NOTIFICATION

No. 89/2020 Date : 26/10//2020

Subject : Implementation of new Syllabi of Semester III & IV of B.E. (C.B.C.S.) as per A.I.C.T.E. Model Curriculum…

It is notified for general information of all concerned that the authorities of the University have accepted to implement new Syllabi of Semester III & IV of B.E./B.Text. E./B.Tech. (Chem.Tech.) (Food, Pulp & Paper, Oil & Paint and Petrochemical Tech.) (C.B.C.S.) as per A.I.C.T.E. Model Curriculum to be implemented from the academic session 2020-21 & onwards as per "**Appendix – A**" as given below:

Sd/-
(Dr.T.R.Deshmukh)
Registrar

"**Appendix – A**"

SYLLABI OF B.E. SEM. III & IV (CIVIL ENGINEERING) [C.B.C.S.]

THIRD SEMESTER

3CE01 MATHEMATICS III

Objectives:-

- Find general solutions of linear differential equations with constant coefficients using the roots of the auxiliary equation.
- Calculate the Laplace Transform of basic functions using the definition.
- Compute the partial Differential Equations.
- Understand the computational details behind certain numerical methods.
- Compute the Analytic function.
- Compute and interpret the correlation coefficient.

Course Outcomes:
After successfully completing the course, the students will be able to:

1. Demonstrate the knowledge of differential equations and partial differential equations, applied to electrical engineering systems.
2. Apply Laplace transform to solve differential equations.
3. Demonstrate the use of Partial Differential Equations.
4. Compute different Numerical Methods.
5. Apply the knowledge of Complex Analysis.
6. Demonstrate the basic concepts of probability and statistics.

SECTION-A

Unit I : Ordinary Differential Equations :

Complete solution, Operator D, rules for finding the complementry 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. (7)

UnitII: Laplace transforms:

Definition and elementry properties, Inverse L.T. by various methods, Convolution theorem, Solution of ordinary differential equation using Laplace transform of periodic functions. Application to problems of beams and fluids. (7)

UnitIII : Partial DifferentialEquations :

P.D.E. of first order and first degree of types i) f(p,q) = O ii) f(p,q,z)=0, iii) f(p,q,x,y)=O iv) f(p,q,x,y,z)=O i.e. (a) Lagrange's form Pp + Qq = R (b) Clairtut'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. (7)

SECTION-B

UnitIV: **Numerical Methods :-** (i) Solution of Algebraic and transcendal Equations by Newton Raphson method and by method of FalsePosition.

(ii) Solution of system of linear equations by Grout's method, Gauss Seidal method and Relaxation Method.

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. (7)

Unit V : Complex variable :

Analytic functions, C.R.conditions, Harmonic functions. harmonic conjugate functions, Milne's method, conformal mappings (translation, rotation, magnification, inversion, bilinear transformation) (7)

UnitVI : 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, Correlation, regression. (7)

TEXT BOOKS:

1. Elements of Applied Mathematics by P. N. Wartikar and J. N. Wartikar. Poona Vidhyarthi Publisher
2. Higher Engineering Mathematics by B.S.Grewal. Khanna Publishers
3. Introduction to method of Numerical Analysis- S. S. Shastry, 2ND Edition, PHI Pvt. Ltd.,New Delhi.

REFERENCES:

1. A Mathematical Companion for Science and Engineering Students – Brettenbach, Oxford University Press, 2008
2. Advancing Engg. Mathematics, E.K.Kreyzig, John Wiley
3. Numerical Method for Mathematics Science and Engineering, John H. Mathew, PHI 4. Numerical Methods - Principles, Analysis & Algorithms Pal, Oxford.

3CE02 – STRENGTH OF MATERIALS

Learning Objectives of Subject:

1. To determine theMechanica lbehavior of the body and construction materials bydetermining the stresses, strains produced by the application of loads.
2. To apply the fundamentals of simple stresses and strains.
3. To make one understand the concept of bending and its theoretical analysis.
4. To apply fundamental concepts related to deformation, moment of inertia, load carrying capacity, shear forces, bending moments, torsional moments, principal stresses and strains, slopes and deflection.

Course outcomes:

At the end of the subject the students will be able -

1. To understand the basics of material properties, stress and strain.
2. To apply knowledge of mathematics, science, for engineering applications
3. To identify, formulate, and solve engineering & real life problems
4. To design and conduct experiments, as well as to analyze and interpret action and reaction data.
5. To understand specific requirement from the component to meet desired needs within realistic constraints of safety.

SECTION – A

Unit I: Mechanical properties: Concept of direct 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, Generalized Hook's law, factor of safety. 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: 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 forces, bending moment and loading intensity.

Unit III: 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, impact loads and instantaneous stresses.

SECTION – B

Unit IV: 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. Thin cylinders subjected to internal pressures.

Unit V: Principal stresses: Biaxial stress system, principal stresses, principal planes, Mohr's circle of stresses, principal strains. Combined direct & bending stresses.

Unit VI: Slope & deflection of beams: Slope & deflection in statically determinate beams subjected to point loads, uniformly distributed loads, moments by Macauley's method. Theory of long columns, Euler, Rankin's 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. Ferdinard 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. R. K. Bansal, Strength of materials, Laxmi Publications Pvt Ltd.
6. Junnarkar, S. B., Mechanics of materials.
7. Mubeen, A., Mechanics of solids, Pearson education (Singapore) Pvt. Ltd.
8. Beer and Johston, Mechanics of materials, Mc-Graw Hill.
9. S. Ramamrutham, Strength of Materials, Dhanpat Rai Publishing Co Pvt Ltd.

3CE03 – BUILDING CONSTRUCTION & ENGINEERING GEOLOGY

Learning Objectives of Subject:

1. To understand various types and components of civil structure.
2. To learn about the type of infilling material, its features and construction methodology.
3. To understand various levels in building – floor, sill, lintel, roof levels and their need.
4. To understand the need and type of vertical and horizontal circulation.
5. To make aware of knowledge and importance of rock, soil and its impact for site selection.
6. To help one to understand the reason for Earthquake and its impact on soil / rock properties.

Course outcomes:

At the end of the subject the students will be able -

1. To understand Load bearing and Frame structure.
2. To recognize various types of construction material and its suitability
3. To recognize the various levels in building and its need.
4. To know types of staircase, doors, windows and other related fixtures.
5. To recognize types of rock and minerals and its construction properties.
6. To know reason for earthquake and seismic waves.

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 & framed structures. Foundation: Definition and necessity, loads of foundation, Bearing Capacity soil, field methods of improving bearing capacity. Types of foundation – shallow foundation and Types of Shallow foundation.Causes of failure of foundations and precautions to be taken.

Unit II: Masonry: Classification of bricks, manufacturing of bricks, tests on bricks, properties of burnt bricks, fly ash bricks, ALC Blocks. Brick masonry construction – Technical terms, general principles, commonly used types of bonds such as stretcher, header, English bond and Flemish bond, their suitability. Formwork: Different types, their relative merits, demerits, period for removal of formwork for different members. Earthquake resistant bands in masonry- Types, location and application.

Unit III: Floors: Types of Floors – Basement floor, ground floor and upper floors, Floorfinishes – Types of flooring material, different types of floor finishes, suitability, method of construction, criteria for selection. Roofs – Flat, pitched roof, steel roof trusses – types and suitability, types of roof covering. Arches, lintels – Types and their suitability, details of R.C.C. lintels.; chajja, precast lintels arches.

SECTION - B

Unit IV: Doors: Purpose, criteria for location, size of door, door frames.; its types, methods of fixing, Types of door shutters and their suitability, Windows – Purpose, criteria for location, no., sizes; shapes of Windows, types of windows; their suitability. Ventilators – Types and their suitability. Fixtures & fastening for doors and windows. Stairs – Function, technical terms, criteria for location, types of staircases, their suitability, principle of stair layout design.

Unit V: Plastering - Necessity, types, processes of different types of plastering, defects inplastered work. Scaffolding – Purpose, types and suitability. Special Aspects of Construction – Damp proofing – causes of dampness, its effects, various methods of damp proofing.Fire proof construction –Fire protection requirements for a multistoried building. Sound proof Construction – Sound absorbents and their characteristic. Expansion & construction joints in building.

Unit VI: Introduction - Different branches of Geology and importance of Geology in CivilEngineering.Folds, faults, joints in Geology. Geological studies related to site selection for dams and reservoirs. Petrology - rock cycle, rock weathering and soil formation, study of common rock types. Earthquake Engineering - earthquake waves, causes and effects, magnitudeand intensity, earthquake zones of India.

Books Recommended:

1. Mackay W.B.: Building Construction, Vol. I, II, III, Longmans.
2. Sushil Kumar: Building Construction, Standard Publishers Distributors.
3. Singh Parbin: General & Engineering Geology.
4. Mukherjee: A Text Book of Geology.
5. TuyrellG.W.: The Principle of Petrology.
6. WadiaD.N. : Geology of India.
7. Sane L.S.: Construction Engg. ManakTalas, Mumbai.
8. National Building Code of India, 2016.
9. Punmia B.C.: Building Construction.
10. A Manual of Earthquake Resistant, Non-Engineered Construction Indian Society of Earthquake Tech.

3CE04 – TRANSPORTATION ENGINEERING

Learning Objectives of Subject:

1. To learn about basics of Road construction like surveys, alignment principles, types of roads.
2. To study and understand various road studies for safe road design principles and essential geometry.
3. To learn about various road pavements its construction and maintenance procedure.
4. To learn about railway transportation and terms related to it.
5. To learn about construction concepts of Airport runway, Apron layout , various survey and terms related to Airport Transportation.
6. To learn about Tunnels and Bridges components types and related transportation study.

Course outcomes:

At the end of the subject the students will be able –

1. To identify type of roads and its utility.
2. To understand the application of various road studies at time of survey and actual construction.
3. To design the various types of road pavements.
4. To understand rules regulations, signals , type of gauges and railway sleepers density.
5. To recognize the Airport features and design concept of components for Aero plains movement.
6. To identify types and components of Tunnels and bridges and its design components.

SECTION-A

Unit-I Highway: Road Transport characteristics, classification of Roads, Road Patterns, Alignment principles, Survey for highway.

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.

Unit-III Pavement Design and Traffic Engineering: Components of Flexible and Rigid pavement, Design factor, Traffic Characteristics, Traffic Studies, Construction and Maintenance – WBM Surface dressing, bituminous roads and construction procedure. Road parking system, traffic control devicesand 3 E's of traffic

SECTION-B

Unit-IV:Railway: Railway transportation, track sections, embankment & cutting. Points and crossing Left &right hand turnouts. Objects, Permanent way, gauges, coning of wheels, components of permanent way, Sleeper density, Rail fixtures & fastening. Rail types and functions.

Unit-V: Airport: Agencies controlling national & international aviation, various surveys to be conducted, airport site selection, Aero plane component parts, Aircraft characteristics. Airport obstructions: Zoning laws, wind rose diagram. Basic runway length and corrections, Apron layout, Aircraft parking & parking system.

Unit-VI: Tunnel and Bridges: Tunnels- necessity, types, tunnel alignment, Size and shape of tunnels, and Tunnel lining. Tunnel drainage, ventilation & lighting of tunnels. Bridge Engineering-Components, classification and identification, data collection, site selection, economic span, Estimation of flood discharge, water way, scour depth, depth of foundation, Afflux, clearance and free board, different structural form – culverts, types of foundation, abutments, piers and wing wall.

Books Recommended:

1) Khanna S.K. & Justo C.E. : Highway Engineering
2) Rao G.V. : Principles of Transportation& Highway Engg.
3) Dr.KadiyaliL.R. : Traffic Engg. & Transport Planning.
4) BindraS.P. : Principles & Practice of Bridge Engg.
5) Saxena &Arora : Railway Engineering.
6) Agrawal M.M. : Railway Engineering.
7) Khanna S.K., Arora M.G., Jain S.S. : Airport Planning & Design,
8) Srinivasan: Tunnel Engineering.
9) Shrarma S.K. : Principles, Practice & Design of Highway Engg.
10) Duggal A.K. &Puri V.P. : Laboratory Mannual in Highway Engg.

3CE05 – CONCRETE TECHNOLOGY & RCC

Learning Objectives of Subject:

1. To understand basic construction material - Cement, its property and suitability tests.
2. To learn about meaning of concrete, strength of concrete, mixing proportion and suitability test.
3. To understand meaning of RCC and its need.
4. To learn various properties of concrete and use of different admixtures.
5. To learn about special concrete materials and methods.
6. To be able to perform mix design of concrete

Course outcomes:

At the end of the subject the students will be able -

1. To know need and composition of binding material, cement.
2. To recognize concrete and RCC and will be able to perform desired test for suitability,
3. To analyze RCC Components like slab and lintels.
4. To decide and utilize the admixtures as per the need of Concrete.
5. To understand importance of mix design.

SECTION-A

Unit I: Cement: Physical properties of Portland cement, laboratory tests on cement, types of cements. Aggregate: Classification of aggregate, physical properties, bulking and moisture content, specific gravity, bulk density.

Unit II: Properties of fresh concrete: Workability of concrete, methods of measuring workability, nominal mix, mixing, centering & formwork, placing, compaction and curing of concrete. Properties of hardened concrete: Grades of concrete, properties of concrete, compressive, tensile, and shear strength, modulus of elasticity, creep, shrinkage.Durability of concrete,laboratory tests on concrete.

Unit III: 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, andchajjas.

SECTION-B

Unit IV: Pozzolana and Admixtures: Plasticizer, retarders, accelerators, water proofing agents, mineral admixtures, IS code provisions. Construction chemicals: concrete curing compounds, polymer bonding agent, surface retarders, bond aid for plastering, protective and decorative coating.

Unit V: Special concrete: Ready Mix Concrete Light weight concrete, fiber 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 shotcrete concrete, introduction & application of Ferrocement.

Unit VI: Introduction of mix design, factors governing mix design, IS Code method of mix design (IS: 10262 – 2019) and Ambuja method.

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 – 2019,,
10. Krishna Raju: Design of Concrete Mixes, Mc – Graw Hill.
11. Ambuja Cement Concrete Mix Design- Ambuja Technical Literature series 79.

3CE06 – STRENGTH OF MATERIALS – LAB

List of Practical's in Strength of Material Lab (Minimum any eight practical from the list should be performed)

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.

3CE07 BUILDING CONSTRUCTION & ENGINEERING GEOLOGY – LAB

List of Practical's in Building Construction & Engineering GeologyLab (Minimum any eight practical from the list should be performed)

1. Drawing of following building elements on A-2 size sheet.
   a) Paneled door, flush door, and 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, and construction details.
6. Sketch book containing Free hand sketches of following:

Different types of foundations, Bonds in brick masonry, Types of floors. [Sections] Types of stairs. [Plans and side view], Line sketches of different types of steel roof trusses, Details of expansion joints, Details of damp proofing for basement, Fixtures & fastenings of doors & windows.

7. To determine shape and size of supplied bricks.
8. Field visit for different types of roof structures.
9. Field visit for studying building component in Load bearing and framed structure.
10. Megascopic study of silicate and non-silicate mineral, with special reference to physical properties of minerals and uses.
11. Megascopic study of the common igneous, sedimentary and metamorphic rocks, with special reference to engineering properties of rock and uses.

3CE08 TRANSPORTATION ENGINEERING – LAB

List of practicals in Transportation Engineering-Lab (Minimum eight experiments from the list should be performed)

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 Viscosity of Bituminous material
7. Determination of softening point of bituminous material.
8. Determination of ductility of bitumen.
9. Determination of marshal stability value

3CE09 CONCRETE TECHNOLOGY & RCC – LAB

List of Practicals in Concrete Technology & RCC Lab (Minimum eight practical from the list should be performed) :

1. Mix Design (Compulsory) by IS method.
2. Compulsory site visit and submission of site visit report.
3. Fineness of cement
4. Soundness of cement
5. Consistency and setting time of the cement
6. Compressive strength of cement
7. Sieve analysis of aggregate.
8. Bulking of sand (fine aggregate).
9. Silting of sand.
10. Workability by slump cone test compaction factor test
11. Admixture: Density, Compatibility Test
12. Workability by flow table method.
13. Compressive & Tensile strength of concrete.

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FOURTH SEMESTER

4CE01 BUILDING PLANNING DESIGNING & CAD

Learning Objectives of Subject:

1. To understand need of engineering drawings and methods to draw it.
2. To learn about various planning principles and able to apply on residential buildings.
3. To understand seasonal and climatic condition and corresponding provisions in structure.
4. To know regional rules regulation related to building construction.
5. To learn various types of plan – Block , Site , Line , Detail , Section etc.
6. To learn about smart buildings.

Course outcomes:

At the end of the subject the students will be able -

1. To make engineering drawings by First angle and Third angle method.
2. To apple building planning principles practically while developing projects.
3. To study the climatic conditions and decide the corresponding provision in structure.
4. To know about Bylaws, Town development authority rules and terms.
5. To draw various plans manually and computationally.

SECTION-A

Unit I: Importance of building drawing for Civil Engineering in construction & industry, estimation, Selection of scales for various drawings. Types of line and theirapplication. Methods of dimensioning in architectural drawing. Abbreviations and graphical symbols used in Civil Engineering Drawing as per IS: 962. Compare first angle and third angle method of projection. Layout of sheet for civil engineering drawing. Requirements of drawing and documents as per plan sanctioning authorities. Define FSI and TDR.

Unit II: Planning of residential building. Introduction, general principles of planning viz. aspect, prospect, roominess, privacy, grouping, circulation, ventilation, furniture requirement.

Climate of Indian and its influence on Building planning: Solar radiation, air temperature, wind, humidity, precipitation, earth & its motion, directions to their characteristics. Orientation of buildings: factors affecting orientation, sun, wind, rain. Requirement of the owner. Alternatives of building types viz. individual bungalows, semidetached houses, row houses, apartments. Provision of mezzanine floor, balconies and porches in the building. Common utilities such as parking, security, water supply, sanitation, etc. for apartments. Criteria for earthquake resistant planning of building.

Concepts of Digitized / Smart Buildings, Internet of Things (IOT) in buildings and Green Buildings, Industrialized Buildings

SECTION -B

Unit-III: Building Bye-laws and Development Control Rules for D Class Municipal Corporations in the Maharashtra State under the provisions of the Maharashtra Regional & Town Planning Act, 1966. Conversion of land to non-agricultural lands, layout for a housing project.Types of public building and their requirements, planning of public building.

Preparing line plans of different public buildings such as schools, commercial market, primary health center, workshop, college building, post-office. Free hand sketching of components of buildings and elevation features of building such as balconies, chajjas, etc.,Staircase planning & drawing.

Unit IV: Concept of line plan, working and submission drawings of the building. Details to be incorporated in the working drawing. Necessity and use of working and submission drawing. Concept of site plan, block plan and layout plan. Importance and details to be incorporated. Concept of foundation plan, importance and use. Developing working and submission drawings for load bearing and framed structures building from the given line plan(Develop plan, elevation, LHSV, RHSV, back side view, section, foundation plan, site plan and their detail). Plumbing ramp, Electric plan.

Books Recommended :

1. Shah, Kale &Patki, Building Planning & Drawing, Tata McGraw-Hill plubication
2. Dr. Kumar Swamy& Rao Swamy, Charotar publications
3. CheryR , Auto cad Pocket reference, BPB Publication.

4CE02 - HYDROLOGY & WATER RESOURCE ENGINEERING

Learning Objectives of Subject:

1. To study the different hydrological parameters.
2. To understand hydrological statistics and design.
3. To characterize and mitigate natural and man-made hazard.
4. To understand the various irrigation systems and its design.

Course outcomes:

At the end of the subject the students will be able -

1. Explain the hydrology and hydrological data.
2. To analyze the hydrological methods for runoff.
3. Evaluate the ground water hydrological problems.
4. Explain the need of irrigation systems and its alternatives.

SECTION – A

Unit I: Introduction - Hydrologic cycle, applications in engineering, sources of data. Precipitation- Forms of precipitation, characteristics of precipitation in India, measurement of precipitation, rain gauge network, mean precipitation over an area, depth-area- duration relationships, maximum intensity/depth-duration-frequency relationship, Probable Maximum Precipitation (PMP).

Unit II: Abstractions from precipitation - evaporation process, analytical methods of evaporation estimation, reservoir evaporation and methods for its reduction, evapotranspiration, measurement of evapotranspiration, interception, depression storage, infiltration, infiltration capacity, measurement of infiltration, modeling infiltration capacity, classification of infiltration capacities, infiltration indices.

Unit III: Runoff - runoff volume, methods of estimating runoff volume, flow duration curve, flow-mass curve, hydrograph, factors affecting hydrograph, components of hydrograph, base flow separation, effective rainfall, unit hydrograph. Ground water and well hydrology - forms of subsurface water, saturated formation, aquifer properties, geologic formations of aquifers, well hydraulics: steady state flow in wells, equilibrium equations for confined and unconfined aquifers, aquifer tests.

SECTION – B

Unit IV: Water requirement of crops-Crops and crop seasons in India, cropping pattern, duty and delta; Quality of irrigation water; Soil-water relationships, root zone soil water, infiltration, consumptive use, irrigation requirement, frequency of irrigation; Methods of applying water to the fields: surface, sub-surface, sprinkler, pipeline distribution network(PDN) and trickle / drip irrigation.

Unit V: Distribution systems - canal systems, alignment of canals, canal losses, estimation of design discharge. Design of channels, Kennedy's and Lacey's theory of regime channels. Canal outlets: non-modular, semi-modular and modular outlets. Lining of canals, types of lining. Water logging problems, causes, effects and remedies.

Unit VI: Dams and spillways – Earthen dams: Classification, design considerations, selection of suitable site. Estimation and control of seepage, slope protection. Gravity dams: forces on gravity dams, causes of failure, stress analysis, elementary and practical profile. Economic height of dam, Spillways: components of spillways, types of gates for spillway.

Books Recommended:

1. K Subramanya, Engineering Hydrology, Mc-Graw Hill.
2. K N Muthreja, Applied Hydrology, Tata Mc-Graw Hill.
3. G L Asawa, Irrigation Engineering, Wiley Eastern

4CE03 SURVEYING

Learning Objectives of Subject:

1. To learn about the term surveying, various instruments and possible error.
2. To learn Linear Measurement methods and way of conduction.
3. To learn about the measurement at elevation and of Directions , contour development process.
4. To understand and learn performing Plane table surveying.

Course Outcomes:

At the end of the course the student will be able to:

1. Define principles of Surveying, Remote Sensing and Geomatics.
2. Describe different instruments, tools, applications and techniques to determine the positions on the surface of the earth, change detection.
3. To perform Liner measurement methods of surveying.
4. Differentiate the techniques for setting out alignments, curves, other layouts, modern survey systems etc.
5. To perform survey at elevation and conduct Plane Table survey.

SECTION-A

Unit I: INTRODUCTION: Geo-informatics- definition, disciplines covered, importance. Field Surveying- definition & objectives; concept of Geoids and reference spheroids, coordinate systems, plane and geodetic surveys. Methods of location of a point- classification of surveys; principles of surveying Errors in measurements- sources, types of errors and their treatment. Random error distribution, accuracy, precision and uncertainty. Surveying instruments- temporary and permanent adjustment concept, principle of reversal. Maps- types, importance, scales/CI, conventional symbols, and generalization; topographic maps projection systems, sheet numbering systems, map layout.

Unit II:LINEAR MEASUREMENTS: Direct and indirect methods; Chain and tape measurements- corrections to tape measurements; Optical methods- tachometers, sub tense bar; Electronic methods- EDMs, total stations.

Unit III: MEASUREMENT OF ELEVATIONS :Various terms; Methods of height determination; Spirit leveling- different types of levels and staves; booking and reduction of data, classification and permissible closing error; profile leveling and cross sectioning; curvature & refraction and collimation errors; reciprocal leveling. Contours- characteristics, uses and methods of contouring.

SECTION – B

UnitIV:MEASUREMENT OF DIRECTIONS: Bearings and angles; Compass surveying- magnetic bearings, declination, local attraction errors and adjustments.

Unit V: TRAVERSING: Purpose and classification of each; Compass and theodolite traverses, theodolites- different types, uses, methods of observation and booking of data, balancing of traverses, computation of coordinates, omitted measurements Gale's traverse table.

