church's hypothesis, Counter machine, Types of TM's.
- Unit V:** Chomsky hierarchy of languages, Linear bounded automata and Context Sensitive Language, Introduction of DCFL and DPDA, Decidability of problems.
- Unit VI:** Undecidability: Properties of recursive & non-recursive enumerable languages, Universal Turing Machine, Post-correspondence problem, Introduction to recursive function theory.

Text books:

1. Hopcraft H.E. & Ullman J: Introduction to Automata Theory, Languages and Computation,
2. Peter Linz: An Introduction to Formal Languages and Automata (Chapter 1 to 12 except 6.3 & 7.4),

Reference Books:

1. Rajendra Kumar: Theory of Automata, Languages & Computation, TMH, 2010.
2. Rajesh K. Shukla: Theory of Computation, CENGAGE Learning, 2009.
3. K V N Sunitha and N Kalyani: Formal Languages and Automata Theory, Mc Graw Hill, 2010.
4. John C. Martin: Introduction to Languages and the Theory of Automata.
5. Lewis H.P. and Papadimition C.H.: Elements of Theory of Computation.
6. Mishra & Chandrashekharan: Theory of Computation.
7. C.K.Nagpal: Formal Languages and Automata Theory, Oxford University Press, 2011.

4KS06/4KE06 Data Structures Lab. : Minimum Eight experiments/ programming assignments must be completed based on the respective syllabus covering each of the units.

4KS07/4KE07 Analog & Digital IC's Lab. : Minimum Eight experiments/ programming assignments must be completed based on the respective syllabus covering each of the units.

4KS08/4KE08 Object Oriented Programming Lab. : Minimum Eight experiments/programming assignments must be completed based on the respective syllabus covering each of the units.

4KS09/4KE09 Assembly Language Programming Lab. : Minimum Eight experiments/programming assignments must be completed based on the respective syllabus covering each of the units.

***Content of the Compulsory Subject
“Environmental Studies” are given on Page
Nos. ES-1 to ES-4 i.e. at the end of this syllabus.***

**SYLLABUS PRESCRIBED FOR
FOUR YEAR DEGREE COURSE IN
BACHELOR OF ENGINEERING
INFORMATION TECHNOLOGY
SEMESTER PATTERN
(CREDIT GRADE SYSTEM)
SEMESTER: THIRD**

3 IT 01/3 KS 01 / 3 KE 01 MATHEMATICS-III

SECTION-A

- UNIT-I: Ordinary differential equations:- Complete solution, Operator D, Rules for finding complementary function, the inverse operator, Rules for finding the particular integral, Method of variations of parameters, Cauchy's and Legendre's linear differential equations.
- UNIT-II: Laplace transforms:- definition, standard forms, properties of Laplace transform, inverse Laplace transform, initial and final value theorem, convolution theorem, Laplace transform of impulse function, Unit step function, Laplace transforms of periodic function Solution of Linear differential equations, Simultaneous differential equation by Laplace transform method.
- UNIT-III: a) Difference equation:- solution of difference equations of first order Solution of difference equations of higher order with constant coefficients,
b) Z-transform:- Definition, standard forms, Z-transform of impulse function, Unit step functions, Properties of Z transforms (linearity, shifting, multiplication by k, change of scale), initial and final values, inverse Z-transforms (by direct division and partial fraction), Solution of difference equation by Z-transforms.

SECTION-B

- UNIT-IV: a) Fourier transforms:- Definition, standard forms, inverse Fourier transforms, properties of Fourier transforms, convolution theorem, Fourier sine and Fourier cosine transforms and integrals.
b) Partial differential equation of first order of following form:- (i) $f(p, q)=0$; (ii) $f(p, q, z)=0$; (iii) $f(x, p)=g(y, q)$; (iv) $Pp + Qq = R$ (Lagrange's Form); (v) $Z = px+qy+f(p, q)$ (Clairaut form)
- UNIT-V: Complex Analysis :- Functions of complex variables, Analytic function, Cauchy-Reimann conditions, Harmonic function, Harmonic conjugate functions, Milne's method conformal mappings (translation, rotation, magnification and bilinear

transformation), singular points, expansion of function in Taylor's and Laurent's series.

- UNIT-VI: Vector calculus:- Scalar and vector point functions, Differentiation of vectors, Curves in space, Gradient of a scalar point function, Directional derivatives, Divergence and curl of a vector point function and their physical meaning, expansion formulae (with out proof), line, surface, volume integrals, irrotational and solenoidal vector fields.

BOOKS RECOMMENDED:-

- 1) Elements of Applied Mathematics, Vol. II by P.N.Wartikar and J.N.Wartikar
- 2) Applied Mathematics, Vol. III, J.N. Wartikar and P.N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune.
- 3) Advancing Engg. Mathematics by E.K.Kreyzig.
- 4) A Text Book of Applied Mathematics by P.N.Wartikar and J.N.Wartikar.
- 5) Higher Engg. Mathematics by B.S.Grewal.
- 6) Control System by Gopal and Nagrath.
- 7) Integral Transforms by Goyal & Gupta.

3 IT 02

PROGRAMMING METHODOLOGY

(8 Hrs. / Unit)

- Unit I:** Introduction to Computer and Languages, OOPS and Software development: Software Engineering and SDLC. Java Basics: Program Components, Compilation cycle. Introduction to Applet and Application, Data types and Variables
- Unit II:** Operators: Arithmetic operators, relational operators, Assignment operators. Control statement: Selection statement: if, nested if, switch statement. Repetition statements: while, do-while, for, nested loops. Introduction to Math class. Arrays: Basics, One dimensional, Multidimensional, Array of Objects, Passing array to method.
- Unit III:** Introducing classes, class fundamentals, declaring objects, methods, class data, & instance data, constructor, this keyword, access control, Introduction to String and String Buffer classes.
- Unit IV:** Event handling: Event handling mechanism, Delegation Event model, Event, Event Listener: Action Listener, mouse Listener, mouse Motion Listener, window Listener, Introduction to AWT, AWT classes: Button, Text Field, Label. Working with Graphics, Working with colors. AWT controls Fundamentals: Adding and removing controls, responding to control. Using

delegation Event model: Handling mouse events

Unit V: Applet class and its methods, Adapter classes, Inheritance, Polymorphism, Abstract classes and Interface, Packages. Multithreaded Programming: The java thread model, Creating a thread, Creating multiple threads.

Unit VI: Java File I/O: File, File Dialog object, Low and High level File I/O, the Stream classes, Byte Stream: Input stream, Output stream, File Input stream, File Output stream, Data Input stream, Data Output stream, Print Writer, Exception handling: Exception types, uncaught Exceptions using try and catch, throw, throws, finally. GUI objects programming: Frame class, menus and other GUI objects.

TEXT BOOK:

- 1) Herbert Schildt : Java Complete References(McGraw Hill)

REFERENCE BOOKS:

- 1) C.Thomas Wu: An Introduction to OOP with Java(McGraw Hill)
- 2) E. Balaguruswami : Programming with JAVA (4th edition), McGraw Hill
- 3) Sachin Malhotra : Programming in JAVA, Oxford Press.

3 IT 03

DISCRETE STRUCTURE

(7 Hrs. /Unit)

UNIT I: Mathematical Logic : Statements & Notation , Connectives , Normal forms , The Theory of Inference for the statement calculus , Predicate calculus , The Theory of the Predicate Calculus.

UNIT II: Set Theory : Basic concepts of Set Theory , Representation of Discrete Structure, Relation and ordering, Functions , Recursion.

UNIT III: Algebraic Structures : Algebraic Systems , Semi groups and Monoids , Grammars and Languages, Polish expression & their compilation , Groups , Semi groups.

UNIT IV : Lattice & Boolean Algebra : Lattices as Partially ordered sets, Boolean Algebra, Boolean Functions, Representation of Boolean Functions , Minimization of Boolean Functions.

UNIT V: Graph Theory : Basic concepts of Graph Theory , Paths , reachability & connectedness, Matrix representation of graphs , Storage Representation and Manipulation of Graphs. Trees :Tree Traversal , Minimal spanning trees. PERT.

UNIT VI: Computability theory :Finite state machines , Finite state acceptors and regular grammars. Turning, machines and partial recursive functions.

TEXT BOOK :

1. J.P.Trembley, R.Manohar :”Discrete Mathematical Structures with Application to Computer Science” 1988 (Tata McGraw Hill)

REFERENCE BOOKS:-

1. S.K. Chakraborty & B.K.Sarkar ;”Discrete Mathematics” OXFORD.
2. Swapan Kumar Sarkar: “A Text Book of Discrete mathematics” (S.CHAND).
3. Bernard Kolman,Robert C.Busby, Sharon Ross: “Discrete Mathematical Structures” Third Edition PHI

3 IT 04

ELECTRONICS DEVICES AND CIRCUITS

UNIT I: Semiconductor Devices: PN Junction Diode, Zener diode BJT & FET transistor. Rectifying circuits & DC power supplies: HWR, FWR, BR, and Comparison. Inductor and capacitor Filter circuits for D.C. Power supplies.