Unit VI: PLANE TABLING: Merits and demerits, accessories; orientation and resection; methods of plane tabling; three point problem and solutions; errors in plane tabling, least square principle, Engineering project surveys- requirements and specifications, various stages of survey.

Books Recommended:

1. D. Clarke: Plane and Geodatic Surveying, Volume I & II
2. T.P. Kanetkar& Kulkarni: Surveying & Levelling, Part I & II.
3. B.C. Punmia : Surveying I & II.
4. N.N. Basak : Surveying & Levelling.

4CE04 - GEOTECHNICAL ENGINEERING –I

Learning Objectives of Subject:

1. To understand the various types of soil and its classification.
2. To learn about the Index and Engineering properties of soil.
3. To make one understand the mechanics of compaction and factors affecting the compaction.
4. To understand the concept of permeability and factors affecting to it.
5. To learn about the concept of seepeage discharge and effective, neutral and total stress in soil mass.
6. To make one understand the stress distribution in soil mass& its engineering applications.

Course Outcomes:

At the end of the subject the students will be able –

1. To determine the Index properties and Atterberg limits for soil classification.
2. To understand the mechanics of compaction and quality control in field.
3. To explain permeability of soil and methods of dewatering.
4. To calculate the seepage discharge and design the graded filter.
5. To understand the concept of consolidation and stress distribution in soil mass.
   To calculate the shear strength of different soil.

SECTION - A

Unit- I History of development of soil mechanics, formation of soil, its significance to the field problems. Soilproperties and its classification, system: Definition of soil, soil as a three phase system, weight – volume relationship Index properties of coarse and fine grained soil BIS classification of fine grained & coarse grained soil.

Unit-II Concept of clay mineral, major soil minerals, their structural formation and properties. Mechanics of compaction, factors affecting compaction, Standard and modified Proctor test, their field Determination, zero air void line, concept of wet of optimum, and dry of optimum, different structures of soil, field compaction & their control. CBR test and CBR value for soak and unsoaked conditions.

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. Permeability for stratified deposits. Drainage and dewatering of soil and it's various methods.

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 Terzaghi's criteria for graded filter, concept of piping and criteria of stability against piping.

Unit-V A physical concept of shear strength, Introduction of Mohr's stress diagram, Mohr's failure criteria, Mohr-Coulomb's theory and development of failure envelopes, Unconfined compression test, Laboratory measurement of shear strength for different drainage, conditions by direct shear test, Triaxial test for various drainage conditions, Merits and demerits of various shear strength tests. Concept of pore pressure coefficient shear characteristics of sand, NC and OC clays and partially saturated soil, Influence of soil structure and strain rate on shear strength.

Unit-VI State of stress at a point, stress distribution in soil mass, Boussinesq's theory and its applications, point load, uniformly loaded rectangular and circular area New-mark's chart, its preparation and use, equivalent point load Compression of laterally confined soil, concept of consolidation spring analogy, Terzaghi's theory of one-dimensional consolidation. e-p curve, compression index, swelling index, coefficient of compressibility, Consoledometer-test, determination of Cv Cassagrande's method for determination of pre-consolidation pressure.

Books Recommended:

1) Craig R.F.: Soil Mechanics,
2) Lambe T.W. & Whiteman 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) Venkataramiah C.: Soil Mechanics and Foundation Engineering.
7) B. M. Das, Advanced Soil Mechanics.
8) S. K. Garg: Soil Mechanics and Foundation Engineering.

4CE05 - STRUCTURAL ANALYSIS- I

Learning Objectives of Subject:

1. To understand the action and corresponding displacement in various type of structural elements.
2. To learn about statically determinate and indeterminate structures.
3. To analyze continuous, cantilever and propped cantilever beams.
4. To learn different analysis methods for analysis of beam, frames and trusses.
5. To learn analysis of 2 Hinge and 3 Hinge arches.

Course outcomes:

At the end of the subject the students will be able -

1. To decide what is required to be analyzed depending upon type of structural element.
2. To know about degree of freedom, Condition of equilibrium and determinacy of element.
3. To understand reason for failure and permissible limits for safety.
4. To apply the knowledge of beam analysis for practical analysis and design purpose.
5. To make application of various analysis methods for actual structural member analysis and design.
6. To know merits for utilization of suspension, 2 hinged and 3 hinged arches.

SECTION – A

Unit-I : 1. Classification of Structures, Concept of statically indeterminate Structures, 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 : Influence line diagrams for reactions, bending moment and shear force for determinate beams. Rolling loads on simply supported beams concentrated and uniformly distributed loads, maximum shear force and bending moment, focal length.

SECTION - B

Unit IV : 1. Analysis of Cables Suspension Bridge under Concentrated Load and UDL for Cables over pulleys and Cable provided with saddles.

2. Two & 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.

4CE06 BUILDING PLANNING DESIGNING & CAD – LAB

A. SKETCH BOOK :

1. Draw various types of lines, Graphical symbols for materials, doors, windows, sanitary and water supply installations, electrical installations, Abbreviations as per IS 962:1989, Location for bed, sofa, dining table with chairs, wardrobe, kitchen furniture, etc. Free hand sketches of Verandah, lobby, passage, corridor and balconies. Building layout plan with setback lines, sanitary and water supply lines. Loft and Mezzanine floor.

2. Collect one readymade drawing for residential building (1 BHKD or 2BHKD) Read various details shown on drawing. write summary of observations on the drawing itself such as orientation of rooms, placement of doors and windows, wall thicknesses, flooring in rooms and sanitary block, skirting, dado, kitchen platform-size, height etc; room height, chajja projections, staircase-rise, tread, landing etc. Attach these drawings with the sketch book.

3. Draw line plans for five Residential Buildings with minimum three rooms and staircase in each with WC and Bath.

4. Draw line plans for five Public Building- School Building, Primary Health Centre, Hospital Building, Bank, Post Office, Hostel, Canteen and Shopping Complex. Bar & Restaurant and Hotels, Saloon, Bus Station.

B. FULL IMPERIAL SIZE SHEET (A1)

AUTOCAD: Understanding basic concepts such as Absolute, relative & world Co-ordinates, Drawing units, drawing limits, extend, layers, line types, object snapping, and filter.

Drawing entities in AutoCAD/Felix CAD, various drawing commands, use of object snaps & filters, Editing the drawing different editing commands, Dimensioning commands, Text commands, Hatching commands viewing the drawing different views, view ports, zooming in & out, panning, saving & printing in different scales.

Draw sheet no. 1, 2 and 3 drawing in Auto-CAD or similar software.Prepare sheet no. 3 in Pre-DCR software.

1. SHEET NO. 1 : Submission drawing, **to the scale 1:100,** of single storied Load Bearing Residential Building (4 Room) with Flat Roof and staircase showing developed plan, elevation, section passing through Stair or W.C. and Bath, site plan (1:200), **foundation plan and section (1:50),** area statement, schedule of openings , construction notes.

2. SHEET NO. 2 : Submission drawing, to the scale 1:100, of (G+1) Residential Building Framed Structure (2 BHKD) with attached toilet to 1 bedroom showing the position of European type WC pan) showing developed plan, elevation, section passing through staircase, site plan (1:200), foundation plan **and section** (1:50), area statement, schedule of openings. (Also Show the place for Washing machine, WHB, Pooja, store, bed, dining table with chairs, sofa, wardrobe etc.)

3. SHEET NO. 3: Submission drawing of Apartment / Multi storeyed building to the scale 1:100, showing developed plan, elevation, section passing through staircase or W.C. and Bath and Component Drawing of RCC Lintel and Chajjas. Shows detailed enlarge section.

Note: No identical plans and every student must have his/her own plans and drawings.

4CE07 - HYDROLOGY & WATER RESOURCE ENGINEERING - LAB

TERM WORK: Five problems from the following to be worked out by the students, whenever necessary scale drawing on half empirical size must be drawn:

Practical examination shall consist of viva – voce.
1. Fixing control levels of Reservoir from given data.
2. Cross section, plan, L-section of Earth dam showing all components.
3. Drawing of elementary and practical profile of gravity dam.
4. Drawing of diversion weir on permeable foundation.
5. Drawing of ogee spillway with energy dissipaters.
6. Computer Aided design of unlined and lined canal.
7. Drawing of any four canal structure (No design)
8. Technical Field visit.

4CE08 SURVEYING– Lab

List of Practical's in Surveying Lab (Minimum eight practical from the list should be performed)

1. Distance measurement by chain tape and EDM.
2. Finding RL of given point.
3. Profile and cross section leveling for road.
4. Measurement of bearings with prismatic compass.
5. Chain and compass traversing.
6. Local attraction detection- correction of bearings.
7. Measurement of Horizontal and Vertical angles using Theodolite.
8. Theodolite Traversing.
9. Plane table surveying- Radiation, Intersection and Resection method.
10. Engineering Project Surveys.

4CE9 GEOTECHNICAL ENGINEERING I – LAB

List of Practical's in Geotechnical Engineering- I Lab (minimum eight practical from the list should be performed)

Experiments:

1. Determination of specific gravity of soil solids by Pyconometer, density bottle.
2. Determination of moisture content by ovendrying 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 Atterbergs limits (LL, PL and SL)
6. Determination of Compaction properties (Standard Proctor Test)
7. Determination of permeability of soil by using 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 list of UU type
11. C.B.R. test. Determination of C.B.R. value by conducting CBR test on soaked sample.
12. Determination of Coefficient of consolidation by conducting consolidation.

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SYLLABUS OF B.E. [MECH.] SEM. III & IV {C.B.C.S.}

Semester-III
3ME01 MATHEMATICS - III

Course Learning Objectives :

1. To provide the knowledge to solve ordinary Linear Differential equations with constant coefficient and its reducible equation using particular integral and complementary function and apply method of variation of parameter to solve ordinary Linear differential equations
2. To understand the Laplace transform and its inverse transform for the basic functions. Locate the Laplace transform of periodic function. Apply the Laplace transform to solve differential equation
3. To provide knowledge to apply False Position, Newton Raphson method to solve nonlinear & polynomial equations, Apply Gauss Elimination method, Gauss Seidal iterative method, Relaxation method to solve system of linear equations, Apply Eulers method, Runge-Kutta method, Picards method to solve differential equations
4. To understand the Gradient, divergent and curl of vector point functions. To find the directional derivatives of scalar point functions. To discuss the Irrotational and solenoidal vector fields. To define line surface and volume integrals.

Course Outcomes :

Students will be able to -

1. Demonstrate the knowledge to solve ordinary Linear Differential equations with constant coefficient and its reducible equation using particular integral and complementary function and apply method of variation of parameter to solve ordinary Linear differential equations
2. Define the Laplace transform and its inverse transform for the basic functions. Locate the Laplace transform of periodic function. Apply the Laplace transform to solve differential equation
3. Apply False Position, Newton Raphson method to solve nonlinear & polynomial equations Apply Gauss Elimination method, Gauss Seidal iterative method, Relaxation method to solve system of linear equations, Apply Eulers method, Runge-Kutta method, Picards method to solve differential equations
4. Define Gradient, divergent and curl of vector point functions. Finds the directional derivatives of scalar point functions. Discuss the Irrotational and solenoidal vector fields. Define line surface and volume integrals

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-III :a) 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 (Lagranges 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 Tayler's and Laurent's series. Cauchy's integral theorem and formula, Residue theorem. (12 Hrs.)

UNIT-V: Numerical Analysis : Solution of algebric and transcendental equations by Newton-Raphson method & method of false position. Solution of system of linear equations by Gauss-Seidal 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 : Advanced Engineering Mathematics, Erwin Kreyzig, John Wiley.

3ME02 MANUFACTURING PROCESSES

Course Learning Objectives :

1. To study the manufacturing processes in sand casting industries, tooling and equipment
2. To study the metal melting process, melting furnaces and defects in casting
3. To study the various types of casting processes
4. To study the mechanical working of metals and allied processes
5. To study the mechanical joining processes and fastenings
6. To study welding processes and surface treatment processes

Course Outcomes :

Students will understand the :

1. basic concept of foundry process and related activities
2. concept of complete sand casting process with advance casting methods
3. fundamentals of welding processes
4. various processes like electroplating, anodizing etc and their importance in industries

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, design of gating and riser system – by numerical approach. (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, load estimation for bulk forming (forging and drawing), rolling and types of rolling mills. (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 Mc-Graw Hill Publication.
2. Workshop Technology Vol I by Hajra Chaudhary, Dhanpat Rai & Sons 2001.

References:-

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

3ME07 MANUFACTURING PROCESSES - LAB

Practices:-

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 - one job, Moulding - one job Casting - one job.
3. Joining Processes :Two composite jobs involving electric welding, gas welding and resistance welding process.
4. One job on Mechanical Working of Metals like piercing / drawing / bending/ embossing/ spinning/ upsetting, etc.

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, term work and viva examination.

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3ME03 MECHANICS OF MATERIALS

Course Learning Objectives :

1. To develop theoretical basis for stress, strain concept in various components under study
2. To study mechanical behavior of engineering material
3. To familiarize about finding shear force, bending moment, torsion, slope and deflection of various types of beams with different loading conditions
4. To build the necessary background to apply the knowledge of mechanics of materials on engineering applications

Course Outcomes :

Students will be able to -

1. Determine the stress & strain in the member subjected to axial, bending & torsional load
2. To observe different types of material behavior such as elastic, plastic, ductile and brittle
3. Apply SF and BM diagrams to analyse resistance offered by the beam and able to solve practical problems in real world
4. Apply deflection criteria to check the stability of beam

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, stress and strain of bar due to self weight.

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, introduction to theory of elasticity and photoelasticity. (10 Hrs.)

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. (7 Hrs.)

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. (7 Hrs.)

SECTION – B

Unit-IV: Thin and thick cylinders and thin spherical shells subjected to internal pressures. (4 Hrs.)

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.
3. Strain energy and resilience : proof resilience, shear resilience, strain energy due to self load (7 Hrs.)

Unit-VI: Deflection in simply supported beam, cantilever beam subjected to point loads, uniformly distributed loads, moments by Macauley's method. (7 Hrs.)

Books Recommended:

Text Books :

1. Ramamruthm : Strength of Materials, Danpat Rai and Sons, New Delhi .
2. R. S. Khurmi: Strength of Material, S. Chand Publication, 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
4. Beer and Johston : Mechanics of Materials, McGraw Hill.
5. D. S. Prakash Rao : Strength of Material : A Practical Approach, University Press, Hyderabad.

3ME08 MECHANICS OF MATERIALS - LAB

Practicals:

Minimum Six to Eight out of the 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.

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3ME04 ENGINEERING THERMODYNAMICS

Course Learning Objectives :

1. To study the basic concepts of thermodynamics, thermodynamic systems, work and heat
2. To study the laws of thermodynamics and their applications
3. To study the properties of steam, work done and concept of heat transfer
4. To study the air standard cycles

Course Outcomes :

Students will be able to

1. Understand the basic concepts of thermodynamics, thermodynamic systems, work and heat
2. Apply first law of thermodynamics and application of first law to flow and non-flow processes
3. Apply second law of thermodynamics and understand concept of entropy
4. Understand the properties of steam, work done and heat transfer during various thermodynamics processes with steam as working fluid
5. Understand the concept of air standard cycles

SECTION – A

Unit-I: Introduction to basic concepts of thermodynamics, Macroscopic and microscopic approaches, properties of system, state, processes and cycle, thermodynamic equilibrium, types of thermodynamic systems, Temperatures and Zeroth law of thermodynamics, Quasi-static process, Gas Laws and Ideal gas equation of states, gas constant and universal gas constant.
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 (10 hrs)

Unit-II: First law of thermodynamics: Energy of a system, classification of energy, law of conservation of energy law, Joules experiment. Energy a property of system, internal energy-a function of temperature, Enthalpy, specific heat at constant volume and constant pressure. Application of first law to non-flow processes, Change in internal energy, work done and Heat transfer during various non-flow processes. (7 hrs)

Unit-III: First Law applied to flow processes: Steady state, steady flow process, equation for work done in steady flow process and its representation on P-V diagram, 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. (9 hrs)

SECTION – B

Unit-IV: Second Law of thermodynamics: Limitations of First law, Thermal energy reservoir, heat engines refrigerator and heat pumps, COP and tonne of refrigeration, COP for heat pump and refrigerator, Kelvin-Plank and Clausious statements, their equivalence, reversible and irreversible processes, Carnot cycle, Carnot theorem and its corollary, The thermodynamic temperature scale, Reverse Carnot cycle, Inequality of Clausius.
Introduction to Entropy, availability and irreversibility. Principle of increase of entropy. (8Hrs)
Unit-V: 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, internal latent hear, 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 VI : Air Standard Cycles: Ottto, diesel, semidiesel, Brayton, Sterling and joule cycles etc., their efficiencies and mean effective pressure, comparison of auto, diesel and duel cycles.
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) (numerical on air standard cycle) (8 Hrs)

BOOKS RECOMMENDED:

Text Books :

1. Engineering Thermodynamic - by P. K. Nag.
2. Fundamentals of Engineering Thermodynamics; R. Yadav;
3. Thermodynamics Basics and Applied: by V. Ganeshan
4. Thermal Engineerirng: by Mahesh M. Rathore.

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.

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3ME05 FLUID MECHANICS

Course Learning Objectives :

1. To introduce and explain the fundamentals of Fluid Mechanics used in applications of Hydraulics, Aerodynamics, Gas dynamics, etc.
2. To give fundamental knowledge of fluid, its properties and behavior under various conditions of internal and external flows.
3. To develop understanding about hydrostatic law, principle of buoyancy and stability of a floating body and application of mass, momentum and energy equation in fluid flow.
4. To imbibe basic laws and equations used for analysis of static and dynamic fluids.
5. To inculcate the importance of boundary layer flow and its applications
6. To determine the losses in a flow system, flow through pipes, impact of jet

Course Outcomes :

The student will be able to:

1. identify importance of various fluid properties at rest and in motion
2. derive and apply general governing equations for various fluid flows
3. understand the concept of boundary layer theory and flow separation.
4. calculate energy losses in pipe flow.
5. evaluate the performance characteristics of hydraulic jets

SECTION – A

UNIT-I : 1. Basic properties of fluid such as Density, Specific weight, Specific Volume, Specific gravity, Viscocity of fluid, Surface Tension, Capilarity, vapour pressure & cavitation.

2. pressure & its measurement: Pascals law, Hydrostatic law of pressure & pressure variation in fluid, measurement of pressure by Manometer. (10 Hours)

UNIT-II : 1. Hydrostatic pressure force on plane & curved surfaces. Measurment of total pressure & centre of pressure.

2. Buoyancy & floatation: Concept of buoyancy, centre of buoyancy. Stability of floating body, Metacentre & metacentric height. Condition of equilibrium of floating & sub-merged body. (08 Hours)

UNIT III : 1. Kinematics of fluid flow, Methods of describing fluid motion, Types of flow, rate of flow, streamline, potential line, flow net, velocity & acceleration, continuity equation in three dimensional flow.

2. Dynamics of fluid flow : Eulers equation of motion, Bernoullis equation measurement of fluid flow with venture meter. (08 Hours)

UNIT-IV : Flow through pipes: Losses in pipe, major losses, Darcy's Weisbach equation, monor losses due to sudden enlargement, contraction, entry, exit & pipe fitting. Hydraulic gradient & total energy line, flow through series & parallel pipes, concept of water hammer in pipes. (08 Hours)

UNIT-V : Motion of viscous fluid: Introduction to Laminar & Turbulent flow, Concept of Boundary layer & its type. Drag & Lift force on object. Boundary layer separation, Reynolds number & its significance. (08 Hours)

UNIT-VI : Principal of fluid machinery : Force exerted by fluid jet on plane, curved, stationary & moving vanes. Velocity diagrams, work done & efficiency. (08 Hours)

Books Recommended :-

Text Books:-

1. Fluid Mechanics & Machinery by Modi & Sheth.
2. Fluid Mechanics and Hydraulic Machines by R. K. Bansal.
3. Engineering fluid Mechanics by R. K. Rajput.
4. Fluid mechanics & Machinery by CRSP. Ojha, R. Berndtsson.
5. Fluid Mechanics by Strecter; Tata Macgraw Hill.

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. Strecter, Fluid Mechanics, Tata Mc-Graw Hill.

3ME09 FLUID MECHANICS - LAB

Practical Term Work:-

At least six (6) practicals (study/Trials) based on above syllabus, as given below shall be performed and a report there of submitted by the students :

1. Measurement of fluid pressure by manometer.
2. Determination of metacentric height.
3. Verification of Bernoulli's equation.
4. Determination of co-efficient discharge by Venturimeter.
5. Calculation of Reynolds number for Laminar & Turbulent flow.
6. Determination of co-efficient of friction (Major losses in Pipes) through pipe.
7. Determination of head loss due to sudden enlargement.
8. Determination of head loss due to sudden contraction.
9. Determination of loss of head in bends & in elbows.
10. Verification of momentum equation.

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

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3ME10 Machine Drawing - Lab

Course Learning Objectives :

1. To study the techniques of sectioning and visualizing the objects
2. To imagine and develop the missing views of objects
3. To seek the knowledge of development of surfaces
4. To seek the knowledge of intersection of solid objects
5. To know the conventions for materials and parts used in industries
6. To prepare the drawings for machine assembly

Course Outcomes :

Student will be able to -

1. Demonstrate the techniques of sectioning and visualizing the objects
2. Imagine, understand and sketch the missing views
3. Develop surfaces of objects and apply knowledge during their fabrication
4. Understand the concept of intersection of solid objects
5. Understand and apply the conventions for materials and parts used in industries
6. Prepare detail machine assembly drawings

List of Practicals :

1. Conversion of pictorial view into Sectional Orthographic Projection
2. Missing Views
3. Development of surfaces of Cubes / Prisms / Cylinders / Pyramids / Cones & their cut sections
4. Intersections of Solids – Prism & Prism /Cylinder & Cylinder /Cylinder & Prism / Cone & Prism
5. Conventions for various materials & parts
6. Preparation of detail drawings of simple machine assembly
7. Preparation of assembly drawing of simple machines

Books recommended:

Text Books:

1. Engineering drawing by N.D. Bhatt; Charactor Publications.
2. Machine Drawing by A. M. Bisen; New Edge International publication.
3. Machine Drawing by R. K. Dhawan, S. Chand
4. Machine Drawing by Basant Agrawal, McGraw Hill.
5.

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B.E. (MECHANICAL) SEMESTER FOURTH

4ME01 MATERIAL SCIENCE

Course Learning Objectives:

1. To study the basic concepts of metallurgy and classification of materials
2. To study the process of formation of microstructures of metal materials and composites
3. To study the alloying elements, their effects and applications
4. To study the ferrous and non-ferrous metals and respective alloys
5. To study the various heat treatment processes and their industrial applications
6. To study the mechanical working of metals and process of powder metallurgy

Course Outcomes:

Students will understand the -

1. Basic concepts of metallurgy and types of materials.
2. Iron-Carbon Equilibrium Diagram, critical temperatures, formation of microstructures and they will get the knowledge of alloys.
3. Uses and practical applications of ferrous & non ferrous materials
4. Various heat treatment processes, powder metallurgy and industrial applications.

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 Hrs)

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 Hrs)

UNIT III: **Alloy Steels:** Purpose of alloying, Classification of alloy steels, classification of alloying elements, Effect of alloying elements on eutectoid composition, Eutectoid temperature, and on the S curve, , alloying elements and their effect on properties of steels, OHNS steels, Hadfield'S Manganese steels, High speed steels, their heat treatments and applications, Ferritic, Austenitic and Martensitic stainless steels, their properties and applications, weld decay in stainless steel. (8 Hrs)

SECTION - B

UNIT IV: Cast irons **:** Factors governing condition of carbon in cast iron, Maurer's diagram, Solidification of grey and white cast iron, Malleabalizing, 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 Hrs)

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 martenste transformation, Quenching media, severity of quench, Austempering, Martempering and patenting, Retained austenite and sub-zero treatment. Hardenability. (8 Hrs)

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& twining, 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 Hrs)

BOOK RECOMMENDED :-

Text Books :-

1. Introduction to physical metallurgy ;Sidney H Avner, TATA Mc-Grawhill
2. Engineering materials & metallurgy R.K.Rajput, S chand publication.
3. Material nScience & Mettalurgy, by V.D. Kodgire. Everest Publication House.

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 Metallugrgy, Y Lakhtin, Mir Publications. Second Ed. 1999
6. Material Science and Meallurgy- C Daniel Yesudian, Scitech Publication.