UNIT II: Transistor biasing: The CE amplifier (Simple analysis), Operating point, Stability Factor of self (Potential divider) bias Definition of Hybrid parameters. RC Oscillator: phase shift oscillator and Wein – Bridge oscillator, Transistor as a switch.

UNIT III: Opto- Electronics Devices: fundamental of light, photoconductive sensors, photodiodes, phototransistors their principle of operation & application. Opto – couplers. Introduction to P-spice: Circuit element sources in PSPICE, Modeling analysis of diode, BJT & Op-Amp.

UNIT IV: Operational Amplifier: Block diagram of op-amp, Differential amplifier, transfer characteristics, CMMR improvement, constant current source, dc level shifting, study of IC uA741. Inverting & non-inverting amplifier,

UNIT V: Linear & non-linear application of Op-Amp: voltage follower, Integrator, Differentiator, voltage to current converter, sinusoidal RC Oscillator. Comparator, Astable Monostable, & Bistable Multivibrator. 3 pin IC Voltage regulator 78XX, 79XX.

UNIT VI: Timer: block diagram of IC 555, application of Timer IC 555 as astable, monostable multivibrator, phase lock loops: operations of phase lock loop system, transfer characteristics, lock range capture range.

Text Books

1. N.N.Bhargava, D.C.Kulshreshtha, S.C.Gupta: Basic Electronics & Linear circuits, (TTTI)

2. M.H. Rasic: SPICE for circuits & electronics Using PSPICE (PHI)
3. Gayakwad R.A.: Op-Amps & Linear Integrated circuits (PHI)

Reference Books

1. Malvino: Principals of Electronics(TMh)
2. Millman & Halkins: Electronics Devices & Circuits (MC Graw Hill)
3. K.R.Botkar: Integrated circuits (Khanna P)
4. D.Roy Choudhury & Shail Jain: Linear Integrated circuits (NAIL)

3 IT 05 ASSEMBLY LANGUAGE PROGRAMMING

- Unit I: Microprocessor 8086 architecture-BIU and EU, pin configuration, Software model of 8086 microprocessor. Memory addresses space and data organization. Data types. Segment registers, memory segmentation. IP & Data registers, Pointer, Index registers. Memory addresses generation, Maximum and Minimum Modes.
- Unit II: 8086 Instruction set overview, addressing modes. 8086 instruction formats. 8086 programming: Integer instructions and computations: Data transfer instructions, Arithmetic instructions, and logical instructions. Shift and rotate instructions and their use in 8086 programming
- Unit III: 8086 programming: 8086 flag register and Flag control instructions control flow and jump instructions, Loops & loop handling instructions. Stack related instructions. 8086 I/O Address space. Subroutines and related instructions, Concept of Macros and their types. 8086 programming using these instructions
- Unit IV: Memory system design: Address decoding techniques, static-RAM interfacing, Dynamic-RAM (DRAM): refreshing techniques, interfacing and DRAM controllers; direct memory access (DMA). Interfacing Chips- SRAM and EPROM with 8086, 8237 DMA: pin diagram, internal organization, modes of operation
- Unit V: 8086 I/O: Types of input output, isolated I/O interface, input output data transfers, I/O instructions and bus cycles. Programmable Peripheral Interface 8255 PPI: pin diagram, internal organization, modes of operation. Programmable Interval Timer / Counter 8253: pin diagram, internal organization, modes of operation
- Unit VI: 8086 Interrupts types, priority and instructions. Interrupt vector table, External hardware-interrupt interface signals & interrupts sequence. Software interrupts, Non-maskable interrupts. Programmable Interrupt Controller 8259: pin diagram, internal organization, modes of operation...

TEXT BOOKS:

1. Avtar Singh & Walter A. Triebel: The 8088 and 8086 Microprocessors, Programming, Interfacing, Software, Hardware, and Applications, PHI, 2003.
2. K.M Bhurchandi, "Advanced Microprocessor and Peripherals Architecture, Programming and Interfacing", Tata Mc Graw Hill , 2006.
3. Ray & Bhurchandi: Advanced Microprocessors & Peripherals (TMH).
4. Liu Gibson: Microcomputer Systems: The 8086/8088 Family- Architecture, Programming And Design , PHI)

REFERENCES:

1. Barry B. Brey : The Intel Microprocessor Architecture, Programming & Interfacing (6/e)(PHI)
2. John P Uffenbeck, "8086/8088 Families: Designing, Programming and Interfacing". Prentice Hall
3. D. V. Hall: Microprocessors and Interfacing, TMH.