4ME07 MATERIAL SCIENCE - LAB

List of Practicals: - (At least eight (8) 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:

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

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4ME02 ENERGY CONVERSION - I

Course Learning Objectives:

1. To study the properties of steam and its behavior for different thermodynamic process.
2. To study different types of boilers, their mountings, accessories, performance of boilers and different efficiencies.
3. To study the various fuel handling and ash handling system in power plant.
4. To study various types of condensers and cooling towers.
5. To study various thermodynamic aspects of flow of steam through nozzle and diffuser.
6. To study flow of steam through steam turbine and concept of compounding.

Course Outcomes:

1. Students will study the concept steam and steam power plant, mounting and accessories.
2. Students will demonstrate the calculation of various efficiency & related parameters.
3. Student will show the adequate knowledge of fuel & ash handling systems.
4. Students will demonstrate the knowledge of condenser & application.
5. Students will understand the concepts of steam nozzles & steam turbine.

SECTION – A

Unit I : Flow diagram for steam power plant with basic units such as steam generator, turbine, condenser and pump. Steam power plant layout, site selection. Boilers: Introduction to water tube and fire tube boilers used in thermal power plants, packaged Boilers, High pressure boilers; Loeffler, Benson, Lamont Boilers, Boiler mountings and accessories—devices for improving Boiler efficiency. Principle of fluidized bed combustion. Concept of co-generation. (7 Hrs.)

Unit II : Boiler draught; Types of draught, expression for diameter & height of chimney, condition for maximum discharge, efficiency of chimney, reasons for draught loss. Boiler performance:- Boiler rating, boiler power, equivalent evaporation, efficiency. Effect of accessories on boiler efficiency and heat balance. (7 Hrs)

Unit III : 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. cooling towers: Natural and mechanical wet type cooling tower.

Steam nozzles : Flow of steam through nozzles & diffusers, Maximum discharge, critical pressure ratio, chocking in nozzles, Effect of friction. Determination of throat & exit areas, Nozzle efficiency, no numerical on concept of super saturated flow & Wilson line. (7 Hrs.)

SECTION – B

UNIT IV : 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. Analysis of steam Turbines : Flow of steam through impulse & impulse reaction turbine blades, Velocity diagrams. Graphical & analytical methods for work & power developed, axial thrust and efficiency. Height of turbine blades. losses in steam turbines:- blade friction, partial admission, disc friction, gland leakage losses and velocity losses. Governing of steam turbines. (7Hrs)

UNIT V : NUCLEAR POWER:- Fusion, fission, Chain reaction, conversion and breeding in nuclear fission. Components of Nuclear Power Plant such as Reactor, Steam generator, turbine, Moderator, Control Rods etc., Types of nuclear reactors like BWR, PWR, CANDU and liquidized metal cooled thermal reactors. (7 Hrs.)

UNIT VI : Introduction to renewable energy, Wind Energy, solar, fuel cell, bio-gas, MHD, Geothermal, OTEC, tidal power plants, Applications of Non conventional energy. (7 Hours)

RECOMMENDED BOOKS:

Text books :

1. Thermal engineering; Mahesh M Rathore; Tata McGraw-Hill
2. Thermal Engineering R.Yadav; Central publication
3. Non-conventional Energy Sources B. H. Khan Tata McGraw-Hill
4. Non-conventional Energy Sources G. D. Rai.

Reference books:

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

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4ME03 MANUFACTURING TECHNOLOGY

Course Learning Objectives :

1. To study the mechanics of metal cutting, tool characteristics and cutting forces
2. To study the turning operations using lathe and CNC machines
3. To study the working of drilling and boring machines
4. To study the working of milling and gear cutting machines
5. To study the machining operations using grinding, shaper, planer and slotter machines
6. To study the unconventional machining processes

Course Outcomes :

Students will be able to -

1. Apply the knowledge of theory of metal cutting, tool selection & calculate cutting forces
2. Demonstrate the knowledge of basics of turning operations
3. Understand the drilling and boring operations and working of drilling & boring machines
4. Understand the milling and gear cutting operations and working of respective machines
5. Understand the working of grinding, shaper, planer and slotter machines
6. Understand the knowledge of unconventional machining processes

SECTION – A

UNIT I : Theory of Metal cutting: Mechanics of Metal cutting, Tool material, Tool Geometry, Cutting tool classification, Tool life, Tool wear, Calculation of Cutting forces, Machinability, Cutting fluids, Chip thickness ratio, Merchant circle. (8 Hrs)

UNIT II : Construction, Operations and accessories of centre lathe, introduction of capstan & turret lathe, indexing mechanism, bar feeding mechanism, Machine tool classification. Numerical approach. Taper turning & Screw cutting & basic concept of CNC. Introduction, working principal & CNC turning operation. (10 Hrs)

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

SECTION - B

UNIT IV : (a) Calculation of machining time for Milling.
(b)Milling M/c :- Types, Types of Milling Cutters, Dividing head, Compound and differential idexing.
c) Gear producing M/cs. (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) Electric discharge Machining - Types die-sinking, wire cut EDM, Mechanism of material removal, process parameters, advantages and applications. (8 Hrs)

BOOKS RECOMMENDED :

Text Books:

1. Manufacturing Technology-Vol 1 & 2; R.L.Timings, S.P. Wilkinson; Pearson Publication.
2. Workshop Technology - By Hajra Choudhaury Vol II.
3. Manufacturing Technology Vol. II P. N. Rao, McGraw Hill Publication

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.

4ME08 MANUFACTURING TECHNOLOGY - 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.

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.

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4ME04 BASIC ELECTRICAL DRIVES AND CONTROL

Course Learning Objectives :

1. To study the working of electrical drives and their components
2. To study the basics of DC motors and their characteristics
3. To study the working of AC motors, Induction motors and concept of braking
4. To study the different speed control methods of A.C. and D.C. motors
5. To study and design of transducers and their applications
6. To study the industrial applications of different drives

Course Outcomes :

Students will be able to -

1. Understand the working of electrical drives and their components
2. Understand the basics of DC motors and their characteristics
3. Understand the working of AC motors, induction motors and concept of braking
4. Understand the different speed control methods of A.C. and D.C. motors
5. Understand the design of transducers and their applications
6. Understand the industrial applications of different drives

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. **(**8 Hrs**)**

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. **(**8 Hrs**)**

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. **(**8 Hours**)**

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. **(**8 Hours**)**

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. **(**8 Hours**)**

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. **(8 Hours)**

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.
3. A Course in Electrical, Electronics Measurement and Instrumentation, By A.K.Sawhney, Dhanpat Rai & Sons,

4ME09 BASIC ELECTRICAL DRIVES AND 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.

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4ME05 HYDRAULIC AND PNEUMATIC SYSTEMS

Course Learning Objectives:

1. To get fundamental background about the hydroelectric power plants
2. To study operation, working principle & performance characteristics of hydraulic turbines
3. To study operation, working principle & performance characteristics of centrifugal pump, reciprocating pump and other hydraulic pumps
4. To study the behavior of compressible fluid flow
5. To study different hydrostatic & hydro kinematics industrial applications

Course Outcomes:

Students will be able to -

1. Demonstrate basic concepts of prime movers and turbines
2. Utilize the knowledge of centrifugal and reciprocating pumps for applications
3. Reveal the importance of other water lifting devices
4. Solve the elementary treatment on compressible fluid flow
5. Understand the concept of hydrostatic and hydrokinetic systems
6. Use the knowledge of hydraulics & pneumatics in developing project work.

SECTION - A

Unit I : Hydraulic Turbines - Theory of impulse and reaction turbines. Pelton, Francis and Kaplan turbines, their construction, classification, analysis, characteristics and governing, draft tube. (10 Hours)

Unit II : Centrifugal pumps :- Basic Theory, classification, construction, operation, characteristics, multistage, NPSH and cavitations in pumps. (7 Hours)

Unit III:

1. Axial flow pump :- Basic theory, construction, & operation.
2. Other water lifting devices :- (a) Air lift pump. (b) Jet Pump. (c) Hydraulic Ram.
3. Computational Fluid Dynamics (CFD)
4. Introduction to CFD: Necessity, limitations, philosophy behind CFD, applications (6 Hours)

SECTION - B

Unit IV : Positive Displacement and other Pumps: Reciprocating pump theory, Slip, Indicator diagram, Effect of acceleration, air vessels. Comparison of centrifugal and reciprocating pumps, performance characteristics. (9 Hours)

Unit V : Compressible fluid flow :- Perfect gas relationship, speed of sound wave, mach number, Isothermal and isotropic flows, shock waves. (8 Hours)

Unit VI : Hydraulic accumulator, Hydraulic intensifier, Hydraulic Press, hydraulic crane, hydraulic lift, hydraulic coupling, hydraulic torque converter. (8 Hours)

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. Jagdish Lal, Hydraulic machines; Metropolitan Book Co. Pvt. Ltd.
2. Dr. Modi & Seth, Hydraulics and Fluid Mechanics; Standard house book.
3. Sen gupta, Computational fluid dynamics; Pearson Publishers.
4. Sameer sheikh, Iliyas Khan, Treaties on Hydraulics; Pneumatics, R.K. Publication.

4ME10 HYDRAULIC & PNEUMATIC SYSTEMS - LAB

List of Practicals:- At least **SIX** (6) practicals based on following :

1) Trial/Study of Pelton wheel
2) Trial/Study of Francis Turbine
3) Trial/Study of Kaplan Turbine
4) Trial/Study of centrifugal pump
5) Trial/Study of reciprocating pump
6) Trial/Study of axial flow pump
7) Trial/Study of hydraulic ram
8) Trial/Study of multistage pump
9) Trial/Study of special pumps (air lift pump/ jet pump)
10) Trial/Study of Gear pump
10) Any one practical based on CFD software

Note : Practical Examination : Practical examination shall consist of Viva Voce/performance based on above syllabus & practical work.

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SYLLABUS OF SEM. III & IV B.E. (ELECTRONICS & TELECOMMUNICATION ENGG.)

Semester-III

3ETC1 - ENGINEERING MATHEMATICS-III

Course Requisite: 1. (IA1) Engineering Mathematics-I 2. (IB1) Engineering Mathematics-II

Course Objectives:

1. To deal with linear differential equations.
2. Understand Laplace transforms .
3. Introduction to geometry of curves, two and three-dimensional regions and calculus of vector valued functions.
4. To equip students with necessary knowledge and skills to enable them to handle mathematical operations of complex analysis .

5. . Understand the computational details behind certain numerical methods and their convergence.
6. To deal with system of differential and difference equations in the study of electrical/electronic and systems.

Outcomes: After successfully completing the course, the students will be able to

1 . Demonstrate the knowledge of differential equations to solve engineering problems of analog systems.
2 . Apply Laplace transform to solve differential equations.
3. Apply knowledge of vector calculus.
4. Comprehend knowledge of complex analysis in terms of complex variables, harmonic functions and conformal mapping.
5. Apply numerical methods to obtain approximate solutions to mathematical problems.
6. Identify and solve certain forms of partial difference equations as applied to discrete systems.

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. (7)

Unit-II: Laplace transforms: definition, standard forms, properties of Laplace transform, inverse Laplace transform, Laplace transform of some basic functions, initial and final value theorem, convolution theorem, Solution of linear differential equations using Laplace transform. (7)

Unit III : 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 (without proof), irrotational and solenoidal vector fields. Fourier transforms: Fourier sine and Fourier cosine transforms and integrals . (7)

SECTION- B

Unit IV : Complex Analysis: - Functions of complex variables, Analytic function, CauchyReimann conditions, Harmonic function, Harmonic conjugate functions, Milne's method. Conformal Mappings: Translation, Rotation, Magnification, Inversion and Bilinear Transformation, expansion of function in Taylor's and Laurent's series. (7)

Unit V : Numerical Methods: Solution of Nonlinear and Polynomial Equations : False Position, Newton Raphson Method. Solution of Linear Systems Equations: Gauss Elimination method, Gauss Seidel Iterative Method, Relaxation method Solution of Differential Equations: Euler's method, Runge-Kutta method, Picards method. (7)

Unit VI : (a) Difference Equation:- solution of difference equations of first order, solution of difference equations of higher order with constant coefficient.
(**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) (7)

Text Books:

1. Elements of Applied Mathematics by P. N. Wartikar and J. N. Wartikar. Poona Vidhyarthi Publisher
2. Higher Engineering Mathematics by B.S.Grewal. Khanna Publishers
3. Introduction to method of Numerical Analysis- S. S. Shastry, Second Edition, PHI Pvt. Ltd.,New Delhi.

References:

1. A Mathematical Companion for Science and Engineering Students – Brettenbach, Oxford University Press, 2008
2. Advancing Engg. Mathematics, E.K.Kreyzig, John Wiley
3. Numerical Method for Mathematics Science and Engineering, John H. Mathew, PHI 4. Numerical Methods - Principles, Analysis & Algorithms Pal, Oxford.

Semester: III Sem

3ETC02 - Electronic Devices & circuits **Maximum Marks: 80**

Course Requisite:

1. Engineering Physics

Course Objectives:

1. To understand detail analysis of Electronic devices.
2. To understand use of electronic devices for various applications in Electronic circuits.
3. To analyze various electronic circuits.

Course Outcomes:

After successfully completing the course, the students will be able to

1. Comprehend the knowledge of diode and its applications in rectifier and regulator circuits.
2. Understand basics of BJT, JFET, MOSFET, UJT and their operational parameters.
3. Understand feedback concept, topologies and their applications.
4. Implement and analyze various electronic circuits.

	Subject: Electronic Devices & circuits	L
Unit-1	**PN junction diode:** Formation of p-n junction, biasing the diode, current equation and V-I characteristics of diode, static and dynamic resistance, Analysis of Half Wave Rectifier (HWR), Full Wave Rectifier (FWR), introduction to filters C, L,LC and CLC filters, working of diode as a Switch, Zener diode and its application as voltage regulator.	06
Unit-2	**Waveshaping:** Analysis of RC low pass, and high pass filters for Sinusoidal, Step, Pulse, Square signal, analysis of clipping and clamping circuits using diodes.	06
Unit-3	**Bipolar Junction Transistors:** Operation of PNP and NPN transistor, CB, CE and CC configurations with characteristics and parameters, transistor as a switch, Transistor switching times, dc load line, transistor biasing methods, bias stability, Introduction to voltage divider biased CE amplifiers using h-parameter model.	06
Unit-4	**dback amplifiers**: Feedback concept, effects of negative feedback, basic feedback topologies **Sinusoidal oscillators**: Barkhausen's criteria, Hartley, Colpitts, RC Phase shift, Wein bridge and crystal oscillators.	06
Unit-5	**Multistage Amplifiers**: Need of multistage, direct coupled amplifier, RC coupled amplifier, transformer coupled amplifier, emitter follower, Darlington emitter follower, bootstrapping principle (analysis not expected).	06
Unit-6	**JFET:** Theory, construction and characteristics: parameters (μ, gm & rd) **MOSFET**: Theory, construction and characteristics of enhancement & depletion type MOSFET. **UJT:** Theory, construction and characteristics; UJT as relaxation oscillator.	06
	Total	**36**

Text Books:

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

References:

1. Robert L.Boylestad, "Electronic Devices and Circuit theory", Publ. Pearson Education.
2. Floyd, "Electron Devices" Pearson Asia 5th Edition, 2001.
3. Donald A Neamen, "Electronic Circuit Analysis and Design" Tata McGraw Hill, 3rd Edition, 2003.

3ETC06 - Electronic Devices and Circuits Lab

Course Requisite:

1. Engineering Physics
2. 3ETC02 Electronic Devices and Circuits

Course Objectives:

1. To verify characteristics of various semiconductor devices.
2. To determine and verify various performance parameters of electronic devices and circuits.
3. To provide basic experimental exposure about operation and applications of electronic devices.

Course Outcomes:

1. Acquiring basics of parameters and operation of various semiconductor devices.
2. Implementation of basic circuits using electronic devices.
3. Verification and analysis of performance of electronic circuits.

List of Experiments

Experiment No.	Aim of Experiment
Expt - 1	To verify V-I characteristics of p-n junction diode and obtain static and dynamic resistance values.
Expt – 2	To calculate efficiency and ripple factor of Half wave, Full wave and Bridge wave rectifier.
Expt - 3	To study different types of filter circuits and calculate its ripple factor for C-filter.
Expt - 4	To study Zener diode as a voltage regulator.
Expt – 5	To observe the response of RC Low pass circuit for a square wave input for different time Constant i) RC >>T ii) RC = T iii) RC <<T.
Expt - 6	To observe the response of RC High pass circuit for a square wave input for different time Constants i) RC>>T ii) RC = T iii) RC<<T.
Expt – 7	To obtain output characteristics of the clipping circuits for different reference voltages and to verify the responses.
Expt – 8	To study and observe the performance of various clamper circuit.
Expt – 9	To verify characteristics of CE mode of BJT and compute its parameters such as gain(β),input and output Impedance.
Expt – 10	To compare calculate and observe frequency response of oscillations of 3 stage RC phase shift oscillator.
Expt - 11	To compare calculate and observe frequency response of oscillations of RC Wein Bridge oscillator.
Expt – 12	To plot frequency response of RC coupled amplifier and determine its bandwidth.
Expt – 13	To plot frequency response of Transformer coupled amplifier and determine its Bandwidth.
Expt – 14	To sketch the drain and transfer characteristics of n-channel JFET and determine ac drain resistance, trans-conductance and amplification factor
Expt – 15	To sketch V-I characteristics of UJT and determine Intrinsic stand-off ratio
Expt – 16	To analyze the response of Rectifier, Amplifier, Oscillator, using simulation software.

* Minimum 08 experiments should be conducted out of above enlisted.

3ETC03 - DIGITAL SYSTEM DESIGN **Maximum Marks: 80**

Course Requisite:

1. Engineering Physics

Course Objectives:

1. To study basic concepts of Boolean algebra, number systems and codes.
2. To study techniques of minimization of Boolean expression.
3. To study the formal procedures for the analysis and design of combinational circuits.
4. To study the formal procedures for the analysis and design of sequential circuits.
5. To learn digital logic families, Programmable logic Devices.
6. To learn the semiconductor memories and mapping.

Course Outcomes:

After successfully completing the course, the students will be able to:

1. Use Boolean algebra to solve logic functions, minimization techniques, number systems and its conversion, arithmetic functions.
2. Identify, analyze and design combinational and sequential circuits.
3. Understand digital logic families and their characteristics.
4. Use the knowledge of semiconductor memories and mapping of memories, programmable logic devices in digital design.

	Subject: DIGITAL SYSTEM DESIGN	L
Unit-1	**Number systems and codes:-** Number system and their conversions, BCD codes, Octal codes, Hexadecimal codes, Excess-3 code, Gray Code, Arithmetic Operations using 1's complement and 2's complement Introduction, Basic Digital Circuits: AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR.	06
Unit-2	**Logic gates, Boolean Algebra and Minimization Techniques:-** Boolean Algebra, Demorgans Theorem, Simplifications using Boolean Algebra , SOP and POS form, K-map representation and minimization of logical functions upto 4 variables, don't care conditions, Quine McCluskey method.	06
Unit-3	**Combinational logic design using 74XX/54XX MSI chip:-** Adders, Subtractors, 4-bit parallel adder, look ahead carry BCD adder, MUX, DEMUX, Decoders, Encoders, Code Converters, Comparators, Parity Generator/Checker, BCD to 7 segment decoder, combinational logic design using ROM, PLA, PAL.	06
Unit-4	**Flip-flops, Registers and Counters:-** S-R, J-K, Master slave J-K, D-type, T-type. Shift Registers: Mode of operations of shift registers, Universal Shift Register. Counters: Asynchronous and Synchronous counter, up/down counter, MOD-N counter, Ring counter, Johnson counter, Frequency Division Counter.	06
Unit-5	**Logic families and Memories:-** TTL NAND gate, specification noise margin, propagation delay, fan-in, fan-out, tri-state TTL, ECL, CMOS. Semiconductor Memories: - RAM, ROM, EPROM, EEPROM, SRAM, DRAM.	06
Unit-6	**Analysis of Clocked Sequential Networks**:- Moore and Mealy Machine, State table, State Assignment, State Reduction, State Transition diagram, Sequence Generator, Sequence Detector.	06
	Total	**36**

Text Books:

1. M.Morris Mano and M.D.Ciletti, "Digital Design", Pearson Education.
2. R P Jain, "Modern Digital Electronics", TMH.

Reference Books:

1. Wakerly, "Digital Design: Principles and Practices", 3rd edition, Pearson Education, 2004.
2. Charles H. Roth, "Fundamentals of Logic Design", 4th Edition, Jaico Publication
3. Lee S.C, "Digital Circuits and Logic Design", PHI
4. Richard S. Sandige, "Modern Digital Design", McGraw-Hill Series in Electrical Engineering.

3ETC07 - DIGITAL SYSTEM DESIGN Lab

Course Requisite:

1. Engineering Physics lab

Course Objectives:

1. To impart the concepts of digital electronics.
2. To provide students basic experimental experiences in the operation of various digital logic Families.
3. To learn the operation of various logic gates and their implementation using digital IC's.
4. To learn the realization of various combinational and sequential circuits.
5. To learn Semiconductor memories and mapping.

Course Outcomes:

After successfully completion of the lab course the students will be able to:

1. Apply practically the concepts of digital electronics.
2. Explain the operation and characteristics of various digital logic families.
3. Understand the operation of various logic gates and their implementation using digital IC's.
4. Design and implement various combinational logic circuits.
5. Design and implement various sequential logic circuits.
6. Design and mapping of various types of memories.

Expt. No.	Experiment List
Expt-1	To study and verify the operation of various digital logic families.
Expt -2	To study and verify the operation of logic gates.
Expt -3	Design and implementation of Adders and Subtractors using logic gates.
Expt -4	Design and implementation of code converters using logic gates.
Expt -5	Design and implementation of multiplexer using logic gates and IC.
Expt -6	Design and implementation of demultiplexer using logic gates and IC.
Expt -7	Design and implementation of code converters using logic gates.
Expt -8	Design and implementation of Magnitude Comparator using logic gates and IC.
Expt -9	Design and implementation of odd/even parity checker /generator using IC.
Expt -10	Implementation of SISO, SIPO, PISO and PIPO shift registers using Flip- flops.
Expt -11	Construction and verification of ripple counters.
Expt -12	Design and implementation of 3-bit synchronous up/down counter

* Minimum 08 experiments should be conducted out of above enlisted.

Maximum Marks: 80

3ETC04 - Electromagnetic Waves

Course Requisite:

1. Engineering Mathematics-I
2. Engineering Mathematics-II
3. Engineering Mathematics-III

Course Objectives:

The objectives of the course are,

1. To introduce basic mathematical concept of coordinate system and vector integrals.
2. To impart knowledge of the basic concepts of electric fields.
3. To impart knowledge of the basic concepts of magnetic fields.
4. To understand the Maxwell's Equations for Electric & Magnetic Field, Boundary conditions and their interpretation.
5. To introduce concept of propagation of electromagnetic waves in free space, conductors and dielectrics.
6. To understand, analyze and evaluate the radiation of electromagnetic wave from theoretical and practical antennas.

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Understand the coordinate systems and vector integrals.
2. Evaluate Electric Field Intensity for different charge distributions.
3. Evaluate Magnetic Field Intensity due to current carrying conductors.
4. Understand scientifically about Maxwell's equations & Boundary conditions.
5. Characterize uniform plane wave & can calculate reflection and transmission coefficient of waves at media interface.
6. Understand principle of radiation and radiation characteristics of theoretical & practical antennas.