3IT06 Programming Methodology Lab.: Minimum Eight experiments/programming assignments must be completed based on the 3 IT 02 syllabus covering each of the units.

3IT07 Electronics Devices & Circuits Lab. : Minimum Eight experiments/programming assignments must be completed based on the 3 IT 03 syllabus covering each of the units. At least two experiments must be conducted using PSPICE.

3IT08 Assembly Language Programming Lab. : Minimum Eight experiments/programming assignments must be completed based on the 3 IT 04 syllabus covering each of the units.

3IT09 Computer Lab-I (Linux,Unix) Lab. : Minimum Eight experiments/programming assignments must be completed based on Linux and /or Unix.

SEMESTER : FOURTH**4IT01****DATASTRUCTURES**

- Unit-I: Data structures basics, Mathematical /algorithmic notations & functions, Complexity of algorithms, Subalgorithms. String processing: storing strings, character data type, string operations, word processing, and pattern matching algorithms.
- Unit-II: Linear arrays and their representation in memory, traversing linear arrays, inserting & deleting operations, Bubble sort, Linear search and Binary search algorithms. Multidimensional arrays, Pointer arrays. Record structures and their memory representation. Matrices and sparse matrices.
- Unit-III: Linked lists and their representation in memory, traversing a linked list, searching a linked list. Memory allocation & garbage collection. Insertion deletion operations on linked lists. Header linked lists, Two-way linked lists.
- Unit-IV: Stacks and their array representation. Arithmetic expressions: Polish notation. Quick sort, an application of stacks, Recursion. Tower of Hanoi problem. Implementation of recursive procedures by stacks, Queues. Deques. Priority queues.
- Unit-V: Trees, Binary trees & and their representation in memory, Traversing binary trees. Traversal algorithms using stacks, Header nodes : threads. Binary search trees, searching, inserting and deleting in binary trees. Heap and heapsort. Path length & Huffman's algorithm. General trees, M-way search Trees.
- Unit-VI: Graph theory, sequential representations of graphs, Warshall's algorithm, Linked representation, operations & traversing the graphs. Posets & Topological sorting. Insertion Sort, Selection Sort. Merging & Merge-sort, Radix sort, Hashing.

Textbook :

Seymour Lipschutz : “ Theory & Problems of Data Structures”
Schaum's Outline series (Mc Graw-Hill) International Editions.

REFERENCES:

1. Reema Thareja : Data Structures Using C. (Oxford)
2. Ellis Horowitz, Sartaj Sahni – Fundamentals of Data Structures (CBS Publications)
3. Trembley, Sorenson:- An Introduction to Data Structures with Applications.
4. Aho Ullman : Analysis and Design of Algorithms.

5. Bhagat Singh, Naps : Introduction to Data Structures.

4IT02**COMMUNICATIONENGINEERING**

- Unit I
AM Transmitters
Modulation, need of modulation, AM Modulation, Frequency spectrum, Principles of DSB-FC, DSBSC, SSB-SC modulation and their comparison, Details of DSBFC Transmitter, Generation of DSB-SC by using balanced modulators (FET & Diodes), DSB-SC Transmitter, Generation of SSB-SC by phase-shift method.
- Unit II
AM Receivers
TRF receiver, Superhetrodyne receiver, Details of each block such as RF amplifier, mixer oscillator, IF amplifier, Diode detector, Audio Amplifier. Need and type of AGC, Communication Receiver, Selectivity filter method, Phase shift method , sensitivity, Image rejection ration of communication receiver,Noise calculation in DSB-FC,DSB-SC & SSB-SC
- Unit III
FM Transmitters
FM Modulation, Frequency Spectrum, Circuits & Analysis for direct FM generation using FET and varactor diode. Circuit & analysis of Indirect FM generation, Narrow Band and Wide Band FM, their comparison, Pre-emphasis and De-emphasis.
- Unit IV
FM Receivers
Details of FM receiver, blocks such as R.F. amplifier, local oscillator, IF amplifier, Mixer, AudiQ Amp!., AGC, Limiter, FM Discriminator, Single Slope and Balanced slope detector, Analysis of Foster seeley and ratio detectors, Stereo FM receiver, Noise in FM Reception, FM threshold effect.
- Unit V
Pulse Modulation Technique : The sampling theorem, Sampling of Band-Pass Signal, Linear and Non linear quantization, Aliasiry effect, Aperture effect, Reconstruction of filter, Time Division Multiplexing, Pulse Amplitude Modulation, Pulse Time Modulation, PCM, DM, ADM
- Unit VI
Signal Analysis
Fourier Series, Exponential Fourier Series, Fourier Transform, Properties of Fourier Transform, Delta Function, Fourier Transform of Periodic functions, fundamental of Power Spectral Density & Energy Spectral Density, Correlation, auto-correlation, Cross-correlation.

Text Books

- (1) Kennedy G. : “Electronic Communication System” Tata Mc-Graw Hill Co.,New Delhi (Third Edition)
- (2) Taub and Schilling D.L. : Principles of Communication Systems, Mc-

Reference books:-

- (1) B. P. Latbi : “Modern Digital and Analog Communication Systems” Oxford University Press, New Delhi.
- (2) Hari Bhat: “Analog Communication, 2nd Edition Pearson India, 2010”
- (3) S. Kundu: “Analog & Digital Communication, Pearson India, 2010”
- (4) R.P.Singh, S.D. Sapre: Communication System, Anolog and Digital, Tata Mc-Graw Hill Co., New Delhi.

4IT03**OJECT ORIENTED TECHNOLOGIES**

- UNIT I:** Introduction to Object Oriented Programming: Introduction to procedural, modular, object-oriented and generic programming techniques, Limitations of procedural programming, Need of object-oriented programming, fundamentals of object-oriented programming. Objects & classes in C++: Declaring & using classes, Constructors, Objects as functions arguments, Copy Constructor, Static class data. Arrays of objects,
- UNIT II:** C++ string Class. Operator overloading :Overloading unary & binary operators. Data conversion. Pitfalls of operator overloading. Pointers& Arrays. Pointer & functions. New & deleter operators. Pointers For objects.
- UNIT III:** Inheritance in C++ :Derived class & base class, Derived class Constructors, Function overloading, class hierarchies, public and private inheritance, multiple inheritance Containership : classes within classes.
- UNIT IV:** Virtual functions concepts, Abstracts classes & pure virtual Functions. Virtual base classes, Friend functions, static Functions, Assignment and copy initialization the this pointer. Dynamic type information. Introduction to C++ graphics, creating basic shapes, using colors and styles .
- UNIT V:** Streams & File in C++: Stream classes, stream errors, disk File I/O with streams File pointers, Error handling in file I/O File I/O with members functions, overloading the extractions & Insertion operators, Memory as a stream object, command Line arguments. Multifile programs.
- UNIT VI:** Function Tamplate, class templates, Exception syntax Multiple exceptions, exception with arguments. Introduction to the Standard Template Library. Algorithms, Sequential Containers iterators, specialized iteratrors, associative containers Function objects.

Text Book:

1. Robert Lafore Object-Oriented Programming in C++ (Galgotia Publications)

References:

1. E. Balaguruswamy, “Object Oriented Programming with C++”, Tata McGraw-Hill Publishing Company Ltd, New Delhi ISBN 0 - 07 - 462038 - X.
2. Herbert Schildt C++ : Complete Reference (TMH)
3. BPB Editorial Board Advanced C++(BPB Publications)
4. Lipmann C++ Primer (Addison-Welsley)

4 IT 04/ 4 BM 04 SOCIAL SCIENCES & ENGINEERING ECONOMICS**SECTION - A**

- Unit I : Study of Social Science : Importance to Engineer, salient features of Indian constitution. Fundamental Rights and Duties. Directive Principles of State Policy. (9)
- Unit II : Indian Parliament : composition and powers. President of India : Election and Powers. Council of Ministers and Prime Minister (9)
- Unit III : Impact of Science and Technology on culture and Civilization. Human Society : Community Groups, Social Control : Meaning, Types and Agencies. Marriage and Family : Functions, Types and problems.

SECTION - B

- Unit IV: Nature and scope of Economics : Special significance of Economics to Engineers. Production : Factors of production, Laws of return, Various Economic systems, Forms of Business Organisation. (9)
- Unit V : Banking : Functions of Central and Commercial Banks. Taxation : Principle of taxation, Direct and Indirect taxes. Market : Forms, perfect and imperfect competition, pricing under perfect and imperfect competition, prices discrimination under monopoly. (9)
- Unit VI: Economics of Development : Meaning, Characterisitcs of under development, obstacles to Economic growth and vicious circle of poverty. Economic Planning : meaning, objective and salient features of current five years plan of India. Planning horizons, life structuring the alternatives. Economics of comparision of different alternative projects.