	Subject: Electromagnetic Waves	L
Unit-1	**Introduction to Vector analysis:** Coordinate systems, Basics of Vectors: Vector products, Projection of vectors, Gradient, Divergence & Curl, Vector integrals, Divergence Theorem & Stokes Theorem.	06
Unit-2	**Electrostatics:** Introduction to Coulomb's law &Electric Field Intensity (without numericals), Evaluation of Electric Field Intensity due to point charge, line charge & surface charge distribution. Introduction to Electric Flux, Electric Flux Density, Electrostatic potential, Potential gradient &Electric dipole (without numericals).	06
Unit-3	**Magnetostatics:** Introduction to Biot Savart's law, Ampere's circuital law, Magnetic Field Intensity (without numericals), Evaluation of Magnetic Field intensity due to infinite, finite & circular current carrying conductors. Introduction to Magnetic Flux, Magnetic Flux Density, Magnetic dipole.	06
Unit-4	**Maxwell Equations & Boundary Conditions:** Derivation of Maxwell's Equations for Electric & Magnetic Field (without numericals). Boundary condition at dielectric-dielectric interface, dielectric-conductor interface &Boundary conditions for magnetic materials interface.	06
Unit-5	**Electromagnetic Wave Propagation:** Uniform plane wave, Propagation of wave, Formulation of wave equation in free space, dielectric &conducting medium, Skin depth, Poynting Theorem, Reflection and refraction of electromagnetic waves with normal incidence at dielectric interface.	06
Unit-6	**Radiation:** Scalar & Vector magnetic potential, Retarded Potential, Radiation of Electromagnetic wave from the Hertzian Dipole ,Quarter wave Monopole and Half-wave Dipole antennas.	06
	Total	**36**

Text Books: 1. William H.Hayt,Jr and John A.Buck., "Engineering Electromagnetics", Tata McGraw-Hill Publishing Ltd. 2. E.C. Jordan & K.G. Balmain, Electromagnetic waves & Radiating Systems, Prentice Hall, India
Reference Books 1. R.K. Shevgaonkar, Electromagnetic Waves, Tata McGraw Hill India, 2005 2. Narayana Rao, N: Engineering Electromagnetics, 3rd ed., Prentice Hall, 1997. 4. David Cheng, Electromagnetics, Prentice Hall Course

Maximum Marks: 80

3ETC05: OBJECT ORIENTED PROGRAMMING

Course Requisite: **1.** Computer Programming
Course Objectives: 1. To learn object-oriented concepts and build simple applications using C++ and Java. 2. To understand the basic concepts and techniques which form the object-oriented programming paradigm
Course Outcomes: After successfully completing the course, the students will be able to: 1. Justify the basic concepts of object-oriented programming such as data types, functions, classes, objects, constructors, inheritance, overloading etc. 2. Design, implement, test, and debug simple programs in C++. 3. Describe how the class mechanism supports encapsulation and information hiding. 4. To know the concept of operator overloading 5. Understand inheritance in C++ 6. Design and test the implementation of Java programming concepts

	Subject: OBJECT ORIENTED PROGRAMMING	L
Unit-1	Principles of object-oriented Programming: OOP'S paradigm, basic concept of OOP'S, benefits of OOP'S, Four pillars of OOP, structure of C++ programming, basic data types.	06
Unit-2	User defined data type, derived data type, Abstract data types in C++, operators and control statement, Functions in C++: Functions, Function over loading, Friend Functions and virtual functions.	06
Unit-3	Classes and objects in C++: Types of classes and its use, concept of object and its implementation, constructor and destructors.	06
Unit-4	Operator and their definition, overloading unary and binary operator, rules for overloading operators, overloading binary operators using friends and string manipulation.	06
Unit-5	Inheritance in C++: Extending classes: Multilevel Inheritance, Multiple inheritances, Hierarchical inheritance, Hybrid inheritance, Virtual base classes and Abstract classes.	06
Unit-6	Introduction to Java programming, features of JAVA, JVM, Variables, Primitive data types, Identifiers, Basics of classes, objects, creating objects and methods in JAVA	06
	Total	**36**

Text Books:

1. E Balagurusamy, "Object Oriented Programming Using C++ and JAVA", Tata McGraw-Hill.
2. E Balagurusamy, "Object Oriented Programming Using C++" ,Tata McGraw-Hill.

Reference Books

1. Bjarne Stroustrup, "C++ Programming Language", Pearson Education.
2. H.M.Dietel and P.J.Dietel, "Java How to Program" Pearson Education/PHI, Sixth Edition.
3. Robert Lafore, "Object-Oriented Programming in C++ ", Pearson Education India, (4th Edition).
4. Herbert Schildt , "Java : The Complete Reference" Tata McGraw-Hill (7th Edition).
5. Yeshwant Kanetkar "Let us C++", BPB Publications.
6. Dr. N.B. Vekateswarlu, Dr. E.V. Prasad, "Learn Object Oriented Programming Using Java: An UML Based", S. Chand Publication.

3ETC08: OBJECT ORIENTED PROGRAMMING Max. Marks : 80

Course Requisite:

3. Computer Programming
4. 3ETC05 Object Oriented Programming

Course Objectives:

4. Design, implement, test, and debug simple programs in an object-oriented programming language.
5. Design and test the implementation of C++ programming concepts.
6. Design and test the implementation of java programming concepts.

Course Outcomes:

After successfully completing the course, the students will be able to

1. Justify the basics of object-oriented design and the concepts of encapsulation, abstraction, inheritance, and polymorphism.
2. Design, implement, test, and debug simple programs in an object-oriented programming language.
3. Describe how the class mechanism supports encapsulation and information hiding.
4. Design and test the implementation of C++ and java programming concepts.

List of Experiments

Experiment No.	Aim of Experiment
Expt - 1	Write a C++ program to swap two variables a) Using third variable b) Without using third variable.
Expt – 2	Write a program in C++ to print the area and perimeter of a rectangle.
Expt - 3	Write a C++ program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
Expt - 4	Develop programs to implement the concepts of classes and object, accessing members: e.g. a. Design an EMPLOYEE class to contain Data members: Employee_Number, Employee_Name, Basic_Salary, All_Allowances, IT, Net_Salary. Member functions: to read the data of an employee, to calculate Net_Salary and to print the values of all the data members.
Expt – 5	Write a program in C++ to implement parameterized constructor and copy constructor.
Expt - 6	Write a C++ program to implement function overloading.
Expt – 7	Write a program in C++ illustrating the use of virtual functions in a class.

Expt – 8	Write a C++ program to overload unary operator for inverting the value of data variable using member function.
Expt – 9	Write a program in C++ to demonstrate multiple inheritances.
Expt – 10	Write a program in C++ to demonstrate multilevel inheritance.
Expt - 11	Write a program in C++ to implement virtual base class.
Expt – 12	Write a java program to Calculate Circle Area.
Expt – 13	Write a program in Java that reads a number in meters, converts it to feet, and displays the result.

* Minimum 08 experiments should be conducted out of above enlisted.

3ETC09 - ELECTRONIC WORKSHOP

Course Objectives:

1. The main objective of this lab is to motivate the student to familiarize with basic component of electronics and testing equipment.
2. To get the knowledge of mechanical component like relay cables and connectors.
3. To familiarized with the basics of Sensors and transducer.
4. To get the comprehension of various electronic component testing using testing equipments.
5. To aware the students with hands-on experience with a variety of practical circuits designing software tool.
6. To initiate the student with basic knowledge of design of PCB, hardware implementation.

Course Outcomes:

After completion of course

1. Students will be familiar with basic components of electronics.
2. Students will be familiarized with the basics of Sensors and transducers.
3. Students will be able to predict and experimentally verify the output voltage characteristics of various series and parallel diode circuits.
4. Students will be used to the basic designing and simulation tools.
5. Students will be able to apply basic knowledge of component to design and hardware implementation.
6. Students will be trained to handle the measuring equipments, components, software tools, designing aspect and hardware implementation in electronics.

List of Experiments

Experiment No.	Aim of Experiment
Expt - 1	To understand the basics of Multimeter and CRO, Digital Storage Oscilloscope (DSO) and Function Generator.
Expt – 2	To examine and distinguish various types of 1. Fixed & Variable Resistors. 2. Fixed & Variable Capacitors.
Expt - 3	To analyze and learn different types of switches and relays.
Expt - 4	To examine and learn different types of cables and connectors.

Expt – 5	To understand and familiarize with different types of transformers (Step up, Step Down, LVDT, small package) and Inductor.
Expt - 6	To study different types of diodes and Opto-Devices: LED, Photo Diode used in various application.
Expt – 7	To scrutinize and learn different types of sensors like temperature sensors, pressure sensors, light detecting sensors, sound sensors, smoke sensors.
Expt – 8	To test various diodes, transistors and various sensors using multimeter and CRO.
Expt – 9	To Simulate 1. Zener diode using Multisim/ ModelSim/ Lab view software. 2. Plot the output waveform of Full Wave rectifier using any one of the above software.
Expt – 10	Preparation of layout, artwork of various circuits for PCB designing along with different types of soldering and desoldering technique. **It is expected that the students submit a mini-project (preparing a PCB for given circuit along with component mounting, soldering and hardware testing)**
Expt - 11	**Additional Experiments** To study and explore the use of Spectrum Analyzer
Expt – 12	Perform component mounting on breadboard using given circuit diagram.

* Minimum 08 experiments should be conducted out of above enlisted.

Text Books:

1. Maduri Joshi, "Electronic Component and Material" 3rd Edition Shroff Publication.
2. David A. Bell- Electronic Instrumentation and Measurements, Third Edition, Oxford Higher Education .
3. David Bell' " Electronic Devices and Circuits" Oxford University Press, 2010

References:

1. Bosshart, " Printed Circuit Board" TMH
2. Boylestad R,"Electronic Devices and Circuits" Prentice Hall of India Pvt. Ltd. New Delhi
3.K.A.Bakshi, A.V.Bakshi, U.A.Bakshi-"Electronic measurement systems" Technical Publications 01-Jan-2008 3. Bosshart, " Printed Circuit Board" TMH

SEMESTER: IV SEM

4ETC01 - ANALOG AND DIGITAL COMMUNICATION **M**aximum Marks: 80

Course Objectives:

1. To understand different modulation and demodulation techniques in analog and Digital communication.
2. To interpret the performance of analog communications systems in presence of noise
3. To study various pulse modulation and demodulation techniques used in transmission of analog signal.
4. To understand the concept of sampling and quantization in digital transmission system.
5. To study basic building blocks of digital communication system.
6. To learn information theory and theoretical bounds on the data rates of digital communication.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

1. Understand the necessity of modulation and identify the various components of analog and Digital communication systems.
2. Compare and contrast the strengths and weaknesses of various communication systems.
3. Apply the concepts of Probability theory in communication systems.
4. Analyze the performance of various pulse modulation scheme
5. Understand basic building blocks of digital communication system and formatting of digital signal.
6. Understand concepts of information theory and analyze information transmission over communication channel.

	Subject: Analog and Digital Communication	L
Unit-1	**AM Transmitters and Receivers:** Modulation, need of modulation, AM Modulation (Mathematical expression and related numerical), Principles of DSB-FC, DSBSC, SSB-SC modulation and their comparison, Details of DSB-FC Transmitter. Superheterodyne receiver: Detail block diagram, Need and types of AGC, Receiver Characteristics: Selectivity, Sensitivity & Fidelity.	06
Unit-2	**FM Transmitters and Receivers:** FM Modulation, Circuit & Analysis for direct FM generation using FET. Circuit & analysis of Indirect FM generation, Narrow Band and Wide Band FM, their comparison, Pre-emphasis and Deemphasis.FM Receiver block diagram including Limiter. FM Discriminator: Introduction to Single Slope and Balanced slope detector, Foster Seeley and Ratio detectors. Comparison of performance of AM & FM systems.	06
Unit-3	**Random Processes and Noise:** Introduction, Random vectors obtained from random processes, Stationary, Mean, Correlation & Covariance function, Properties of autocorrelation function, Properties of Power spectral density Types of Noise, Gaussian and white noise characteristics. Noise in FM Reception: FM threshold effect.	06
Unit-4	**Pulse Modulation:** Band limited & time limited signals, Narrowband signals and systems, Sampling Theorem in time domain, Nyquist criteria, ISI, Types of sampling- ideal, natural, flat top, Aliasing & Aperture effect. Analog modulation techniques: PAM, PWM & PPM. Digital representation of Analog signal, PCM Generation and Reconstruction: Quantization and its types, Companding, Quantization Noise, Differential Pulse Code Modulation, Delta Modulation, Adaptive Delta Modulation.	06
Unit-5	**Introduction to Digital Communication System:** Functional Blocks of Digital Communication System, Line Coding: Need for Line coding, Properties of Line Coding, Types of Line Coding and its comparison, Scrambler and Unscrambler. Information Theory: Measure of Information, Entropy and Information Rate Introduction of Binary Symmetric Channel.	06
Unit-6	**6 Digital Modulation:** BPSK, BFSK, ASK and DPSK generation and reception, QPSK and MSK Transmitter and Receiver, Probability of Error (only theoretical concepts) of ASK, BPSK and BFSK systems, Comparison of Digital modulation systems. Equalization: Need and types of equalization, Clock and Carrier Synchronization.	06
	Total	**36**

Text Books:

1. Kennedy G. “Electronic Communication System” Tata Mc-Graw Hill Co., New Delhi (Third Ed).
2. Taub and Schilling D.L., “Principles of Communication Systems”, Mc-Graw Hill Co., New Delhi (Second Ed.).
3. Shanmugam K.S., “Digital & Analog Communication Systems”, John Wiley & Sons, NewYork, 1996.
4. Lathi B. P., “Modern Digital and Communication Systems”, Holt Rinchart and Winston Inc.,New York, 1993.
5. Simon Haykin, “Digital Communication”, John Wiley and Sons,Pvt. Ltd., Singapore.

References:

1. Proakis J. K., “Digital Communication”, Mc-Graw Hill Book Co., London (Second Edition).
2. Glover and Grant, “Digital Communication”, Prentice Hall Publication
3. Collins Dennis, Collins John, “Electronic Communications” PHI.
4. Wayne Tomasi, “Electronic Communication Systems” Pearson Education, (Fifth Edition).
5. Wozencraft J. M. and Jacobs I. M., ``Principles of Communication Engineering",John Wiley, 1965.
6. Barry J. R., Lee E. A. and Messerschmitt D. G., ``Digital Communication'', Kluwer Academic Publishers, 2004.

4ETC06 - Analog and Digital Communication Lab

Course Requisite:

1.4ETC01 Analog and Digital Communication.

Course Objectives:

1. To demonstrate the performance of different modulation and demodulation techniques on the basis of various performance parameters.
2. To verify the performance of different analog communication systems
3. To understand various Pulse communication systems for transmission of analog signals.
4. To enable the students to understand different line coding used for representation of digital waveforms.
5. To understand operation of Scrambler and Unscrambler.
6. To understand Bandpass Modulation and Demodulation techniques.

Course Outcomes:

1. Understand the concepts of modulation and demodulation in communication system.
2. Analyze performance characteristics of AM/FM receiver
3. Describe various line codes used for representation of digital waveforms.
4. Demonstrate different working blocks of digital communication system.
5. Analyze the performance of digital communication system.
6. Apply various MATLAB functions for digital Communication Systems.

LIST OF EXPERIMENTS :

Experiment No.	Aim of Experiment
Expt - 1	To explore the operation of AM Transmitter and Receiver in the communication system
Expt – 2	To explore the operation of FM Transmitter and Receiver
Expt - 3	To explore the generation of SSB-SC by using different methods
Expt - 4	To study the generation of DSB-SC Signal
Expt – 5	To observe the AM & FM frequency spectrum on spectrum analyzer.
Expt - 6	To interpret the effect of Pre-emphasis and De-emphasis.
Expt – 7	To verify the operation of PWM, PAM and Demodulation.
Expt – 8	To verify the operation of Pulse Code Modulation (PCM) and Demodulation.
Expt – 9	To explore Time Division Multiplexing (TDM) Technique as a application of PAM.
Expt – 10	To implement various line coding schemes in MATLAB/SCILAB and observe their spectrum.
Expt - 11	To analyze and compare performance of 1) Phase Shift Keying (PSK). 2) Differential Phase Shift Keying (DPSK). 3) Quadrature Phase Shift Keying (QPSK
Expt – 12	Implementation of Scrambler and Unscrambler.
Expt – 13	To implement Shanon-Fano / Huffman coding using MATLAB.
Expt – 14	To verify the output of Delta Modulation and Demodulation process.

* Minimum 08 experiments should be conducted out of above enlisted.

Semester: IV Sem

Maximum Marks: 80

4ETC02 - ANALOG CIRCUITS

Course Requisite:

1. (3ETC02) Electronic Devices and Circuits

Course Objectives:

1. To understand the basics and internal structure of Op-Amp.
2. To analyze and design linear and non-linear applications of Op-Amp.
3. To understand and design concepts of voltage regulators.
4. To study and synthesize the waveform generators using IC 555 and IC 565.
5. To demonstrate applications of Op-Amp in temperature monitoring.

Course Outcomes:

After successfully completing the course, the students will be able to

1. Perform evaluation of the switching behavior of semiconductor devices.
2. Comprehend the knowledge of basic concepts and performance parameters of Op-Amp.
3. Use Op-Amp for implementation of linear and non-linear applications.
4. Comprehend the knowledge of PLL, its applications and data converters.

	Subject: Analog Circuits	L
Unit-1	**Operational amplifier** Operational amplifier Block diagram of Op-Amp, differential amplifier configurations using BJT, constant current source, level shifting, transfer characteristics, frequency response, study of ICuA741, Op-Amp parameters	06
Unit-2	**Linear applications of Op-Amp:** Linear applications of Op-Amp: Inverting and non inverting amplifiers scaling amplifiers, summing amplifiers, differential amplifier, integrator and differentiator, sinusoidal RC oscillators: RC-phase shift, Wein bridge oscillator using IC 741.	06
Unit-3	**Non Linear Applications of Op-Amp:** Non Linear Applications of Op-Amp: comparator, zero-crossing detector, window detectors, Schmitt trigger, astable multivibrator as square and triangular wave generator, Monostable Multivibrator	06
Unit-4	Design of Voltage regulators using IC 723 and LM 317, instrumentation amplifier, bridge amplifier, temperature Controller/indicator using RTD	06
Unit-5	Introduction to IC 555, IC 555 based design of Astable, Monostable multivibrator and their applications, A to D converters: Successive approximation & Dual Scope, D to A converters: Weighted Register & R-2R Ladder.	06
Unit-6	PLL: Operation of phase lock loop system, transfer characteristics, lock range and capture range, study of PLL IC LM 565 and its applications as AM detector, FM detector, Design of Butterworth first and second order low pass, high pass, all pass filter, design of notch filter.	06
	Total	**36**

Text Books:

1. R.A. Gayakwad, "OP-AMP and Linear Integrated Circuits", Prentice Hall/ Pearson Education Publications.
2. K R Botkar "Integrated Circuits" Khanna Publications.
3. Sergio Franco, "Design with Linear Integrated Circuits & Op-Amps",TMH Publications.

References:

1. Gray and Meyer, "Analysis and Design of Analog Integrated Circuits", Wiley Intl. Publication.
2. Paul Horowitz, W. Hill, "The art of Electronics", Cambridge Publications.

4ETC07 – Analog Circuits Lab

Course Requisite:

1. (3ET3) Electronic Devices and Circuits.
2. (4ETC02) Analog Circuits

Course Objectives:

1. To verify operation of various wave shaping circuits.
2. To demonstrate linear and non-linear applications of Op-Amp.
3. To analyze multivibrator circuits using BJT and Op-Amp.
4. To understand functions and characteristics of PLL.

Course Outcomes:

After successfully completing the course, the students will be able to:

1. Implement wave shaping circuits using passive components, diode and BJT and perform their analysis.
2. Demonstrate linear and non-linear applications of Op-Amp.
3. Implement PLL in certain applications.

List of Experiments

Experiment No.	Aim of Experiment
Expt - 1	To verify Op-Amp IC 741 as an inverting and non- inverting amplifier with a specific gain value.
Expt – 2	To demonstrate integrator and differentiator circuit using Op-Amp IC 741.
Expt - 3	To verify RC- phase shift oscillator using Op-Amp IC 741.
Expt - 4	To verify Op-Amp IC 741 as a Schmitt trigger and calculate the hysteresis voltage.
Expt – 5	To verify operation of Astable multivibrator using Op-Amp IC 741.
Expt - 6	To plot frequency response of first order Butterworth LPF for a specific pass-band gain and cut-off frequency.
Expt – 7	To verify characteristics of PLL.
Expt – 8	Application of PLL as AM detector/FM detector/frequency translator (Any one application)
Expt – 9	Design transistorized series voltage regulator
Expt – 10	Design a low voltage variable regulator to 7 V using IC 723.
Expt - 11	Design of summing amplifier using IC 741.
Expt – 12	Design of Schmitt trigger.
Expt – 13	Design of integrator and differentiator.
Expt – 14	Design of sinusoidal RC phase shift oscillator.
Expt – 15	Design and setup a Wien-bridge oscillator.
Expt – 16	Design the square and triangular wave generator using IC 741.
Expt – 17	Design a Butterworth high pass filter with specifications.

* Minimum 08 experiments should be conducted out of above enlisted.

Maximum Marks: 80

4ETC03 - NETWORK THEORY

Course Requisite:

1. Electrical Engineering.
2. Engineering Mathematics.

Course Objectives:

1. To understand fundamental concepts of Node and Mesh analysis for linear circuits.
2. To study Network Theorems for circuit analysis.
3. To study Graph Theory for network analysis.
4. To apply Laplace Transform Technique for analysis of linear circuits.
5. To study Two Port Network parameters.
6. To study Network Functions.

Course Outcomes:

After successfully completing the course, the students will be able to:

1. Analyze electrical circuits using Mesh and Node analysis.
2. Apply suitable Network Theorem to analyze electrical circuits.
3. Draw oriented Graph of the network to determine their currents and voltages.
4. To implement the concept of Laplace Transform for electrical circuit analysis.
5. To apply Two-Port network theory for electrical network analysis.
6. To evaluate different Network Functions.

	NETWORK THEORY	L
Unit-1	**Node and Mesh analysis**: Circuit components, assumptions for circuit analysis, Sources of electrical energy, Source transformation, Kirchoff's laws, Node and Mesh analysis, Matrix approach of network containing voltage and current sources and reactances, Network equations for RLC networks.	08
Unit-2	**Network Theorems**: Superposition theorem, Reciprocity theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem as applied to AC circuits.	08
Unit-3	**Graph theory and network equations**: Graph of a network, Trees, cotrees and loops, Incidence matrix, Tie set and Cut set of a network, Analysis of a network using Tie set and Cut set matrix, Network equilibrium equations (without magnetic coupling), Duality.	08
Unit-4	**Network Analysis using Laplace Transform**: Overview of Laplace transforms, singularity functions, waveform synthesis, analysis of RC, RL and RLC networks with and without initial conditions. Initial and Final value theorems.	08
Unit-5	**Two port networks**: Open circuit impedance parameters, Short circuit admittance parameters, Transmission parameters, Hybrid parameters, Condition for reciprocity and symmetry of a two port network, Interconnection of two port networks.	08
Unit-6	**Network functions**: Ports and terminal pairs, Network functions, poles and zeros, Necessary conditions for driving point function, Necessary conditions for transfer function, Application of network analysis in deriving functions, Time domain behaviour from pole-zero plot, driving point and transfer impedance functions of LC networks.	08
	Total	**48**

Text Book:

1. D. Roy Choudhary, "Networks and Systems", New Age International.

Reference Books:

1. M. E. Van Valkenburg, "Network Analysis", Prentice Hall,3rd Edition.
2. Sudhakar A., Shyammohan S. P. “Circuits and Network” ; Tata McGraw-Hill New Delhi, 1994
3. W. H. Hayt, J. E. Kemmerly and S. M. Durbin, "Engineering Circuit Analysis", 7th Edition, Tata McGraw-Hill education private Limited, New Delhi.
4. Abhijit Chakrabarti, “Circuit theory, Analysis and Synthesis”,Dhanpat Rai and Co. Publications.

4ETC08 - NETWORK THEORY LAB

Course Objectives:

1. To apply knowledge of Mesh and Node analysis for a given network.
2. To learn various network theorems and apply them to solve networks.
3. To apply knowledge of Two Port network and Network Functions to analyze given network.

Course Outcomes:

After successfully completion of the lab course the students will be able to:

1. To apply knowledge of Mesh and Node analysis for a given network.
2. To apply various network theorems to solve networks.
3. To apply knowledge of Two Port network and Network Functions to analyze given network.