Books Recommended :

1. Pylee M.V. : Constitutional Govt. in India, S.Chand and Co.
2. Joshi G.N. : The Constitution of India, Macmillan India Ltd.
3. Mahajan : The Constitution of India, S.Chand, New Delhi.
4. Maclaver and Page : Principle of Sociology.
5. Davis K. : Human Society
6. Dewett and Varma J.D. : Elementary Economic Theory, S.Chand and Co.
7. A.N.Agrawal : Indian Economy, Problem of Development and Planning (Wiley Eastern Ltd), New Delhi.
8. S.K.Mishra : Indian Economy, Its Development Experience. Himalaya Pub.House, Bombay.
9. Datt R.K. : Indian Economy, S.Chand and Comp. New Delhi P.M.Sundharam
10. Dhingra I.C. : Indian Economy
11. E.Kuper : Economics of W.R.Development, McGraw Hill Co.,
12. James L.E., R.R.Lee : Economics of W.R.Planning, McGraw Hill Co.

4IT05 NUMERICAL METHODS & OPERATION RESEARCH TECHNIQUES

- Unit I : Error Analysis, absolute, relative and percentage errors. A general error formula and error in series approximation, Solution of Non linear and polynomial equations: Bisection Method, False Position method, secant, Newton Raphson methods.
- Unit II : Solution of Linear Systems of Equation : Gauss elimination method, Gauss Jordan Method, Gauss Seidel Iterative Method, Gaussian elimination, Matrix Inversion Method, L-U factorization method. Regression, Curve fitting: Least Square Method, Correlations.
- Unit III : Integration and Differential equations : Numerical Integration-Trapezoidal, Simpsons one third and three eight rules, Romberse Method. Newtons forward and backward interpolation formula. Numerical differentiation : Maximum and minimum values. Lagrange's Interpolation Method, Euler's method, Runge Kutta methods, Predictor Corrector method, Taylor Series.
- Unit IV : Operations Research Models and Dynamic Programming : Operations research models- classification of problems, phases of operation research, scope and limitation of operations research. Dynamic programming : Investment

problem Stagecoach Problem, Equipment Replacement problem, conversion of final value problem into an initial value problems.

- Unit V : Linear Programming and Sequencing: Linear programming – Concept of Linear Programming, simplex method, Big-M Method, Two Phase Simplex Method, concept of duality, transportation problems, Assignment Problem, Hungarian Method. Sequencing Problem: Two-Machine, N-Jobs, and Three Machine Problem.
- Unit VI: PERT and CPM : Pert Networks, ET, TE, TL, SE and Critical path, Probability of completion. Decision theory : Introduction, Minimax decision procedure, Bayes decision procedure with and without data, Regret function Vs. Loss function.

TEXT BOOKS :-

- 1) Computer Oriented Numerical Methods : V.Rajaraman, Second Edition, Prentice Hall of India Pvt. Ltd., New Delhi.
- 2) Introduction to Operation Research : Billy, E.Gillett, Tata McGraw Hill Pub. Co. Ltd., New Delhi.

REFERENCE BOOKS

- 1) Introduction to Methods of Numerical Analysis : S.S.Shastry, Second Edition, Prentice Hall of India Pvt. Ltd., New Delhi.
- 2) Optimization Theory and Applications : S.S.Rao, Second Edition, Wiley Eastern Limited, New Delhi.
- 3) J. N. Kapoor- Mathematical Statistics Tata McGraw Hill Pub. Co. Ltd.

4IT06 Data Structures Lab : Minimum Eight experiments/programming assignments must be completed based on the respective syllabus covering each of the units.

4IT07 Communication Engineering Lab : Minimum Eight experiments/programming assignments must be completed based on the respective syllabus covering each of the units.

4IT08 Object Oriented Technologies Lab : Minimum Eight experiments/programming assignments must be completed based on the respective syllabus covering each of the units.

4IT09 Computer Lab-II (HTML) : Minimum Eight experiments/programming assignments must be completed based on HTML.

This Lab is based on Web publishing. The topics to be covered include

1. Web Publishing
2. Web Page Design
3. Exposure to IE & NN Browsers

4. Dynamic HTML.

Each group of 2 students should build their own Website.

Text Book: M. Petrovsky : Dynamic HTML in Action (TMH)

***Content of the Compulsory Subject
“Environmental Studies” are given on Page
Nos. ES-1 to ES-4 i.e. at the end of this syllabus.***

PART-A

SHORT ANSWER PATTERN 25 Marks

1. The Multidisciplinary nature of environmental studies

- . Definition, scope and importance.
- . Need for public awareness.