Expt. No.	Experiment List
Expt-1	To verify Node Analysis for electric circuit.
Expt -2	To verify Mesh Analysis for electric circuit.
Expt -3	To verify Superposition theorem for a given network.
Expt -4	To verify Thevenin's theorem for a given network.
Expt -5	To verify Norton's theorem for a given network.
Expt -6	To verify Reciprocity theorem for a given network.
Expt -7	To verify Maximum Power Transfer theorem for a given network.
Expt -8	To determine and verify open circuit (Z) Impedance parameters of a given Two Port network.
Expt -9	To determine and verify short circuit (Y) Admittance parameters of a given Two Port network.
Expt -10	To determine and verify Transmission (ABCD) parameters of a given Two Port network.
Expt -11	To determine and verify Hybrid (h) parameters of a given Two Port network.
Expt -12	To find the driving point Impedance for a given network.
Expt -13	To find the Voltage Transfer Ratio for a given network.
Expt -14	To study RLC series circuit using any simulation Tool.
Expt -15	To study RLC parallel circuit using any simulation Tool.

- Minimum 08 experiments should be conducted out of above enlisted.

Maximum Marks: 80

4ETC04 – SIGNALS AND SYSTEMS.

Course Requisite:

1. Engineering Mathematics-III

Course Objectives:

1. Understand the fundamental characteristics of signals and systems.
2. Understand signals and systems in terms of both the time and transform domains.
3. Develop the mathematical skills to solve problems involving convolution and sampling.

Course Outcomes:

After successfully completing the course, students will be able to

1. Understand the continuous time signals and systems mathematically and their classification along with the mathematical operations that can be performed on them.
2. Understand the spectral characteristics of continuous-time periodic signals using Fourier series.
3. Analyze the spectral characteristics of continuous-time aperiodic signals and systems using Fourier Transform.
4. Apply the Laplace transform for analysis of continuous-time systems.
5. Understand the Discrete Time signals and systems mathematically and understand their classification along with the mathematical operations that can be performed on them.
6. Analyze the spectral characteristics of Discrete Time signals and systems using Discrete Time Fourier Transform.

	Subject: Signals and Systems.	L
Unit-1	**Continuous time signals and systems**: Signal Classification, Energy and Power Signal, Signal Operations, Signal models, Even and Odd functions, convolution, System Classification	06
Unit-2	**Continuous-Time Signal Analysis -The Fourier Series:** Periodic Signal Representation by Trigonometric Fourier Series, Existence and Convergence of Fourier Series, Gibbs Phenomenon, Exponential Fourier Series, Magnitude and phase plots of Fourier coefficients.	06

Unit-3	**Continuous-Time Signal Analysis-The Fourier Transform:** Aperiodic Signal Representation by Fourier Integral, Properties of Fourier Transform, Signal Transmission Through LTIC Systems, Signal energy, Inverse Fourier Transform, plotting Fourier Spectrum.	06
Unit-4	**Continuous-Time System Analysis Using Laplace Transform**: Laplace Transform, Region of convergence, Inverse Laplace transforms Application of Laplace transform for determination of solution of differential equation and System realization up to second order, Frequency response of LTIC system.	06
Unit-5	**Time-Domain Analysis of Discrete-Time Signals & Systems:** Sampling theorem, Signal Operations, Classification of Discrete-Time Systems, Discrete-Time System Equations, System response to Internal condition, Unit Impulse Response, System response to External Input, Classical Solution of Linear Difference Equations.	06
Unit-6	**Fourier Analysis of Discrete-Time Signals:** Discrete-Time Fourier Series (DTFS), Aperiodic Signal Representation by Fourier Integral, Properties of DTFT, Relationship between DTFT & CTFT.	06
	Total	**36**

Text Books:

1. Lathi B. P., "Principles of Linear Systems and Signals" Second Edition (International Version) Oxford University Press.
2. Alan V. Oppenheim & Alan S. Willsky with S. Hamid Nawab, "Signals & Systems" PHI Publication, Second Edition.

Reference Books:

1. Ambardar A., "Analog And Digital Signal Processing", Thomson Learning-2005.
2. Simon Haykin, Barry Van Veen, "Signals & Systems", IInd Edition, Wiley Pub.
3. Michael J. Roberts, "Signals and Systems Analysis Using Transform Methods and MATLAB", Mc Hill Publication.

4ETC09 – Signals and Systems Lab

Course Requisite:

4ETC04 Signals & Systems.

Course Objectives:

1. To use software to visualize analysis of Signals and System.
2. To manipulate the time signals and identify the type of given system.

Course Outcomes:

1. After successful completion of this course, students will be able to
2. Generate different plots and explore results to draw valid conclusions and inferences in Signal Processing.
3. Enable on how to approach for requirement of signal processing and system design using simulation tools.
4. Familiarize with the concepts of sampling.

List of Experiments

Experiment No.	Aim of Experiment
Expt - 1	Study of Signal Processing Functions used in MATLAB/SCILAB.
Expt – 2	Program to generate standard continuous Time Signals.
Expt - 3	Program to generate standard discrete Time Signals.
Expt - 4	Program to perform basic operations on Signals.
Expt – 5	Program to find Even And Odd parts of a signal.
Expt - 6	Program to check Periodicity of signals.
Expt – 7	Program to find the Energy and Power of a Signal.
Expt – 8	Program to identify a given system as linear/ non-linear, time variance/ invariance property of a given system.
Expt – 9	Program to demonstrate the time domain sampling of band limited signals (Nyquist theorem).
Expt – 10	Program to find Fourier transform of given signal.
Expt - 11	Implement system equation using Simulink/Xcos to find output of system for different input signals.
Expt – 12	Find unit step response of system described by transfer function using Simulink/Xcos.

* Minimum 08 experiments should be conducted out of above enlisted.

Maximum Marks: 80

4ETC05 – Values & Ethics (HS)

Course Requisite:
Course Objectives: To create an awareness on Engineering Ethics and Human Values. 1. To understand social responsibility of an engineer. 2. To appreciate ethical dilemma while discharging duties in professional life.
Course Outcomes: 1. Understand the significance of value inputs in a classroom and start applying them in their life and profession 2. Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc. 3. Understand the role of a human being in ensuring harmony in society and nature. 4. Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.

	Subject: Values & Ethics	L
Unit-1	**Introduction to Value Education** Value Education, Definition, Concept and Need for Value Education, The Content and Process of Value Education, Basic Guidelines for Value Education, Self exploration as a means of Value Education, Happiness and Prosperity as parts of Value Education.	06
Unit-2	**Harmony in the Human Being** Human Being is more than just the Body, Harmony of the Self ('I') with the Body, Understanding Myself as Co-existence of the Self and the Body, Understanding Needs of the Self and the needs of the Body, Understanding the activities in the Self and the activities in the Body.	06
Unit-3	**Harmony in the Family and Society and Harmony in the Nature** Family as a basic unit of Human Interaction and Values in Relationships, The Basics for Respect and today's Crisis: Affection, Guidance, Reverence, Glory, Gratitude and Love, Comprehensive Human Goal: The Five Dimensions of Human Endeavour. Harmony in Nature: The Four Orders in Nature, The Holistic Perception of Harmony in Existence.	06
Unit-4	**Social Ethics** The Basics for Ethical Human Conduct, Defects in Ethical Human Conduct, Holistic Alternative and Universal Order, Universal Human Order and Ethical Conduct, Human Rights violation and Social Disparities.	06
Unit-5	**Professional Ethics** Value based Life and Profession, Professional Ethics and Right Understanding, Competence in Professional Ethics, Issues in Professional Ethics – The Current Scenario, Vision for Holistic Technologies.	06
Unit-6	Production Systems and Management Models - Typical Case Studies, Strategies for Transition towards Value-based Life and Profession.	06
	Total	**36**

Text Books:

1. A.N.Tripaty, Human Values, New Age Intemational Publishers, 2003
2. Bajpai.B.L.,Indian Ethos and Modern Management, New Royal Book Co., Lucknow, Reprinted, 2004
3. Bertrand Russell, Human Society in Ethics and Politics

Reference Books:

1. Corliss Lamon! Philosophy of Humanism
2. Gaur.R.R., Sangal.R, Bagaria.G.P., A Foundation Course in Value EducatiorL Excel Books, 2009
3. Gaur.R.R., Sangal.R, Bagaria.G.P., Teacher's Manual, Excel Books, 2009
4. I.C.Sharma, Ethical Philosophy of L:rdia, Nagin & Co., Julundhar 8. Mortimer.J.Adler, What Man has Made of Man.
5. R.Subramanian, Professional Ethics, Oxford University Press
6. Text Book for Intermediate Ethics and Human Values, Board of lntermediate Education & Telugu Academy, Hyderabad 11. William LiJIy, Introduction to Ethics, Allied Publishers.

B.E. COMPUTER SCIENCE & ENGG. SEM. III & IV

Syllabus of B.E. Sem. III (Computer Science & Engineering)

3 KS01/3IT01/3KE01 ENGINEERING MATHEMATICS-III

Course Objectives:-

- Find general solutions of linear differential equations with constant coefficients using the roots of the auxiliary equation.
- Calculate the Laplace Transform of basic functions using the definition.
- Apply Laplace transform to find solution of linear differential equations. And solve problems related to Fourier Transform
- Compute and interpret the correlation coefficient.
- Compute the Analytic function and Complex Analysis.
- Perform vector differentiation and integration to analyze the vector fields and apply to compute line, surface and volume integrals.

Course Outcomes:

After successfully completing the course, the students will be able to:

1. Demonstrate the knowledge of differential equations and linear differential equations .
2. Apply Laplace transform to solve differential equations.
3. Demonstrate the use of Fourier Transform to connect the time domain and frequency domain.
4. Demonstrate the basic concepts of probability and statistics.
5. Apply the knowledge of Complex Analysis.
6. Apply the knowledge of vector calculus to solve physical problems.

SECTION-A

UNIT-I: **Ordinary differential equations**:- Complete solution, Operator D, Rules for finding commplementary function, the inverse operator, Rules for finding the particular integral, Method of variation of parameters, Cauchy's and Legendre's linear differential equations. (7)

UNIT-II: **Laplace Transform:-** 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 . (7)

UNIT-III: **a) Applications of Laplace Transform:-** Solution of Linear differential equations, Simultaneous differential equation by Laplace transform method

b) Fourier Transform:- Definition, standard forms, Fourier transforms, properties of Fourier transforms, Convolution theorem, Fourier sine and Fourier cosine transforms and integrals, inverse Fourier transforms.(7)

SECTION-B

UNIT-IV: **a) 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) P p + Qq = R (Lagranges Form); (v) z = px + qy + f(p,q) (Clairauts form)

b) Statistics Curve fitting: Least Square Method, Coefficient of Correlations, Lines of Regression. (7)

UNIT-V: **Complex Analysis: -** Functions of complex variables, Analytic function, Cauchy- conditions, Harmonic function, Harmonic conjugate functions, Milne's Method, conformal mappings (translation, rotation, magnification and bilinear transformation), Expansion of function in Taylor's and Laurent's series. (7)

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 (without proof), line, surface, volume integrals, irrotational Solenoidal Vector fields. (7)

TEXT BOOKS:

1. Elements of Applied Mathematics Vol. II by P. N. Wartikar and J.N. Wartikar,
2. Higher Engg. Mathematics by B.S. Grewal.

REFERENCE BOOKS:

1. Advancing Engg. Mathematics by E.K.Kreyzig.
2. A text book of Differential Calculus by Gorakh Prasad.
3. A Text Book of Applied Mathematics by P.N.Wartikar and J.N.Wartikar.
4. Engineering Mathematics by Ravish R Singh, Mukul Bhatt.

3KS02 DISCRETE STRUCTURE AND GRAPH THEORY

Course Pre-requisite: Basic knowledge of Mathematics

Course Objectives: Throughout the course, students will be expected to demonstrate their understanding of Discrete Structure and Graph Theory by being able to do each of the following:

1. Use mathematically correct terminology and notation.
2. Construct correct direct and indirect proofs.
3. Use division into cases in a proof.
4. Apply logical reasoning to solve a variety of problems.

Course Outcomes : On completion of the course, the students will be able to

1. Analyze and express logic sentence in terms of predicates, quantifiers, and logical connectives.
2. Derive the solution for a given problem using deductive logic and prove the solution based on logical inference.
3. Classify algebraic structure for a given mathematical problem.
4. Perform combinatorial analysis to solve counting problems.
5. Develop the given problem as graph net works and solve with techniques of graph theory

Unit I: Foundations: Logic and Proofs (Hours: 7)

Propositions, Truth Tables, Compound Propositions, Logical Operators, Logic and Bit Operations; Logical Equivalences, De Morgan's Laws, Predicates, Quantifiers: Restricted Domains, Precedence, Logical Equivalences; Rules of Inference for Propositional Logic, Use to Build Arguments, Resolution, Combination for Propositions and Quantified Statements; Proofs Terminology, Methods, Direct Proofs, Proof by Contraposition and Contradiction;

Unit II: Sets, Functions and Relations (Hours: 7)

Introduction, Venn Diagrams, Subsets, Size of a Set, Power Sets, Cartesian Products, Set Notation with Quantifiers, Truth Sets and Quantifiers, Set Operations; Inverse Functions, Compositions and Graphs of Functions, Important Functions, Partial Functions; Sequences, Recurrence Relations, Special Integer Sequences, Summations; Countable Sets, An Uncountable Set; Functions as Relations, Relations on a Set, Properties of Relations, Combining Relations; n-ary Relations, Operations on n- ary Relations; Representing Relations Using Matrices; Closures, Transitive Closures

Unit III: Number Theory and Induction (Hours: 6)

Division, The Division Algorithm, Modular Arithmetic, Arithmetic Modulo m; Primes, Trial Division, Conjectures and Open Problems About Primes, GCD and LCM, The Euclidean Algorithm, gcds as Linear Combinations; Linear Congruences, The Chinese Remainder Theorem, Fermat's Little Theorem, Pseudoprimes, Primitive Roots and Discrete Logarithms, Applications: Hashing Functions, Mathematical Induction and Examples of Proofs, Mistaken Proofs, Guidelines for Proofs; Strong Induction, Examples of Proofs.

Unit IV: Algebraic Structures (Hours: 7)

Algebraic Systems: Examples and General Properties; Semigroups and Monoids: Homomorphism of Semigroups and Monoids, Subsemigroups and Submonoids; Groups: Definitions, Subgroups and Homomorphisms, Cosets and Lagrange's Theorem, Normal Subgroups, algebraic Systems with Two Binary Operations.

Unit V: Counting (Hours: 7)

Basic Counting Principles, Complex Counting Problems, Subtraction and Division Rule, The Pigeonhole Principle, The Generalized Pigeonhole Principle, Applications; Permutations, Combinations, Generating Permutations, Generating Combinations.

Unit VI: Graphs (Hours: 6)

Graph Models; Basic Terminology, Special Simple Graphs, Bipartite Graphs, Matchings, Applications of Special Types of Graphs, New Graphs from Old; Graph Representation, Adjacency and Incidence Matrices, Isomorphism of Graphs, Determining Isomorphism; Paths, Connectedness in Undirected Graphs and Directed Graphs, Paths and Isomorphism, Counting Paths Between Vertices; Euler Paths and Circuits, Hamilton Paths and Circuits, Applications of Hamilton Circuits; Planar Graphs: Euler's Formula, Kuratowski's Theorem; Graph Coloring: Introduction, Applications of Graph Colorings.

Text Book: Kenneth H. Rosen: Discrete Mathematics and Its Applications, 7th Edition, McGraw-Hill.

Reference Books:

1. J. P. Tremblay and R. Manohar: Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw-Hill Edition, McGraw-Hill.
2. Norman L. Biggs: Discrete Mathematics, 2nd Edition, Oxford University Press.
3. Seymour Lipschutz and Marc Lars Lipson: Schaum's Outline of Theory and Problems of Discrete Mathematics, 3rd Edition, Schaum's Outlines Series, McGraw-Hill.
4. C. L. Liu and D. P. Mohapatra: Elements of Discrete Mathematics: A Computer Oriented Approach, 3rd Edition, Tata McGraw-Hill, McGraw-Hill.

3KS03 OBJECT ORIENTED PROGRAMMING

Course Pre-requisite: Computer Programming

Course Objectives:

1. To explore the principles of Object Oriented Programming (OOP) such as data abstraction, encapsulation, inheritance and polymorphism.
2. To use the object-oriented paradigm in program design.
3. To Provide programming insight using OOP constructs.
4. To lay a foundation for advanced programming

Course Outcomes : On completion of the course, the students will be able to

1. Apply Object Oriented approach to design software.
2. Implement programs using classes and objects.
3. Specify the forms of inheritance and use them in programs.
4. Analyze polymorphic behaviour of objects.
5. Design and develop GUI programs.
6. Develop Applets for web applications

Unit I: Introduction to Object Oriented Programming (Hours:7)

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 (Hours:7)

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

Unit III:Inheritance, Interfaces and Packages (Hours:6)

Inheritance: Inheritance vs. Aggregation, Method Overriding, super keyword, final keyword, Abstract class. Interfaces: Defining interfaces, Implementing interfaces, Accessing interface variables, Extending interfaces. Packages: Packages, java.lang package, Enum type.

Unit IV: Exception handling and Input /Output (Hours:7)

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 (Hours:7)

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: Unit Title: Event Handling (Hours:6)

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 Books:

1. Sachin Malhotra and Saurabh Choudhary: Programming in Java, Oxford University Press 2010.
2. Herbert Schildt: Java Complete References (McGraw Hill)

Reference Books:

1. H.M.Dietel and P.J.Dietel, “Java How to Program” Pearson Education/PHI, Sixth Edition.
2. E. Balagurusamy: Programming with Java (McGraw Hill)
3. Dr. R. NageswaraRao: Core Java An Integrated Approach (Dreamtech)
4. Khalid Mughal: A Programmer’s Guide to Java Certification, 3rd Edition (Pearson)
5. Sharnam Shah and Vaishali Shah: Core Java for Beginners, (SPD), 2010.

3KS04/3KE04 DATA STRUCTURES

Course Pre-requisite: Fundamentals of programming Language & Logic Building Skills

Course Objectives:

1. To understand the linear and nonlinear data Structures and its memory representations.
2. To perform different operations on data structures such as insertion, deletion, searching and traversing.
3. To understand various data searching and sorting methods with its complexity.
4. To introduce various techniques for representation of the data in the real world.

Course Outcomes: On completion of the course, the students will be able to

1. Apply various linear and nonlinear data structures
2. Demonstrate operations like insertion, deletion, searching and traversing on various data structures
3. Examine the usage of various structures in approaching the problem solution.
4. Choose appropriate data structure for specified problem domain

Unit I: Introduction to Data Structures (Hours: 7)

Introduction to Data structures, Data Structure Operations, Algorithmic Notation, Complexity of algorithms.String processing: storing strings, character data type, string operations, word processing, and pattern matching algorithms.

Unit II: Array & Record Structure (Hours: 7)

Linear arrays : Memory Representation of arrays, traversing linear arrays, insertion & deletion operations, Bubble sort, Linear search and Binary search algorithms. Multi dimensional arrays, Pointer arrays.Record structures and Matrices.

Unit III: Linked lists (Hours: 6)

Linked lists: Memory Representation of Linked List, 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: Stack & Queue (Hours: 7)

Stacks: Sequential Memory Representation of Stack, Arithmetic expressions: Polish notation. Quick sort, Recursion, Tower of Hanoi.

Queues: Sequential Memory Representation of Queue, DeQueue, Priority queues.

Unit V: Trees (Hours: 7)

Introduction to Trees, Binary trees, Memory Representation of Binary Tree, Traversing binary trees, Header nodes, Binary Search Tree, Heap and heap sort, Path length & Huffman's algorithm.

Unit VI: Graphs & Sorting Algorithms (Hours: 6)

Introduction to Graphs, Memory representation of graphs, Warshalls' algorithm, operations on Graphs, Breadth First Search, Depth First Search.

Sorting : Insertion Sort, Selection Sort, Radix sort, Merge Sort.

Text Books:

1. Seymour Lipschutz: Data Structures, Schaum's Outline Series, McGraw-Hill, International Editions.
2. Trembley, Sorenson: An Introduction to Data Structures with Applications, McGraw Hill.

Reference Books:

1. Ellis Horowitz, Sartaj Sahni: Fundamentals of Data Structures, CBS Publications.
2. Data Structure Using C, Balagurusamy.
3. Standish: Data Structures in Java, Pearson Education.

3KS05 ANALOG& DIGITAL ELECTRONICS

Course Prerequisite: Basic Physics.

Course Objectives:

1. To get the introductory knowledge of PN Junction Diode, Bipolar Junction Transistor, Field Effect Transistor.
2. To understand number systems and conversion between different number systems.
3. To get basics knowledge about digital ICs and digital systems.
4. To study the design of combinational circuits and sequential circuits

Course Outcomes : At the end of course students will able to

1. Explain basic concepts of semiconductor devices and its application.
2. Compare different Number System and basics of conversion of number systems.
3. Realize different minimization technique to obtain minimized expression.
4. Design Combinational Circuits.
5. Design and Develop Sequential Circuits.

Unit I: PN Junction Diode and Bipolar Junction Transistor (Hours: 7)

PN-Junction Diode, Characteristics and Parameters, BJT operation, BJT Voltages and Currents, BJT Amplification: Current and Voltage, BJT Switching, Common-Base Characteristics, Common-Emitter Characteristics, Common- Collector Characteristics

Unit II: Field Effect Transistors (Hours: 7)
Junction Field Effect Transistors, n-Channel and p-Channel JFET, JFET Characteristics, JFET Parameters, FET Amplifications and Switching, MOSFETs: Enhancement MOSFET, Depletion_Enhancement MOSFET, Comparison of p-channel and n-channel FETs, Introduction to CMOS.

Unit III: Number System (Hours: 6)
Binary Number System, Signed and unsigned Number, Octal Number System, Hexadecimal Number System, Conversions between Number Systems, r's and (r-1)'s Complements Representation, Subtraction using 1's and 2's Complements, BCD, Gray Code, Excess 3 Code and Alpha numeric codes.

Unit IV: Minimization Techniques (Hours: 7)
Logic Gates, Boolean Algebra, Logic Operation, Axioms and Laws of Boolean Algebra, Reducing Boolean Expression, Boolean Functions and their representation, SOP Form, POS Form, Karnaugh Map (up to 5 variable), Limitation of Karnaugh Map, Quine- McCluskey Minimization Technique (up to 5 variable).

Unit V: Combinational Circuits (Hours: 7)
Introduction, Design Procedure, Adders, Subtractors, Binary Parallel Adder, 4 Bit Parallel Subtractor, Look-ahead-carry Adder, BCD adder, BCD Subtractor, Multiplexer, De-multiplexer, Decoder, Encoder, Comparator, Parity bit Generator/Checkers, Boolean Expression Implementation using these ICs.

Unit VI: Sequential Circuits (Hours: 6)
Flip-flops: S-R, J-K, Master slave J-K, D-type, T-type, Flip flop Excitation Table, Conversion of Flip Flops, Registers: SISO, SIPO, PISO, PIPO, Universal Shift Register. Counters: Asynchronous and Synchronous counter, Up/Down counter, MOD-N counter, Ring counter, Johnson counter.

Text Books:

1. David A. Bell: "Electronic Devices and Circuits", 5e , Oxford University Press.
2. Jain R.P. "Modern Digital Electronics", 3e, TMH.

Reference Books:

1. Millman & Halkies: "Electronic Devices & Circuits", 2e, McGraw Hill.
2. Sedra& Smith: "Microelectronics Circuits", 5e, Oxford University Press.
3. Anand Kumar: "Switching Theory and Logic Design", 3e, PHI Learning Private Limited
4. Wakerly, "Digital Design: Principles and Practices", 3 e, Pearson Education, 2004.

3KS06 OBJECT ORIENTED PROGRAMMING - LAB

Course Pre-requisite: Basic Computer Programming

Course Objectives: Design, implement, test, and debug simple programs in an object-oriented programming language.

1. To develop the knowledge of object-oriented paradigm in the Java programming language.
2. To evaluate classical problems using java programming.
3. To develop software development skills using java programming for real world applications.

Course Outcomes : On completion of the course, the students will be able to

1. Design, implement, test, and debug simple programs in an object-oriented programming language.
2. Interpret the basics of object-oriented design and the concepts of encapsulation, abstraction, inheritance, and polymorphism
3. Build applications in Java by applying concepts like interfaces, packages and exception handling.
4. Make use of Java concepts like API, Applets, AWT.