(2 lecture hours)

2. Social Issues and the Environment

- . From Unsustainable to Sustainable development
- . Urban problems related to energy
- . Water conservation, rain water harvesting, watershed management
- . Resettlement and rehabilitation of people; its problems and concerns. Case studies.
- . Environmental ethics : Issues and possible solutions.
- . Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.
- . Wasteland reclamation.
- . Consumerism and waste products.
- . Environment Protection Act.
- . Air (Prevention and Control of Pollution) Act.
- . Water (Prevention and Control of Pollution) Act.
- . Wildlife Protection Act.
- . Forest Conservation Act.
- . Issues involved in enforcement of environmental legislation.
- . Public awareness. (7 lecture hours)

3. Human Population and the Environment

- . Population growth, variation among nations.
- . Population explosion - Family Welfare Programme.
- . Environment and human health.
- . Human Rights.
- . Value Education.
- . HIV / AIDS.
- . Women and Child Welfare.
- . Role of Information Technology in Environment and human health.
- . Case Studies. (6 lecture hours)

4. Natural resources :

. Renewable and non-renewable resources :

- . Natural resources and associated problems.
 - Forest resources : Use and over exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
 - Water resources : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
 - Mineral resources : Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
 - Food resources : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer - pesticide problems, water logging, salinity, case studies.
 - Energy resources : Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources, Case studies.
 - Land resources : Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
- . Role of an individual in conservation of natural resources.
- . Equitable use of resources for sustainable lifestyles.

(8 lecture hours)

5. Ecosystems

- . Concept of an ecosystem.
- . Structure and function of an ecosystem.
- . Producers, consumers and decomposers.
- . Energy flow in the ecosystem.
- . Ecological succession.
- . Food chains, food webs and ecological pyramids.
- . Introduction, types, characteristic features, structure and function of the following ecosystem :-
 - Forest ecosystem
 - Grassland ecosystem
 - Desert ecosystem
 - Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

(6 lecture hours)

6. Biodiversity and its conservation

- . Introduction - Definition : genetic, species and ecosystem diversity.
- . Biogeographical classification of India.
- . Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values.
- . Biodiversity at global, National and local levels.
- . India as a mega-diversity nation.
- . Hot-spots of biodiversity.

ES-3

- Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts.
- Endangered and endemic species of India.
 - Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity. (8 lecture hours)

7. Environmental Pollution

- Definition
- Causes, effects and control measures of :-
 - Air pollution
 - Water pollution
 - Soil pollution
 - Marine pollution
 - Noise pollution
 - Thermal pollution
 - Nuclear hazards
- Solid Waste Management : Causes, effects and control measures of
 - Role of an individual in prevention of pollution.
 - Pollution case studies.
 - Disaster management : floods, earthquake, cyclone and landslides. (8 lecture hours)

PART-C ESSAY ON FIELD WORK 25 Marks

8. Field work

- Visit to a local area to document environmental assets - river / forest / grass land / hill / mountain
- Visit to a local polluted site - Urban / Rural / Industrial / Agricultural
- Study of common plants, insects, birds.
- Study of simple ecosystems - pond, river, hill slopes, etc. (5 lecture hours)

- (Notes : i) Contents of the syllabys mentioned under paras 1 to 8 shall be for teaching for the examination based on Annual Pattern.
ii) Contents of the syllabys mentioned under paras 1 to 4 shall be for teaching to the Semester commencing first, and
iii) Contents of the syllabys mentioned under paras 5 to 8 shall be for teaching to the Semester commencing later.

LIST OF REFERENCES :-

- Agarwal, K.C., 2001, Environmental Biology, Nidi Publ. Ltd., Bikaner.
- Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad - 380 013, India, Email : mapin@icenet.net (R)
- Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p.
- Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)

ES-4

- Cunningham, W.P.Cooper, T.H.Gorhani, E & Hepworth, M.T., 2001, Environmental Encyclopedia, Jaico Publ. House, Mumbai, 1196p.
- De A.K., Environmental Chemistry, Wiley Eastern Ltd.
- Down to Earth, Centre for Science and Environment (R)
- Gleick, H.P. 1993, Water in Crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press. 473p.
- Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural History Society, Mumbai (R)
- Heywood, V.H. & Watson, R.T. 1995, Global Biodiversity Assessment, Cambridge Univ. Press 1140p
- Jadhav, H & Bhosale, V.M. 1995, Environmental Protection and Laws, Himalaya Pub. House, Delhi. 284 p.
- Mckinney, M.L. & Schoch, R.M. 1996, Environmental Science Systems & Solutions, Web Enhanced Edition. 639 p.
- Mhaskar A.K., Matter Hazardous, Techno-Science Publications (TB)
- Miller T.G. Jr., Environmental Science, Wadsworth Publishing Co. (TB)
- Odum, E.P., 1971, Fundamentals of Ecology, W.B.Saunders Co., U.S.A., 574p.
- Rao M.N. & Datta A.K., 1987, Waste Water Treatment, Oxford & IBH Publ. Co. Pvt. Ltd. 345 p.
- Sharma B.K., 2001, Environmental Chemistry, Goel Publ. House, Meerut.
- Survey of the Environment, The Hindu (M)
- Townsend C., Harper J., and Michael Begon, Essentials of Ecology, Blackwell Science (TB)
- Trivedi R.K., Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol. I and II, Enviro Media (R)
- Trivedi R.K. and P.K. Goel, Introduction to Air Pollution, Techno-Science Publications (TB)
- Wagner K.D., 1998, Environmental Management, W.B.Saunders Co., Philadelphia, USA 499p.
- डॉ. विठ्ठल घारपुरे : पर्यावरणशास्त्र- पिंपळापूरे अॅन्ड कंपनी पब्लीशर्स, नागपूर.(R)
- Dr. Deshpande, A.P.Dr. Chudiwale, A.D., Dr. Joshi, P.P., Dr. Lad, A.B.: Environmental Studies, Pimpalpure & Co., Publishers, Nagpur. (R)
- R.Rajagopalan : Environmental Studies, Oxford University Press, New Delhi, 2005 (R)

(M) Magazine
(R) Reference
(TB) Textbook

DIRECTION

No. 31/2011

Date : 10/06/2011

Subject : Schemes of teaching & examinations of III to VIII/X Semesters as per Credit Grade System of various branches in the faculty of Engineering & Technology

Whereas faculty of Engineering & Technology in its meeting held on 6th June, 2011 vide Item No. 39 accepted and recommended schemes of teaching & examinations of III to VIII/X as per Credit Grade System of various branches as per Credit Grade System in the faculty of Engineering & Technology for its implementation from the session 2011-2012 in phase wise manner,

AND

Whereas the schemes of teaching & examinations of VII & VIII/X Semesters as per Credit Grade System of various branches in the faculty of Engineering & Technology were accepted by the Hon'ble Vice-Chancellor u/s Section 14 (7) of M.U. Act, 1994 on behalf on Academic Council on 9th June, 2011,

AND

Whereas this schemes of teaching & examinations of various branches as per Credit Grade System in the faculty of Engineering & Technology are required to be regulated by the Regulation,

AND

Whereas the process of making the Regulation is likely to take some time,

AND

Whereas the schemes of various branches as per Credit Grade System in the faculty of Engineering & Technology are to be implemented from the academic session 2011-2012,

AND

Whereas syllabi of various branches in the faculty of Engineering & Technology are to be sent for printing.

Now, therefore, I, Dr. Mohan K. Khedkar, Vice-Chancellor of Sant Gadge Baba Amravati University in exercise of powers confirmed upon me under sub section (8) of Section 14 of the Maharashtra Universities Act, 1994, hereby direct as under :-

- 1) This Direction shall be called "Schemes of teaching & examinations of III to VIII/X Semesters as per Credit Grade System of various branches in the faculty of Engineering & Technology, Direction, 2011"
- 2) This Direction shall come into force from the date of its issuance.
- 3) Schemes of teaching and examinations of III to VIII/X semesters as per Credit Grade System of the following branches shall be as per respective Appendices appended with this Direction :-

BRANCH

1)	Civil Engineering	A
2)	Mechanical Engineering	B
3)	Production Engineering	C
4)	Electrical Engineering (Electronics & Power)	D
5)	Electrical and Electronics Engineering	E
6)	Electrical Engineering (Electrical & Power)	F
7)	Electrical Engineering	G
8)	Electronics & Telecommunication Engineering	H
9)	Electronics Engineering	I
10)	Instrumentation Engineering	J
11)	Computer Science & Engineering	K
12)	Computer Engineering	L
13)	Architecture	M
14)	Textile Engineering	N
15)	Chemical Engineering	O
16)	Chemical Technology (Polymer) (Plastic) Technology	P
17)	Chemical Technology (Food, Pulp & Paper, Oil & Paint and Petrochemical) Technology	Q
18)	Information Technology	R
19)	Biomedical Engineering	S

Appendix No.

Sd/-

Dr. Mohan K. Khedkar
Vice-Chancellor