List of Experiments:

This is a sample list of Experiments; **minimum 12 experiments** are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. Introduction to Object Oriented Programming and installation of JDK. Write a program to print a message "Hello World..."
2. Develop a program to explain use of Operators in java.
3. Develop a Program to study and implement Looping Statements belonging to Java**.**
4. Develop a Program to study and implement Selection Statements belonging to Java**.**
5. Develop a program to study and implement some Pyramid.
6. Develop a program to demonstrate the concept of Class, Method and Object.
7. Develop a program to study and implement the concept of Method Overloading.
8. Develop a program to study and implement concept of Constructor in Java.
9. Develop a program to study and implement concept of Constructor Overloading in Java.
10. Develop a program to study and implement the Array in Java.

11. Develop a Program on various ways to accept data through keyboard(Command Line Argument)
12. Develop a program to study and implement the concept of Inheritance.
13. Develop a program to study and implement the concept of Method Overriding.
14. Develop a program to study and implement the Abstract Class.
15. Develop a program to study and implement the concept of Interface in Java.
16. Develop a program to study and implement Exception Handling Mechanism in Java.
17. Develop a program to study and implement Java I/O.
18. Develop a program to study and implement simple Applet in java.
19. Develop a program on Applet to demonstrate Graphics, Font and Color class.
20. Develop a Program on passing parameters to applets
21. Develop a Program to create GUI application without event handling using AWT controls
22. Develop a Program to create GUI application with event handling using AWT controls
23. Develop a program on Multithreading
24. Develop a Program to create GUI application with event handling using Swing controls
25. Mini Project based on content of the syllabus. (Group of 2-3 students)

3KS07 DATA STRUCTURE - LAB

Course Pre-requisite: Basics of programming Language & Logic Building Skills

Course Objectives:

1. To understand the linear and nonlinear data Structures and its memory representations.
2. To perform different operations on data structures such as insertion, deletion, searching and traversing.
3. To understand various data searching and sorting methods with its complexity.
4. To introduce various techniques for representation of the data in the real world.

Course Outcomes : On completion of the course, the students will be able to

1. Apply various linear and nonlinear data structure.
2. Demonstrate operations like insertion, deletion, searching and traversing on various data structures
3. Examine the usage of various structures in approaching the problem solution.
4. Choose appropriate data structure for specified problem domain

List of Experiments:

This is a sample list of Experiments; **minimum 12 experiments** are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. Write a program to find out largest number from the array and also find it's location.
2. Write a program to traverse an array and find the sum and average of data elements from an array.
3. Write a Program to a) insert an element in an array b)delete an element from an array.
4. To study and execute the Linear search method
5. To study and execute the Binary Search method
6. To study and execute the Pattern matching Algorithms(Slow and Fast)
7. To study and execute Bubble sort method.
8. To study and implement various operations on singly linked list
    (a) Traversing the linked list.
    (b) Insert a node at the front of the linked list.
    (c) Delete a last node of the linked list.
    (d) Searching a Linked list.
9. To study and implement following operations on the doubly linked list.
    (a) Insert a node at the front of the linked list.
    (b) Insert a node at the end of the linked list.
    (c) Delete a last node of the linked list.
    (d) Delete a node before specified position.
10. To study and implement following operations on the circular linked list.
    (a) Insert a node at the end of the linked list.
    (b) Insert a node before specified position.
    (c) Delete a first node of the linked list.
    (d) Delete a node after specified position.
11. Understand the stack structure and execute the push, pop operation on it.
12. Understand the Queue structure and execute the insertion, deletion operation on it.
13. Formulate and demonstrate Transforming Infix Expressions to Postfix Expression using Stack.
14. Formulate and demonstrate the Evaluation of Postfix Expression using Stack.
15. To study and execute Quick sort method.
16. Understand the Tree structure and implement the Pre-order, In-order, post-order traversingoperations on it.
17. Understand the concept of Recursion and write a program to calculate factorial of a numberusing Recursion.
18. Understand the Heap sort and implement it on given data.
19. Understand the Insertion sort and implement it on given data.

20. Understand the Selection sort and implement it on given data.
21. To study and execute Merge sort method.
22. To study and execute Radix sort method.
23. Write a Program to implement the concept of BFS algorithm.
24. Write a Program to implement the concept of DFS algorithm.
25. To study and execute Josephus problem.

3KS08 ANALOG & DIGITAL ELECTRONICS - LAB

Course Pre-requisite: Students should have the knowledge of Basic Physics.

Course Objectives:

1. To impart the concepts of analog and digital electronics practically.
2. To provide students basic experimental experiences in the operation of semiconductor device and Digital ICs.
3. To learn the operation of various logic gates and their implementation using digital IC's.
4. To learn the realization of various combinational and sequential circuits.

Course Outcomes : After successfully completing the lab, the students will be able to

1. Apply practically the concepts of analog and digital electronics.
2. Explain the operation and characteristics of semiconductor devices.
3. Illustrate the operation of various logic gates and their implementation using digital IC's.
4. Design and implement various combinational logic circuits.
5. Design and implement various sequential logic circuits

List of Experiments:

This is a sample list of Experiments; **minimum 10 experiments** are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. To study V-I characteristics of a PN Junction diode in Forward and Reverse bias.
2. To Sketch and Study the input and output characteristics of transistor connected in Common Emitter (CE) configuration..
3. To Sketch and Study the input and output characteristics of transistor connected in Common Base (CB) configuration
4. To Sketch and Study the input and output characteristics of transistor connected in Common Collector (CC) configuration.
5. To plot static characteristics of FET & calculate its parameters g_m, r_d and μ.
6. To implement Logic gates using TTL ICs (7400, 7402, 7404, 7408, 7410, 7411, 7420, 7427, 7432, 7486).
7. Study and verify the truth table of half adder and full adder using logic gates.
8. Study and verify the truth table of half subtractor and full subtractor using logic gates
9. To compare two 4 bits number and verify the output using 4-bit comparator IC 7485.
10. Implementation of 4×1 multiplexer using logic gates.
11. Implementation and verification of Demultiplexer and Encoder using logic gates.
12. Implementation of 4bit parallel adder using 7483 IC.
13. Design and verify the 4 bit synchronous counter.
14. Design and verify the 4 bit asynchronous counter.
15. Verification of truth table of SR, JK, T and D Flip Flops.

List of Experiments beyond syllabus:

1. Design and Implementation of Op-amp as an inverting amplifier.
2. Design and Implementation of Op-amp as a non-inverting amplifier.
3. To design and find frequency of A stable multi-vibrator using IC 555.

3KS09 C SKILL - LAB - I

Course Prerequisite: Basic knowledge of any Programming Language

Course Objectives:

1. To be able to program design with functions using Python.
2. To understand data and information processing techniques.
3. To understand to Design a program to solve the problems.
4. To be able to access database using python programming.
5. To be able to design web applications using python programming.

Course Outcomes : On completion of the course, the students will be able to

1. Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python
2. Interpret different Decision Making statements, Functions, Object oriented programming in Python
3. Summarize different File handling operations
4. Explain how to design GUI Applications in Python and evaluate different database operations
5. Develop applications using Django framework or Flask

List of Experiments:

This is a sample list of Experiments, **minimum 12 experiments** are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. Write python program to store data in list and then try to print them.
2. Write python program to print list of numbers using range and for loop
3. Write python program to store strings in list and then print them.
4. Write python program in which an function is defined and calling that function prints Hello World.
5. Write a python script to print the current date in the following format "Sun May 29 02:26:23 IST 2017"
6. Write a program to create, append, and remove lists in python.
7. Write a program to create, concatenate and print a string and accessing sub-string from a given string.
8. Write a program to demonstrate working with tuples in python.
9. Write a program to demonstrate working with dictionaries in python.
10. Write a python program to find largest of three numbers.
11. Write python program in which an function(with single string parameter) is defined and calling that function prints the string parameters given to function.
12. Write python program in which an class is define, then create object of that class and call simple print function define in class.
13. Write a Python script that prints prime numbers less than 20.
14. Write a python program to find factorial of a number using Recursion.
15. Write a python program to define a module to find Fibonacci Numbers and import the module to another program.
16. Write a script named copyfile.py. This script should prompt the user for the names of two text files. The contents of the first file should be input and written to the second file.
17. Write a program that inputs a text file. The program should print all of the unique words in the file in alphabetical order.
18. Write a Python class to convert an integer to a roman numeral.
19. Write a Python class to implement pow(x, n)
20. Write a Python class to reverse a string word by word.
21. Accessing and working with databases using Python.
22. Create data frame from .csv files and operations on it.
23. Plotting various graphs using Python.
24. Developing basic GUI using Python.
25. Developing web applications using Django framework or Flask

Reference Books :

1. "Core Python Programming", R. NageswaraRao, dreamtech press.
2. "Python Programming A Modular Approach With Graphics, Database, Mobile and WebApplications", SheetalTaneja, Naveen Kumar, Pearson.
3. Python Web Development with Django By Jeff Forcier, Paul Bissex, Wesley J Chun, Addison-Wesley Professional.
4. Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2011, Cengage Learning
5. Allen B. Downey , " Think Python: How to Think Like a Computer Scientist", Second Edition, Shroff/O'Reilly Publishers
6. John V Guttag. "Introduction to Computation and Programming Using Python", Prentice Hall of India
7. Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, "Data Structures and Algorithms in Python", Wiley
8. Introduction to Computation and Programming using Python, by John Guttag, PHI Publisher, Revised and Expanded version (Referred by MIT)

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SEMESTER - IV

4KS01 ARTIFICIAL INTELLIGENCE

Course Pre-requisite: Basic concepts of Data Structures, Algorithms, Programming

Course Objectives:

1. To present an overview of Artificial Intelligence (AI) principles and approaches.
2. To understand the historical evolution of Artificial Intelligence.
3. To learn various searching techniques and identify to address a particular problem).

Course Outcomes : On completion of the course, the students will be able to

1. Explain concepts of Artificial Intelligence and different types of intelligent agents and their architecture.
2. Formulate problems as state space search problem & efficiently solve them.
3. Summarize the various searching techniques, constraint satisfaction problem and example problems - game playing techniques.

4. Apply AI techniques in applications which involve perception, reasoning and learning.
5. Compare the importance of knowledge, types of knowledge, issues related to knowledge acquisition and representation.

Unit I: Introduction to AI (Hours: 7)

Introduction : What Is AI?, The Foundations of Artificial Intelligence, The History of Artificial Intelligence, The State of the Art, Risks and Benefits of AI,

Intelligent Agents: Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents

Unit II: Problem Solving Through AI (Hours: 7)

Introduction, Representation the AI Problems, Production System, Algorithm of Problem Solving, Examples of AI Problems, Nature of AI Problems

Unit III: Uninformed Search Strategies (Hours: 6)

Problem-Solving Agents, Example Problems, Search Algorithms, **Uninformed Search Strategies**: Breadth-First Search, Uniform-Cost Search, Depth First Search, Bidirectional Search, Depth Limited Search, Iterative Deepening Depth-First Search

Unit IV: Informed Search Strategies (Hours: 7)

Basic Concept of Heuristic Search and Knowledge, Designing of Heuristic Function, **Heuristic Search Strategies:** Generate-And-Test, Best-First Search, Problem Reduction, Hill Climbing, Constraint Satisfaction, Means-Ends-Analysis

Unit V: Adversarial Search & Games (Hours: 7)

Game Theory, Optimal Decisions in Games, Mini-Max Search, Alpha Beta Pruning, Additional Refinements, Monte Carlo Tree Search, Stochastic Games, Partially Observable Games, Limitations of Game Search Algorithms

Unit VI: Introduction to Knowledge (Hours: 6)

Introduction, Types of Knowledge, Knowledge Representation, Knowledge Storage, Knowledge Acquisition, Knowledge Organization and Management, Basic Concepts of Knowledge Engineering

Text Books:

1. Artificial Intelligence: A Modern Approach by Stuart Russell & Peter Norvig (Pearson - 4th Ed.)
2. Artificial Intelligence by Ela Kumar (IK International Publishing House Pvt. Ltd.)

Reference Books:

1. Artificial Intelligence by Elaine Rich and Kevin Knight (Tata McGraw Hill - 3rd Ed.)
2. A First Course in Artificial Intelligence by Deepak Khemani (Tata McGraw Hill - 1st Ed.)
3. Artificial Intelligence and Expert Systems by Patterson (PHI)
4. Introduction to Artificial Intelligence by RajendraAkerkar (PHI Learning Pvt. Ltd.)

4KS02 DATA COMMUNICATION AND NETWORKING

Course Prerequisite: Computer and Data Communication Requirements

Course Objectives:

1. To understand the building blocks of digital communication system.
2. To prepare mathematical background for communication signal analysis.
3. To understand and analyze the signal flow in a digital communication system
4. To analyze error performance of a digital communication system in presence of noise and other interferences.
5. To evaluate the errors using various error detection & correction techniques.
6. To understand network based protocols in data communication and networking.

Course Outcomes : On completion of the course, the students will be able to

1. Describe data communication Components, Networks, Protocols and various topology based network architecture
2. Design and Test different encoding and modulating techniques to change digital –to- digital conversion, analog-to-digital conversion, digital to analog conversion, analog to analog conversion,
3. Explain the various multiplexing methods and evaluate the different error detection & correction techniques.
4. Illustrate and realize the data link control and data link protocols.
5. Describe and demonstrate the various Local area networks and the IEEE standards.

Unit I: Introduction to Data Communication (Hours: 7)

Introduction: Data Communication, Components, Networks, Network types: Local Area Network,Wide Area Network, Switching, The Internet, Accessing the Internet, Standards and Administration: Internet Standards, Internet Administration, Network Models:TCP/IP Protocol Suite,TheOSI Model, Transmission media: Introduction, Guided media & Unguided media-Wireless. Switching: Introduction, Circuit Switched Networks, Packet Switching.

Unit II: Data link Layer (Hours: 6)

Data Link Layer: Introduction, Nodes & Links, Services , Two categories of link, Two sub-layers, Error detection and correction: Introduction, Block Coding, Cyclic codes, Checksum, Forward Error Correction, Data link control: DLC services, Data-Link Layer Protocol, HDLC, Point-To-Point Protocol, Media Access Control (MAC): Random Access, Controlled Access, Channelization.

Unit III: Network Layer (Hours: 7)

Introduction to Network layer Network Layer Services: Packetizing, Routing and Forwarding, Other Services Packet Switching: Datagram Approach: Connectionless Service, Virtual-Circuit Approach: Connection-Oriented Service , Network Layer performance: Delay, Throughput, Packet Loss, Congestion Control, IPV4 Address: Address Space, Classful Addressing, Classless Addressing, Dynamic Host Configuration Protocol (DHCP), Network Address Resolution (NAT), Forwarding of IP packets: Forwarding Based on Destination Address, Forwarding Based on Label, Routers as Packet Switches

Unit IV: Network Layer Protocol (Hours: 7)

Network Layer Protocols: Internet Protocol (IP),Datagram Format, Fragmentation, Security of IPv4 Datagrams,ICMPV4: Messages, Debugging Tools, ICMP Checksum,Mobile IP: Addressing, Agents, Three Phases, Inefficiency in Mobile IP,Routing algorithms: Distance Vector routing, Link State Routing, IPV6 Addressing: Representation, Address Space, Address Space Allocation, Auto configuration, Renumbering, Transition from IPV4 to IPV6: Strategies, Use of IP Addresses

Unit V: Transport Layer (Hours: 6)

Introduction to Transport layer: Introduction, Transport-Layer Services, Connectionless and Connection-Oriented Protocols, Transport-Layer Protocols: Simple Protocol, Stop-and-Wait Protocol, Go-Back-N Protocol (GBN), Selective-Repeat Protocol, Bidirectional Protocols: Piggy backing, User Datagram Protocols: User Datagram, UDP Services, UDP Applications, Transmission Control Protocol: TCP Services, TCP Features , Segment, A TCP Connection, State Transition Diagram, Windows in TCP, Flow Control, Error Control, TCP Congestion Control, TCP Timers, Options, SCTP: SCTP Services, SCTP Features

Unit VI: Application layer (Hours: 7)

Introduction to Application layer: Providing Services, Application-Layer Paradigms, Client-Server Programming: Application Programming Interface, Using Services of the Transport Layer, Iterative Communication Using UDP, Iterative Communication Using TCP, Concurrent Communication, World wide web and HTTP: World Wide Web, Hyper-Text Transfer Protocol (HTTP) FTP: Two Connections, Control Connection, Data Connection, Security for FTP, Electronic Mail: Architecture, Web-Based Mail, E-Mail Security, Domain Name System (DNS):Name Space, DNS in the Internet, Resolution, Caching, Resource Records, DNS Messages, Registrars, Security of DNS, Network Management: Introduction. Configuration Management, Fault Management, Performance Management, Security Management, Accounting Management, SNMP: Managers and Agents, Management Components, ASN.1: Language Basics, Data Types, Encoding.

Text Book: Behrouz A. Forouzan: Data Communication and Networking, (5/e) (TMH).

Reference Books:

1. William Stallings: Data & Computer Communications, 6/e, Pearson Education
2. William L. Schweber : Data Communication, McGraw Hill
3. J.Freey : Computer Communication & Networks, AEW Press
4. D. Corner: Computer Networks & Internet, Pearson Education.

4KS03 OPERATING SYSTEM

Course Pre-requisite: Discrete Structures, Data Structure, Any programming Language

Course Objectives:

1. To make students aware of the kernel and shell structure of the operating systems.
2. To make students aware of the purpose, structure and functions of operating systems
3. To equip students with understanding of the various scheduling algorithms in OS.
4. To make students aware of understanding of memory management in different OS.

Course Outcomes : On completion of the course, the students will be able to

1. Explain memory management issues like external fragmentation, internal fragmentation.
2. Illustrate multithreading and its significance.
3. List various protection and security mechanisms of OS.
4. Analyze and solve the scheduling algorithms.
5. Analyze the deadlock situation and resolve it.
6. Compare various types of operating systems

Unit I: Introduction to OS (Hours: 7)
Introduction: Operating System definition, OS Evolution, Components and Services, Process Concept, Process Scheduling, Operations on Processes, Cooperating Processes, Interprocess Communication, Threads Overview, Multithreading Models, Threading Issues, Java Threads

Unit II: Process Scheduling (Hours: 7)
Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time; Scheduling algorithms: Pre-emptive and Non pre-emptive, FCFS, SJF, RR, Priority, Multilevel Queue, Multilevel Feedback Queue Scheduling

Unit III: Process Synchronization (Hours: 6)
Process Synchronization Basics: The Critical-Section Problem, Synchronization Hardware, Semaphores, Monitors, Deadlocks: Definition & Characterization, Deadlocks Prevention, Avoidance, Detection and Recovery from Deadlock

Unit IV: Memory Management (Hours: 7)
Memory Management Background, Swapping, Contiguous Memory Allocation Schemes, Paging, Segmentation, Virtual Memory Management: Background, Demand paging scheme, Process Creation, Page Replacement Policies, Allocation of Frames, Thrashing

Unit V: Unit Title: File System (Hours: 7)
File-System Interface; Directory Structure, File-System Mounting, File Sharing &Protection, File-System Structure, File-System Implementation, Directory Implementation, Allocation Methods, Free-Space Management. File Recovery

Unit VI: Unit Title: I/O System (Hours:6)
I/O Systems : Overview, I/O Hardware, Application I/O Interface, Kernel I/O Subsystem, Transforming I/O to Hardware Operations , Disk Scheduling, Disk Management, Swap-Space Management, RAID Structure.

Text Book : Avi Silberschatz, P.B.Galvin, G.Gagne: "Operating System Concepts" (9/e) John-Wiley & Sons.

Reference Books:

1. A.S.Tanenbaum "Modern Operating Systems" Pearson Education.
2. William Stallings "Operating Systems" Prentice-Hall.
3. D. M. Dhamdhere "Operating Systems" Tata McGraw-Hill.
4. P. Balkrishna Prasad: "Operating Systems" Scitech Publications (I) Pvt. Ltd.

4KS04 MICROPROCESSOR & ASSEMBLY LANGUAGE PROGRAMMING

Course Pre-requisite: Computer Programming and Computer Fundamentals

Course Objectives:

1. To explore 8086 microprocessor and its architecture.
2. To introduce interfacing techniques of 8086 microprocessor.
3. To introduce basics of Internet of Things

Course Outcomes : On completion of the course, the students will be able to

1. Describe 8086 microprocessor and its architecture; also understand instruction processing during the fetch-decode-execute cycle.
2. Design and Test assembly language programs using 8086 microprocessor instruction set.
3. Demonstrate the implementation of standard programming constructs, including control structures and functions, in assembly language.
4. Illustrate and realize the Interfacing of memory & various I/O devices with 8086 microprocessor.
5. Explain the basic concepts of Internet of Things

Unit I: 8086 Architecture (Hours: 7)
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 (Hours: 7)
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 Instruction Set (Hours: 6)
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.

Unit IV: Subroutines& Macros (Hours: 7)
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 Interrupt (Hours: 7)
8086 Interrupts types, priority and instructions. Interrupt vector table, External hardware-interrupt interface signals & interrupts sequence. Software interrupts. Non-maskable interrupts. 8086 microprocessor interrupt programming.

Unit VI: Internet of Things (IoT) (Hours: 6)
Internet of things: An overview, IoT conceptual framework, IoT Architectural View, Technology behind IoT, Sources of IoT, M2M communication, Examples of IoT.

Text Book:
1. A. K. Ray & K. M. Bhurchandi: Advanced Microprocessors & Peripherals, Third Edition (TMH).
2. Raj Kamal: Internet of Things, Architecture and Design Principals, McGraw Hill Education (India) Private Limited

Reference Books:
1. W. A. Triebel& Avatar Singh: The 8088/8086 Microprocessors (4e) (PHI /Pearson Education)
2. Liu & Gibson: The 8088/8086 Microprocessor Architecture Programming and Interface (6/e) (PHI)

4KS05 THEORY OF COMPUTATION

Course Pre-requisite: Discrete Mathematics, Data Structures

Course Objectives:
1. To understand different automata theory and its operation.
2. To understand mathematical expressions for the formal languages
3. To study computing machines and comparing different types of computational models
4. To understand the fundamentals of problem decidability and Un-Decidability

Course Outcomes: On completion of the course, the students will be able to
1. To construct finite state machines to solve problems in computing.
2. To write regular expressions for the formal languages.
3. To construct and apply well defined rules for parsing techniques in compiler
4. To construct and analyze Push Down, Turing Machine for formal languages
5. To express the understanding of the Chomsky Hierarchy.
6. To express the understanding of the decidability and un-decidability problems.

Unit I: Finite State Machines (Hours: 8)
Alphabet, String, Formal and Natural Language, Operations, Definition and Design DFA (Deterministic Finite Automata), NFA (Non Deterministic Finite Automata), Equivalence of NFA and DFA: Conversion of NFA into DFA, Conversion of NFA with epsilon moves to NFA, Minimization Of DFA, Definition and Construction of Moore and Mealy Machines, Inter-conversion between Moore and Mealy Machines. Minimization of Finite Automata. (Construction of Minimum Automaton)

Unit II: Regular Expression and Regular Grammar (Hours: 8)
Definition and Identities of Regular Expressions, Construction of Regular Expression of the given Language, Construction of Language from the RE, Conversion of FA to RE using Arden's Theorem, Inter-conversion RE to FA, Pumping Lemma for RL, Closure properties of RLs(proofs not required), Regular grammar, Equivalence of RG (RLG and LLG) and FA.

Unit III: Context Free Grammar and Languages (Hours: 8)
Introduction, Formal Definition of Grammar, Notations, Derivation Process: Leftmost Derivation, Rightmost Derivation, Derivation Trees, Construction of Context-Free Grammars and Languages, Pumping Lemma for CFL, Simplification of CFG, Normal Forms (CNF and GNF), Chomsky Hierarchy.

Unit IV: Pushdown Automata (Hours: 8)
Introduction and Definition of PDA, Construction of PDA, Acceptance of CFL, Equivalence of CFL and PDA: Inter-conversion , Introduction of DCFL and DPDA, Enumeration of properties of CFL, Context Sensitive Language, Linear Bounded Automata.

Unit V: Turing Machines (Hours: 8)
Formal definition of a Turing Machine, Design of TM, Computable Functions, Church's hypothesis, Counter machine, Variants of Turing Machines: Multi-tape Turing machines, Universal Turing Machine.

Unit VI: Decidability and Un-Decidability (Hours: 8)
Decidability of Problems, Halting Problem of TM, Un-Decidability: Recursive enumerable language, Properties of recursive & non-recursive enumerable languages, 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

Reference Books:

1. Rajesh K. Shukla: Theory of Computation, CENGAGE Learning, 2009.
2. K V N Sunitha and N Kalyani: Formal Languages and Automata Theory, McGraw Hill,2010
3. Lewis H.P. and Papadimition C.H.: Elements of Theory of Computation
4. Mishra &Chandrashekharan: Theory of Computation
5. C.K.Nagpal: Formal Languages and Automata Theory, Oxford University Press, 2011.
6. VivekKulkarni : Theory of Computation, OUP India, 2013.

4KS06 DATA COMMUNICATION & NETWORKING LAB

Course Pre-requisite: Computer and Data Communication Requirements

Course Objectives:

1. To understand the working principle of various communication protocols
2. To understand and analyze the signal flow in a digital communication system.
3. To analyze error performance of a digital communication system in presence of noise and other interferences.
4. To evaluate the errors using various error detection & correction techniques.
5. To understand network based protocols in data communication and networking.

Course Outcomes : On completion of the course, the students will be able to

1. Analyze performance of various communication protocols
2. Implement Configure various network protocols.
3. Compare IP Address classes of networks

List of Experiments:

This is a sample list of Experiments; **minimum 12 experiments** are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. To study various LAN topologies and their creation using network devices, cables and computers. .
2. To connect the computers in Local Area Network.
3. Familiarization with Networking Components and devices: LAN Adapters, Hubs, Switches, Routers etc.
4. Write a program of bit stuffing used by Data Link Layer
5. Write a program to implement CRC(Cyclic Redundancy Check)
6. Write a program to implement Checksum
7. Write a program to implement Sliding window
8. Configure Internet connection and use IP-Config, PING / Tracer and Net stat utilities to debug the network issues.
9. Configuration of TCP/IP Protocols in Windows and Linux.
10. Transfer files between systems in LAN using FTP Configuration, install Print server in a LAN and share the printer in a network.
11. Write a C Program to determine if the IP Address is in Class A, B, C, D, or E
12. Write a C Program to translate Dotted Decimal IP Address into 32 Bit Address.
13. Configure Host IP, Subnet Mask and Default Gateway in a System in LAN(TCP/IP Configuration)

4KS07 OPERATING SYSTEM - LAB

Course Pre-requisite: Basic computer programming

Course Objectives:

1. To make students aware of the kernel and shell structure of the operating systems.
2. To make students aware of the purpose, structure and functions of operating systems
3. To equip students with understanding of the various scheduling algorithms in OS.
4. To make students aware of understanding of memory management in different OS.

Course Outcomes : On completion of the course, the students will be able to

1. Explain memory management issues like external fragmentation, internal fragmentation.
2. Illustrate multithreading and its significance.
3. List various protection and security mechanisms of OS.
4. Analyze and solve the scheduling algorithms.
5. Analyze the deadlock situation and resolve it.
6. Compare various types of operating systems

List of Experiments:

This is a sample list of Experiments, **minimum 12 experiments** are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. To study Linux Operating System along with its installation.
2. To Study and Execute basic file commands and process related open source Ubuntu commands
   a. Commands to view all executing, block and suspended process.
   b. Command to check and change the priority of process CPU utilization for executing processes.
   c. Commands to check for child process, sub-processes, process tree, abort & end process and all other basics commands related to processes
3. Write a program for multithreading using C.
4. To simulate First Come First Serve & Shortest Job First process scheduling algorithm
5. To simulate Shortest Job First process scheduling algorithm
6. To simulate Preemptive Shortest Job First process scheduling algorithm
7. To implement Round Robin Process scheduling Algorithm
8. To implement Priority Based Process scheduling Algorithm
9. To implement and analyze multi-level queue scheduling algorithm
10. To implement the following file allocation strategies.
11. To simulate paging technique of memory management.
12. To implement theFIFO page replacement policy
13. To implement the LRU page replacement policy
14. To implement the optimalpage replacement policy
15. To simulate producer-consumer problem using semaphores.
16. To implement Dining-Philosophers problem to deal with concurrency control mechanism.
17. To implement contiguous memory allocation strategies to detect fragmentation using: First Fit, Best Fit and Worst Fit.
18. To implement FCFS Disk Scheduling algorithm
19. To implement SCAN Disk Scheduling algorithm
20. To implement C-SCAN Disk Scheduling algorithm
21. To simulate Bankers algorithm for deadlock avoidance
22. To implement following memory management techniques
    Implement MVT and MFT where memory block size is 100 for 5 processes. Enter no. of blocks for each process and calculate internal fragmentation.
23. To simulate LFU page replacement algorithms
24. To simulate the Single level directory file organization techniques.
25. To Simulate bankers algorithm for Dead Lock Avoidance (Banker‘s Algorithm)

4KS08 MICROPROCESSOR & ASSEMBLY LANG. PROG. - LAB

Course Pre-requisite: Computer Programming, Number System

Course Objectives: In this lab student will learn about’ Microprocessor and Interfacing’ in regards to digital computer, microprocessor architecture, programming with 8086 microprocessor and different peripherals**.**

Course Outcomes On completion of the course, the students will be able to

1. Analyze the internal workings of the microprocessor
2. Design and develop programs in Assembly Language Programming
3. Describe 8086 microprocessor and its architecture; also understand instruction processing during the fetch-decode-execute cycle.
4. Design and Test assembly language programs using 8086 microprocessor instruction set.
5. Demonstrate the implementation of standard programming constructs, including control structures and functions, in assembly language
6. Illustrate and realize the Interfacing of memory & various I/O devices with 8086 microprocessor.

List of Experiments:

This is a sample list of Experiments; **minimum 12 experiments** are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. Installation and Introduction of TASM Assembler.
2. Write a program for addition of two 8-bits numbers and two 16-bits numbers.
3. Write a program for subtraction of two 8-bits numbers and two 16-bits numbers.
4. Write a program for multiplication of two 8-bits numbers.
5. Write a program for division of two 8-bits numbers
6. Write a program to check whether a given number is even or odd.
7. Write a program to demonstrate Logical Group and Shift Rotate Instructions.
8. Write a program to check whether a given number is positive or negative.
9. Write a program to find greatest of two 8-bits signed &unsigned numbers.
10. Block Transfer Program
11. Write a program to find Factorial of a number using loop instruction.

12. Write a program to find cube of a given number using Subroutine.
13. Write a program to find square of a given number using Subroutine.
14. Write a program to find square of a given number using Macro.
15. Write a program to find whether the string is palindrome or not.
16. To convert BCD Number Program
17. Write a program to perform Reverse of the String
18. Write a program to transfer 10-bytes from one memory bank to another memory bank.
19. Program for sorting an array for 8086 microprocessor.
20. To write an assembly language program to arrange the given numbers in descending order.
21. Program for searching for a number/character in a string for 8086 microprocessor.

4KS09 C-SKILL-LAB II

Course Pre-requisite: Basic knowledge of scripting language, Programming language.Basic understanding of Electronic concepts.

Course Objectives: To develop an ability to design and implement static and dynamic website and to develop embedded systems with the help of Raspberry Pi/Ardino.

Course Outcomes : On completion of the course, a student will be able to

1. Develop client server program and web applications
2. Make use of project-based experience for web application development.
3. Create embedded systems using Raspberry Pi/Ardino

List of Experiments:

This is a sample list of experiments, **minimum 12 experiments** are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. Introduction to PHP and configure it to work with Apache Web Server.
2. Design web pages for your college containing a description of the courses, departments, faculties, library etc, use href, list tags.
3. Create your class timetable using table tag.
4. Create user Student feedback form (use textbox, text area , checkbox, radio button, select box etc.)
5. Create your resume using HTML tags also experiment with colors, text , link , size and also other tags you studied.
6. Design a web page of your home town with an attractive background color, text color, an Image, font etc. (use internal CSS).
7. Develop a JavaScript to display today's date.
8. Write a JavaScript to design a simple calculator to perform the following operations: sum, product, difference and quotient.
9. Write an HTML page that contains a selection box with a list of 5 countries. When the user selects a country, its capital should be printed next to the list. Add CSS to customize the properties of the font of the capital (color, bold and font size).
10. Write a PHP program to keep track of the number of visitors visiting the web page and to display this count of visitors, with proper headings.
11. Write a PHP program to display a digital clock which displays the current time of the server.
12. Write the PHP programs to do the following: a. Implement simple calculator operations. b. Find the transpose of a matrix.
13. Write a PHP program to sort the student records which are stored in the database using selection sort.
14. Study and Install IDE of Arduino and different types of Arduino.
15. Write program using Arduino IDE for Blink LED.
16. Write Program for RGB LED using Arduino.
17. Study the Temperature sensor and write a Program for monitor temperature using Arduino.
18. Study and Implement RFID, NFC using Arduino. • Study and implement MQTT protocol using Arduino.
19. Study and Configure Raspberry Pi.
20. WAP for LED blink using Raspberry Pi.
21. Study and Implement Zigbee Protocol using Arduino / Raspberry Pi.
22. Create Smart Plugs with Arduino and Raspberry Pi.
23. Interfacing digital sensors with raspberry pi.
24. Creating a webpage to control I-O devices, Reading data from sensor and passing to web page.
25. Implement a program to access Analog sensor via wifi with HTML Web server.

SYLLABUS OF B.E. SEM. III & IV [COMPUTER ENGINEERING] (C.B.C.S.)
Semester-III

3KE02 DISCRETE MATHEMATICS

Course Prerequisite: Basic knowledge of Mathematics

Course Objectives: Throughout the course, students will be expected to demonstrate their understanding of Discrete Structure and Graph Theory by being able to do each of the following:

1. Use mathematically correct terminology and notation.
2. Construct correct direct and indirect proofs.
3. Use division into cases in a proof.
4. Apply logical reasoning to solve a variety of problems.

Course Outcomes : On completion of the course, the students will be able to

1. Analyze and express logic sentence in terms of predicates, quantifiers, and logical connectives.
2. Derive the solution for a given problem using deductive logic and prove the solution based on logical inference.
3. Classify algebraic structure for a given mathematical problem.
4. Perform combinatorial analysis to solve counting problems.
5. Develop the given problem as graph net works and solve with techniques of graph theory

Unit I: Foundations: Logic and Proofs

Propositions, Truth Tables, Compound Propositions, Logical Operators, Logic and Bit Operations; Logical Equivalences, De Morgan's Laws, Predicates, Quantifiers: Restricted Domains, Precedence, Logical Equivalences; Rules of Inference for Propositional Logic, Use to Build Arguments, Resolution, Combination for Propositions and Quantified Statements; Proofs Terminology, Methods, Direct Proofs, Proof by Contraposition and Contradiction. **(Hours 7)**

Unit II: Sets, Functions and Relations

Introduction, Venn Diagrams, Subsets, Size of a Set, Power Sets, Cartesian Products, Set Notation with Quantifiers, Truth Sets and Quantifiers, Set Operations; Inverse Functions, Compositions and Graphs of Functions, Important Functions, Partial Functions; Sequences, Recurrence Relations, Special Integer Sequences, Summations; Countable Sets, An Uncountable Set; Functions as Relations, Relations on a Set, Properties of Relations, Combining Relations; n-ary Relations, Operations on n- ary Relations; Representing Relations Using Matrices; Closures, Transitive Closures. **(Hours 7)**

Unit III: Number Theory and Induction

Division, The Division Algorithm, Modular Arithmetic, Arithmetic Modulo m; Primes, Trial Division, Conjectures and Open Problems About Primes, GCD and LCM, The Euclidean Algorithm, gcds as Linear Combinations; Linear Congruences, The Chinese Remainder Theorem, Fermat's Little Theorem, Pseudoprimes, Primitive Roots and Discrete Logarithms, Applications: Hashing Functions, Mathematical Induction and Examples of Proofs, Mistaken Proofs, Guidelines for Proofs; Strong Induction, Examples of Proofs. **(Hours 6)**

Unit IV: Algebraic Structures

Algebraic Systems: Examples and General Properties; Semigroups and Monoids: Homomorphism of Semigroups and Monoids, Subsemigroups and Submonoids; Groups: Definitions, Subgroups and Homomorphisms, Cosets and Lagrange's Theorem, Normal Subgroups, algebraic Systems with Two Binary Operations. **(Hours 7)**

Unit V: Counting

Basic Counting Principles, Complex Counting Problems, Subtraction and Division Rule, The Pigeonhole Principle, The Generalized Pigeonhole Principle, Applications; Permutations, Combinations, Generating Permutations, Generating Combinations. **(Hours 6)**

Unit VI: Graphs

Graph Models; Basic Terminology, Special Simple Graphs, Bipartite Graphs, Matchings, Applications of Special Types of Graphs, New Graphs from Old; Graph Representation, Adjacency and Incidence Matrices, Isomorphism of Graphs, Determining Isomorphism; Paths, Connectedness in Undirected Graphs and Directed Graphs, Paths and Isomorphism, Counting Paths Between Vertices; Euler Paths and Circuits, Hamilton Paths and Circuits, Applications of Hamilton Circuits; Planar Graphs: Euler's Formula, Kuratowski's Theorem; Graph Coloring: Introduction, Applications of Graph Colorings.

Text Book: Kenneth H. Rosen: Discrete Mathematics and Its Applications, 7th Edition, McGraw-Hill.

Reference Books:

1. J. P. Tremblay and R. Manohar: Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw-Hill Edition, McGraw-Hill.
2. Norman L. Biggs: Discrete Mathematics, 2nd Edition, Oxford University Press.
3. Seymour Lipschutz and Marc Lars Lipson: Schaum's Outline of Theory and Problems of Discrete Mathematics, 3rd Edition, Schaum's Outlines Series, McGraw-Hill.
4. C. L. Liu and D. P. Mohapatra: Elements of Discrete Mathematics: A Computer Oriented Approach, 3rd Edition, Tata McGraw-Hill, McGraw-Hill.

3KE03 PROGRAMMING METHODOLOGY

Course Prerequisite: Computer Programming

Course Objectives:

1. To explore the principles of Object Oriented Programming (OOP) such as data abstraction, encapsulation, inheritance and polymorphism.
2. To use the object-oriented paradigm in program design.
3. To Provide programming insight using OOP constructs.
4. To lay a foundation for advanced programming

Course Outcomes: On completion of the course, the students will be able to

1. Apply Object Oriented approach to design software.
2. Implement programs using classes and objects.
3. Specify the forms of inheritance and use them in programs.
4. Analyze polymorphic behaviour of objects.
5. Design and develop GUI programs.
6. Develop Applets for web applications

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. **(Hours: 7)**

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. **(Hours: 6)**

Unit III: Inheritance, Interfaces and Packages
Inheritance: Inheritance vs. Aggregation, Method Overriding, super keyword, final keyword, Abstract class. Interfaces: Defining interfaces, Implementing interfaces, Accessing interface variables, Extending interfaces. Packages: Packages, java.lang package, Enum type. **(Hours: 7)**

Unit IV: Exception handling and Input / Output
Exception: Introduction, Exception handling Techniques, User-defind 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. **(Hours: 7)**

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, getDocumentBase() and getCodeBase () methods, Applet Context Interface, Audio clip, Graphic Class, Color, Font, Font Metrics. **(Hours: 7)**

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. **(Hours: 6)**

Text Books:

1. SachinMalhotra and SaurabhChoudhary: Programming in Java, Oxford University Press 2010.
2. Herbert Schildt: Java Complete References (McGraw Hill)

Reference Books:

1. H.M.Dietel and P.J.Dietel, “Java How to Program” Pearson Education/PHI, Sixth Edition.
2. E. Balagurusamy: Programming with Java (McGraw Hill)
3. Dr. R. NageswaraRao: Core Java An Integrated Approach (Dreamtech)
4. Khalid Mughal: A Programmer’s Guide to Java Certification, 3rd Edition (Pearson)
5. Sharnam Shah and Vaishali Shah: Core Java for Beginners,(SPD),2010.

3KE04 / 3KS04 DATA STRUCTURES

Course Prerequisite: Fundamentals of programming Language & Logic Building Skills

Course Objectives:

1. To understand the linear and nonlinear data Structures and its memory representations.
2. To perform different operations on data structures such as insertion, deletion, searching and traversing.
3. To understand various data searching and sorting methods with its complexity.
4. To introduce various techniques for representation of the data in the real world.

Course Outcomes: On completion of the course, the students will be able to

1. Apply various linear and nonlinear data structures
2. Demonstrate operations like insertion, deletion, searching and traversing on various data structures
3. Examine the usage of various structures in approaching the problem solution.
4. Choose appropriate data structure for specified problem domain.

Unit I: Introduction to Data Structures

Introduction to Data structures, Data Structure Operations, Algorithmic Notation, Complexity of algorithms.String processing: storing strings, character data type, string operations, word processing, and pattern matching algorithms. **(Hours: 7)**

Unit II: Array & Record Structure

Linear arrays : Memory Representation of arrays, traversing linear arrays, insertion & deletion operations, Bubble sort, Linear search and Binary search algorithms. Multi dimensional arrays, Pointer arrays.Record structures and Matrices. **(Hours: 7)**

Unit III: Linked lists

Linked lists: Memory Representation of Linked List, 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. **(Hours: 6)**

Unit IV: Stack & Queue)

Stacks: Sequential Memory Representation of Stack, Arithmetic expressions: Polish notation. Quick sort, Recursion, Tower of Hanoi.

Queues: Sequential Memory Representation of Queue, DeQueue, Priority queues. **(Hours: 7)**

Unit V: Trees

Introduction to Trees, Binary trees, Memory Representation of Binary Tree, Traversing binary trees, Header nodes, Binary Search Tree, Heap and heapsort, Path length & Huffman's algorithm.

(Hours:7)

Unit VI: Graphs & Sorting Algorithms

Introduction to Graphs, Memory representation of graphs, Warshalls' algorithm, operations on Graphs, Breadth First Search, Depth First Search

Sorting : Insertion Sort, Selection Sort, Radix sort, Merge Sort. **(Hours: 6)**

Text Books:

1. SeymourLipschutz: Data Structures ,Schaum's Outline Series,McGraw-Hill, International Editions.
2. Trembley, Sorenson: An Introduction to Data Structures with Applications, McGraw Hill.

Reference Books:

1. Ellis Horowitz, SartajSahni: Fundamentals of Data Structures, CBSPublications.
2. Data Structure Using C, Balagurusamy.
3. Standish: Data Structures in Java, Pearson Education.

3KE05 ANALOG ELECTRONICS & DIGITAL LOGIC DESIGN

Course Pre-requisite: Basic Physics.

Course Objectives:

1. To get the introductory knowledge of PN Junction Diode, Bipolar Junction Transistor, Field Effect Transistor.
2. To understand number systems and conversion between different number systems.
3. To get basics knowledge about digital ICs and digital systems.
4. To study the design of combinational circuits and sequential circuits.

Course Outcomes: At the end of course students will able to

1. Explain basic concepts of semiconductor devices and its application.
2. Compare different Number System and basics of conversion of number systems.
3. Realize different minimization technique to obtain minimized expression.
4. Design Combinational Circuits.
5. Design and Develop Sequential Circuits.

Unit I: PN Junction Diode and Bipolar Junction Transistor (Hours: 7)
PN-Junction Diode, Characteristics and Parameters, BJT operation, BJT Voltages and Currents, BJT Amplification: Current and Voltage, BJT Switching, Common-Base Characteristics, Common-Emitter Characteristics, Common- Collector Characteristics

Unit II: Field Effect Transistors (Hours: 7)
Junction Field Effect Transistors, n-Channel and p-Channel JFET, JFET Characteristics, JFET Parameters, FET Amplifications and Switching, MOSFETs: Enhancement MOSFET, Depletion_Enhancement MOSFET, Comparison of p-channel and n-channel FETs, Introduction to CMOS.

Unit III: Number System (Hours: 6)
Binary Number System, Signed and unsigned Number, Octal Number System, Hexadecimal Number System, Conversions between Number Systems, r's and (r-1)'s Complements Representation, Subtraction using 1's and 2's Complements, BCD, Gray Code, Excess 3 Code and Alpha numeric codes.

Unit IV: Minimization Techniques (Hours: 7)
Logic Gates, Boolean Algebra, Logic Operation, Axioms and Laws of Boolean Algebra, Reducing Boolean Expression, Boolean Functions and their representation, SOP Form, POS Form, Karnaugh Map (up to 5 variable), Limitation of Karnaugh Map, Quine- McCluskey Minimization Technique (up to 5 variable).

Unit V: Combinational Circuits (Hours: 7)
Introduction, Design Procedure, Adders, Subtractors, Binary Parallel Adder, 4 Bit Parallel Subtractor, Look-ahead-carry Adder, BCD adder, BCD Subtractor, Multiplexer, De-multiplexer, Decoder, Encoder, Comparator, Parity bit Generator/Checkers, Boolean Expression Implementation using these ICs.

Unit VI: Sequential Circuits (Hours: 6)
Flip-flops: S-R, J-K, Master slave J-K, D-type, T-type, Flip flop Excitation Table, Conversion of Flip Flops, Registers: SISO, SIPO, PISO, PIPO, Universal Shift Register. Counters: Asynchronous and Synchronous counter, Up/Down counter, MOD-N counter, Ring counter, Johnson counter.

Text Books:

1. David A. Bell: "Electronic Devices and Circuits", 5e , Oxford University Press.
2. Jain R.P. "Modern Digital Electronics", 3e, TMH.

Reference Books:

1. Millman & Halkies: "Electronic Devices & Circuits", 2e, McGraw Hill.
2. Sedra & Smith: "Microelectronics Circuits", 5e, Oxford University Press.
3. Anand Kumar: "Switching Theory and Logic Design", 3e, PHI Learning Private Limited
4. Wakerly, "Digital Design: Principles and Practices", 3 e, Pearson Education, 2004.

3KE06 PROGRAMMING METHODOLOGY - LAB

Course Prerequisite: Basic Computer Programming

Course Objectives: Design, implement, test, and debug simple programs in an object-oriented programming language.

1. To develop the knowledge of object-oriented paradigm in the Java programming language.
2. To evaluate classical problems using java programming.
3. To develop software development skills using java programming for real world applications.

Course Outcomes : On completion of the course, the students will be able to

1. Design, implement, test, and debug simple programs in an object-oriented programming language.
2. Interpret the basics of object-oriented design and the concepts of encapsulation, abstraction, inheritance, and polymorphism
3. Build applications in Java by applying concepts like interfaces, packages and exception handling.
4. Make use of Java concepts like API, Applets, AWT.

List of Experiments:

This is a sample list of Experiments; **minimum 12 experiments** are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. Introduction to Object Oriented Programming and installation of JDK. Write a program to print a message "Hello World..."
2. Develop a program to explain use of Operators in java.
3. Develop a Program to study and implement Looping Statements belonging to Java**.**
4. Develop a Program to study and implement Selection Statements belonging to Java**.**
5. Develop a program to study and implement some Pyramid.
6. Develop a program to demonstrate the concept of Class, Method and Object.
7. Develop a program to study and implement the concept of Method Overloading.
8. Develop a program to study and implement concept of Constructor in Java.
9. Develop a program to study and implement concept of Constructor Overloading in Java.
10. Develop a program to study and implement the Array in Java.
11. Develop a Program on various ways to accept data through keyboard(Command Line Argument)
12. Develop a program to study and implement the concept of Inheritance.
13. Develop a program to study and implement the concept of Method Overriding.
14. Develop a program to study and implement the Abstract Class.
15. Develop a program to study and implement the concept of Interface in Java.
16. Develop a program to study and implement Exception Handling Mechanism in Java.
17. Develop a program to study and implement Java I/O.
18. Develop a program to study and implement simple Applet in java.
19. Develop a program on Applet to demonstrate Graphics, Font and Color class.
20. Develop a Program on passing parameters to applets
21. Develop a Program to create GUI application without event handling using AWT controls
22. Develop a Program to create GUI application with event handling using AWT controls
23. Develop a program on Multithreading
24. Develop a Program to create GUI application with event handling using Swing controls
25. Mini Project based on content of the syllabus. (Group of 2-3 students)

3KE07 DATA STRUCTURE - LAB

Course Prerequisite: Basics of programming Language & Logic Building Skills

Course Objectives:

1. To understand the linear and nonlinear data Structures and its memory representations.
2. To perform different operations on data structures such as insertion, deletion, searching and traversing.
3. To understand various data searching and sorting methods with its complexity.
4. To introduce various techniques for representation of the data in the real world.

Course Outcomes : On completion of the course, the students will be able to

1. Apply various linear and nonlinear data structure.
2. Demonstrate operations like insertion, deletion, searching and traversing on various data structures
3. Examine the usage of various structures in approaching the problem solution.
4. Choose appropriate data structure for specified problem domain

List of Experiments:

This is a sample list of Experiments; **minimum 12 experiments** are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. Write a program to find out largest number from the array and also find it's location.
2. Write a program to traverse an array and find the sum and average of data elements from an array.
3. Write a Program to a) insert an element in an array b)delete an element from an array.
4. To study and execute the Linear search method
5. To study and execute the Binary Search method
6. To study and execute the Pattern matching Algorithms(Slow and Fast)
7. To study and execute Bubble sort method.
8. To study and implement various operations on singly linked list
   (a) Traversing the linked list.
   (b) Insert a node at the front of the linked list.
   (c) Delete a last node of the linked list.
   (d) Searching a Linked list.

9. To study and implement following operations on the doubly linked list.
    (e) Insert a node at the front of the linked list.
    (f) Insert a node at the end of the linked list.
    (g) Delete a last node of the linked list.
    (h) Delete a node before specified position.
10. To study and implement following operations on the circular linked list.
    (e) Insert a node at the end of the linked list.
    (f) Insert a node before specified position.
    (g) Delete a first node of the linked list.
    (h) Delete a node after specified position.
11. Understand the stack structure and execute the push, pop operation on it.
12. Understand the Queue structure and execute the insertion, deletion operation on it.
13. Formulate and demonstrate Transforming Infix Expressions to Postfix Expression using Stack.
14. Formulate and demonstrate the Evaluation of Postfix Expression using Stack.
15. To study and execute Quick sort method.
16. Understand the Tree structure and implement the Pre-order, In-order, post-order traversing operations on it.
17. Understand the concept of Recursion and write a program to calculate factorial of a number using Recursion.
18. Understand the Heap sort and implement it on given data.
19. Understand the Insertion sort and implement it on given data.
20. Understand the Selection sort and implement it on given data.
21. To study and execute Merge sort method.
22. To study and execute Radix sort method.
23. Write a Program to implement the concept of BFS algorithm.
24. Write a Program to implement the concept of DFS algorithm.
25. To study and execute Josephus problem.

3KE08 ANALOG ELECTRONICS & DIGITAL LOGIC DESIGN - LAB

Course Prerequisite: Basic Physics.

Course Objectives:

1. To impart the concepts of analog and digital electronics practically.
2. To provide students basic experimental experiences in the operation of semiconductor device and Digital ICs.
3. To learn the operation of various logic gates and their implementation using digital IC's.
4. To learn the realization of various combinational and sequential circuits.

Course Outcomes : After successfully completing the lab, the students will be able to

1. Apply practically the concepts of analog and digital electronics.
2. Explain the operation and characteristics of semiconductor devices.
3. Illustrate the operation of various logic gates and their implementation using digital IC's.
4. Design and implement various combinational logic circuits.
5. Design and implement various sequential logic circuits

List of Experiments:

This is a sample list of Experiments; **minimum 10 experiments** are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. To study V-I characteristics of a PN Junction diode in Forward and Reverse bias.
2. To Sketch and Study the input and output characteristics of transistor connected in Common Emitter (CE) configuration..
3. To Sketch and Study the input and output characteristics of transistor connected in Common Base (CB) configuration
4. To Sketch and Study the input and output characteristics of transistor connected in Common Collector (CC) configuration.
5. To plot static characteristics of FET & calculate its parameters g_m, r_d and μ.
6. To implement Logic gates using TTL ICs (7400, 7402, 7404, 7408, 7410, 7411, 7420, 7427, 7432, 7486).
7. Study and verify the truth table of half adder and full adder using logic gates.
8. Study and verify the truth table of half subtractor and full subtractor using logic gates
9. To compare two 4 bits number and verify the output using 4-bit comparator IC 7485.
10. Implementation of 4×1 multiplexer using logic gates.
11. Implementation and verification of Demultiplexer and Encoder using logic gates.
12. Implementation of 4bit parallel adder using 7483 IC.

13. Design and verify the 4 bit synchronous counter.
14. Design and verify the 4 bit asynchronous counter.
15. Verification of truth table of SR, JK, T and D Flip Flops.

List of Experiment beyond syllabus:

1. Design and Implementation of Op-amp as an inverting amplifier.
2. Design and Implementation of Op-amp as a non-inverting amplifier.
3. To design and find frequency of A stable multi-vibrator using IC 555.

3KE09 C-SKILL-LAB I

Course Pre-requisite: Basic knowledge of any Programming Language

Course Objectives:

1. To be able to program design with functions using Python.
2. To understand data and information processing techniques.
3. To understand to Design a program to solve the problems.
4. To be able to access database using python programming.
5. To be able to design web applications using python programming.

Course Outcomes: On completion of the course, the students will be able to

1. Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python
2. Interpret different Decision Making statements, Functions, Object oriented programming in Python
3. Summarize different File handling operations
4. Explain how to design GUI Applications in Python and evaluate different database operations
5. Develop applications using Django framework or Flask

List of Experiments:

This is a sample list of experiments, **minimum 12 experiments** are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. Write python program to store data in list and then try to print them.
2. Write python program to print list of numbers using range and for loop
3. Write python program to store strings in list and then print them.
4. Write python program in which an function is defined and calling that function prints Hello World.
5. Write a python script to print the current date in the following format “Sun May 29 02:26:23 IST 2017”
6. Write a program to create, append, and remove lists in python.
7. Write a program to create, concatenate and print a string and accessing sub-string from a given string.
8. Write a program to demonstrate working with tuples in python.
9. Write a program to demonstrate working with dictionaries in python.
10. Write a python program to find largest of three numbers.
11. Write python program in which an function(with single string parameter) is defined and calling that function prints the string parameters given to function.
12. Write python program in which an class is define, then create object of that class and call simple print function define in class.
13. Write a Python script that prints prime numbers less than 20.
14. Write a python program to find factorial of a number using Recursion.
15. Write a python program to define a module to find Fibonacci Numbers and import the module to another program.
16. Write a script named copyfile.py. This script should prompt the user for the names of two text files. The contents of the first file should be input and written to the second file.
17. Write a program that inputs a text file. The program should print all of the unique words in the file in alphabetical order.
18. Write a Python class to convert an integer to a roman numeral.
19. Write a Python class to implement pow(x, n)
20. Write a Python class to reverse a string word by word.
21. Accessing and working with databases using Python.
22. Create data frame from .csv files and operations on it.
23. Plotting various graphs using Python.
24. Developing basic GUI using Python.
25. Developing web applications using Django framework or Flask

Reference Books :

1. “Core Python Programming”, R. NageswaraRao, dreamtech press.
2. “Python Programming A Modular Approach With Graphics, Database, Mobile and Web Applications”, Sheetal Taneja, Naveen Kumar, Pearson.
3. Python Web Development with Django By Jeff Forcier, Paul Bissex, Wesley J Chun, Addison-Wesley Professional.
4. Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2011, Cengage Learning
5. Allen B. Downey , “ Think Python: How to Think Like a Computer Scientist”, Second Edition, Shroff/O’Reilly Publishers
6. John V Guttag. “Introduction to Computation and Programming Using Python”, Prentice Hall of India.

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SEMESTER IV

4KE01 ARTIFICIAL INTELLIGENCE

Course Prerequisite: Basic concepts of Data Structures, Algorithms, Programming

Course Objectives:

1. To present an overview of Artificial Intelligence (AI) principles and approaches.
2. To understand the historical evolution of Artificial Intelligence.
3. To learn various searching techniques and identify to address a particular problem).

Course Outcomes : On completion of the course, the students will be able to

1. Explain concepts of Artificial Intelligence and different types of intelligent agents and their architecture.
2. Formulate problems as state space search problem & efficiently solve them.
3. Summarize the various searching techniques, constraint satisfaction problem and example problems - game playing techniques.
4. Apply AI techniques in applications which involve perception, reasoning and learning.
5. Compare the importance of knowledge, types of knowledge, issues related to knowledge acquisition and representation.

Unit I: Introduction to AI (Hours: 7)

Introduction : What Is AI?, The Foundations of Artificial Intelligence, The History of Artificial Intelligence, The State of the Art, Risks and Benefits of AI,

Intelligent Agents: Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents

Unit II: Problem Solving Through AI (Hours: 7)

Introduction, Representation the AI Problems, Production System, Algorithm of Problem Solving, Examples of AI Problems, Nature of AI Problems

Unit III: Uninformed Search Strategies (Hours: 6)

Problem-Solving Agents, Example Problems, Search Algorithms, **Uninformed Search Strategies**: Breadth-First Search, Uniform-Cost Search, Depth First Search, Bidirectional Search, Depth Limited Search, Iterative Deepening Depth-First Search

Unit IV: Informed Search Strategies (Hours: 7)

Basic Concept of Heuristic Search and Knowledge, Designing of Heuristic Function, **Heuristic Search Strategies:** Generate-And-Test, Best-First Search, Problem Reduction, Hill Climbing, Constraint Satisfaction, Means-Ends-Analysis

Unit V: Adversarial Search & Games (Hours: 7)

Game Theory, Optimal Decisions in Games, Mini-Max Search, Alpha Beta Pruning, Additional Refinements, Monte Carlo Tree Search, Stochastic Games, Partially Observable Games, Limitations of Game Search Algorithms

Unit VI: Introduction to Knowledge (Hours: 6)

Introduction, Types of Knowledge, Knowledge Representation, Knowledge Storage, Knowledge Acquisition, Knowledge Organization and Management, Basic Concepts of Knowledge Engineering

Text Books:

1. Artificial Intelligence: A Modern Approach by Stuart Russell & Peter Norvig (Pearson - 4th Ed.)
2. Artificial Intelligence by Ela Kumar (IK International Publishing House Pvt. Ltd.)

Reference Books:

1. Artificial Intelligence by Elaine Rich and Kevin Knight (Tata McGraw Hill - 3rd Ed.)
2. A First Course in Artificial Intelligence by Deepak Khemani (Tata McGraw Hill - 1st Ed.)
3. Artificial Intelligence and Expert Systems by Patterson (PHI)
4. Introduction to Artificial Intelligence by RajendraAkerkar (PHI Learning Pvt. Ltd.)

4KE02 COMPUTER NETWORKS

Course Prerequisite: Computer and Data Communication Requirements

Course Objectives:

1. To understand the building blocks of digital communication system.
2. To prepare mathematical background for communication signal analysis.
3. To understand and analyze the signal flow in a digital communication system
4. To analyze error performance of a digital communication system in presence of noise and other interferences.
5. To evaluate the errors using various error detection & correction techniques.
6. To understand network based protocols in data communication and networking.

Course Outcomes: On completion of the course, the students will be able to

1. Describe data communication Components, Networks, Protocols and various topology based network architecture
2. Design and Test different encoding and modulating techniques to change digital –to- digital conversion, analog-to-digital conversion, digital to analog conversion, analog to analog conversion,
3. Explain the various multiplexing methods and evaluate the different error detection & correction techniques.
4. Illustrate and realize the data link control and data link protocols.
5. Describe and demonstrate the various Local area networks and the IEEE standards.

Unit I: Introduction to Data Communication (Hours: 7)

Introduction: Data Communication, Components, Networks, Network types: Local Area Network,Wide Area Network, Switching, The Internet, Accessing the Internet, Standards and Administration: Internet Standards, Internet Administration, Network Models:TCP/IP Protocol Suite,TheOSI Model, Transmission media: Introduction, Guided media & Unguided media-Wireless. Switching: Introduction, Circuit Switched Networks, Packet Switching.

Unit II: Data link Layer (Hours: 6)

Data Link Layer: Introduction, Nodes & Links, Services , Two categories of link, Two sub-layers, Error detection and correction: Introduction, Block Coding, Cyclic codes, Checksum, Forward Error Correction, Data link control: DLC services, Data-Link Layer Protocol, HDLC, Point-To-Point Protocol, Media Access Control (MAC): Random Access, Controlled Access, Channelization.

Unit III: Network Layer (Hours: 7)

Introduction to Network layer Network Layer Services: Packetizing, Routing and Forwarding, Other Services Packet Switching: Datagram Approach: Connectionless Service, Virtual-Circuit Approach: Connection-Oriented Service , Network Layer performance: Delay, Throughput, Packet Loss, Congestion Control, IPV4 Address: Address Space, Classful Addressing, Classless Addressing, Dynamic Host Configuration Protocol (DHCP), Network Address Resolution (NAT), Forwarding of IP packets: Forwarding Based on Destination Address, Forwarding Based on Label, Routers as Packet Switches

Unit IV: Unit Title: Network Layer Protocol (Hours: 7)

Network Layer Protocols: Internet Protocol (IP),Datagram Format, Fragmentation, Security of IPv4 Datagrams,ICMPV4: Messages, Debugging Tools, ICMP Checksum, Mobile IP: Addressing, Agents, Three Phases, Inefficiency in Mobile IP, Routing algorithms: Distance Vector routing, Link State Routing, IPV6 Addressing: Representation, Address Space, Address Space Allocation, Auto configuration, Renumbering, Transition from IPV4 to IPV6: Strategies, Use of IP Addresses

Unit V: Unit Title: Transport Layer (Hours: 6)

Introduction to Transport layer: Introduction, Transport-Layer Services, Connectionless and Connection-Oriented Protocols, Transport-Layer Protocols: Simple Protocol, Stop-and-Wait Protocol, Go-Back-N Protocol (GBN), Selective-Repeat Protocol, Bidirectional Protocols: Piggybacking,User Datagram Protocols: User Datagram, UDP Services, UDP Applications,Transmission Control Protocol: TCP Services, TCP Features , Segment, A TCP Connection, State Transition Diagram, Windows in TCP, Flow Control, Error Control, TCP Congestion Control, TCP Timers, Options, SCTP: SCTP Services, SCTP Features

Unit VI: Unit Title: Application layer (Hours: 7)

Introduction to Application layer:Providing Services, Application-Layer Paradigms, Client-Server Programming: Application Programming Interface, Using Services of the Transport Layer, Iterative Communication Using UDP, Iterative Communication Using TCP, Concurrent Communication, World wide web and HTTP: World Wide Web, Hyper-Text Transfer Protocol (HTTP) FTP: Two Connections, Control Connection, Data Connection, Security for FTP, Electronic Mail: Architecture, Web-Based Mail, E-Mail Security, Domain Name System (DNS):Name Space, DNS in the Internet, Resolution, Caching, Resource Records, DNS Messages, Registrars, Security of DNS, Network Management: Introduction. Configuration Management, Fault Management, Performance Management, Security Management, Accounting Management, SNMP: Managers and Agents, Management Components, ASN.1: Language Basics, Data Types, Encoding.

Text Book: Behrouz A. Forouzan: Data Communication and Networking, (5/e) (TMH

Reference Books:

1. William Stallings: Data & Computer Communications, 6/e, Pearson Education
2. William L. Schweber : Data Communication, McGraw Hill
3. J.Freey : Computer Communication & Networks, AEW Press
4. D. Corner: Computer Networks & Internet, Pearson Education.

4KE03 OPERATING SYSTEM

Course Pre-requisite: Discrete Structures, Data Structure, Any programming Language

Course Objectives:

1. To make students aware of the kernel and shell structure of the operating systems.
2. To make students aware of the purpose, structure and functions of operating systems
3. To equip students with understanding of the various scheduling algorithms in OS.
4. To make students aware of understanding of memory management in different OS.

Course Outcomes : On completion of the course, the students will be able to

1. Explain memory management issues like external fragmentation, internal fragmentation.
2. Illustrate multithreading and its significance.
3. List various protection and security mechanisms of OS.
4. Analyze and solve the scheduling algorithms.
5. Analyze the deadlock situation and resolve it.
6. Compare various types of operating systems

Unit I: Introduction to OS : (Hours: 7)
Introduction: Operating System definition, OS Evolution, Components and Services, Process Concept, Process Scheduling, Operations on Processes, Cooperating Processes, Interprocess Communication, Threads Overview, Multithreading Models, Threading Issues, Java Threads

Unit II: Process Scheduling (Hours: 7)
Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time; Scheduling algorithms: Pre-emptive and Non pre-emptive, FCFS, SJF, RR, Priority, Multilevel Queue, Multilevel Feedback Queue Scheduling

Unit III: Process Synchronization (Hours: 6)
Process Synchronization Basics: The Critical-Section Problem, Synchronization Hardware, Semaphores, Monitors, Deadlocks: Definition & Characterization, Deadlocks Prevention, Avoidance, Detection and Recovery from Deadlock

Unit IV: Memory Management (Hours: 7)
Memory Management Background, Swapping, Contiguous Memory Allocation Schemes, Paging, Segmentation, Virtual Memory Management: Background, Demand paging scheme, Process Creation, Page Replacement Policies, Allocation of Frames, Thrashing

Unit V: Unit Title: File System (Hours: 7)
File-System Interface; Directory Structure, File-System Mounting, File Sharing &Protection, File-System Structure, File-System Implementation, Directory Implementation, Allocation Methods, Free-Space Management. File Recovery

Unit VI: Unit Title: I/O System (Hours : 6)
I/O Systems : Overview, I/O Hardware, Application I/O Interface, Kernel I/O Subsystem, Transforming I/O to Hardware Operations , Disk Scheduling, Disk Management, Swap-Space Management, RAID Structure.

Text Book : Avi Silberschatz, P.B.Galvin, G.Gagne: “Operating System Concepts” (9/e) John-Wiley & Sons.

Reference Books:

1. A.S.Tanenbaum “Modern Operating Systems” Pearson Education.
2. William Stallings “Operating Systems” Prentice-Hall.
3. D. M. Dhamdhere “Operating Systems” Tata McGraw-Hill.
4. P. Balkrishna Prasad: “Operating Systems” Scitech Publications (I) Pvt.

4KE04 MICROPROCESSOR & INTERFACING

Course Pre-requisite: Computer Programming and Number System

Course Objectives:

1. To explore 8086 microprocessor and its architecture.
2. To introduce interfacing techniques of 8086 microprocessor.
3. To introduce basics of Internet of Things

Course Outcomes : On completion of the course, the students will be able to

1. Describe 8086 microprocessor and its architecture; also understand instruction processing during the fetch-decode-execute cycle.
2. Design and Test assembly language programs using 8086 microprocessor instruction set.
3. Demonstrate the implementation of standard programming constructs, including control structures and functions, in assembly language.
4. Illustrate and realize the Interfacing of memory & various I/O devices with 8086 microprocessor.
5. Explain the basic concepts of Internet of Things

Unit I: 8086 Architecture (Hours: 7)
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 (Hours: 7)
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 Instruction Set (Hours: 6)
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.

Unit IV: Subroutines& Macros (Hours: 7)
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 Interrupt (Hours: 7)
8086 Interrupts types, priority and instructions. Interrupt vector table, External hardware-interrupt interface signals & interrupts sequence. Software interrupts. Non-maskable interrupts. 8086 microprocessor interrupt programming.

Unit VI: Internet of Things (IoT) (Hours: 6)
Internet of things: An overview, IoT conceptual framework, IoT Architectural View, Technology behind IoT, Sources of IoT, M2M communication, Examples of IoT.

Text Books:
1. A. K. Ray & K. M. Bhurchandi: Advanced Microprocessors & Peripherals, Third Edition (TMH).
2. Raj Kamal: Internet of Things, Architecture and Design Principals, McGraw Hill Education (India) Pvt Ltd

Reference Books:
1. W. A. Triebel& Avatar Singh: The 8088/8086 Microprocessors (4e) (PHI /Pearson Education)
2. Liu & Gibson: The 8088/8086 Microprocessor Architecture Programming and Interface (6/e) (PHI)

4KE05 THEORY OF COMPUTATION

Course Pre-requisite: Discrete Mathematics, Data Structures

Course Objectives:
1. To understand different automata theory and its operation.
2. To understand mathematical expressions for the formal languages
3. To study computing machines and comparing different types of computational models
4. To understand the fundamentals of problem decidability and Un-Decidability

Course Outcomes : On completion of the course, the students will be able to
1. To construct finite state machines to solve problems in computing.
2. To write regular expressions for the formal languages.
3. To construct and apply well defined rules for parsing techniques in compiler
4. To construct and analyze Push Down, Turing Machine for formal languages
5. To express the understanding of the Chomsky Hierarchy.
6. To express the understanding of the decidability and un-decidability problems.

Unit I: Finite State Machines (Hours: 8)
Alphabet, String, Formal and Natural Language, Operations, Definition and Design DFA (Deterministic Finite Automata), NFA (Non Deterministic Finite Automata), Equivalence of NFA and DFA: Conversion of NFA into DFA, Conversion of NFA with epsilon moves to NFA, Minimization Of DFA, Definition and Construction of Moore and Mealy Machines, Inter-conversion between Moore and Mealy Machines. Minimization of Finite Automata. (Construction of Minimum Automaton)

Unit II: Regular Expression and Regular Grammar (Hours: 8)
Definition and Identities of Regular Expressions, Construction of Regular Expression of the given Language, Construction of Language from the RE, Conversion of FA to RE using Arden's Theorem, Inter-conversion RE to FA, Pumping Lemma for RL, Closure properties of RLs(proofs not required), Regular grammar, Equivalence of RG (RLG and LLG) and FA.

Unit III: Context Free Grammar and Languages (Hours: 8)
Introduction, Formal Definition of Grammar, Notations, Derivation Process: Leftmost Derivation, Rightmost Derivation, Derivation Trees, Construction of Context-Free Grammars and Languages, Pumping Lemma for CFL, Simplification of CFG, Normal Forms (CNF and GNF), Chomsky Hierarchy.

Unit IV: Pushdown Automata (Hours: 8)

Introduction and Definition of PDA, Construction of PDA, Acceptance of CFL, Equivalence of CFL and PDA: Inter-conversion , Introduction of DCFL and DPDA, Enumeration of properties of CFL, Context Sensitive Language, Linear Bounded Automata.

Unit V: Turing Machines (Hours: 8)

Formal definition of a Turing Machine, Design of TM, Computable Functions, Church's hypothesis, Counter machine, Variants of Turing Machines: Multi-tape Turing machines, Universal Turing Machine.

Unit VI: Decidability and Un-Decidability (Hours: 8)

Decidability of Problems, Halting Problem of TM, Un-Decidability: Recursive enumerable language, Properties of recursive & non-recursive enumerable languages, 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.

Reference Books:

1. Rajesh K. Shukla: Theory of Computation, CENGAGE Learning, 2009.
2. K V N Sunitha and N Kalyani: Formal Languages and Automata Theory, McGraw Hill,2010
3. Lewis H.P. and Papadimition C.H.: Elements of Theory of Computation
4. Mishra &Chandrashekharan: Theory of Computation
5. C.K.Nagpal: Formal Languages and Automata Theory, Oxford University Press, 2011.
6. VivekKulkarni : Theory of Computation, OUP India, 2013

4KE06 COMPUTER NETWORK - LAB

Course Pre-requisite: Computer and Data Communication Requirements

Course Objectives:

1. To understand the working principle of various communication protocols
2. To understand and analyze the signal flow in a digital communication system.
3. To analyze error performance of a digital communication system in presence of noise and other interferences.
4. To evaluate the errors using various error detection & correction techniques.
5. To understand network based protocols in data communication and networking.

Course Outcomes : On completion of the course, the students will be able to

1. Analyze performance of various communication protocols
2. Implement Configure various network protocols.
3. Compare IP Address classes of networks.

List of Experiments:

This is a sample list of Experiments; **minimum 12 experiments** are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. To study various LAN topologies and their creation using network devices, cables and computers. .
2. To connect the computers in Local Area Network.
3. Familiarization with Networking Components and devices: LAN Adapters, Hubs, Switches, Routers etc.
4. Write a program of bit stuffing used by Data Link Layer
5. Write a program to implement CRC(Cyclic Redundancy Check)
6. Write a program to implement Checksum
7. Write a program to implement Sliding window
8. Configure Internet connection and use IP-Config, PING / Tracer and Net stat utilities to debug the network issues.
9. Configuration of TCP/IP Protocols in Windows and Linux.
10. Transfer files between systems in LAN using FTP Configuration, install Print server in a LAN and share the printer in a network.
11. Write a C Program to determine if the IP Address is in Class A, B, C, D, or E
12. Write a C Program to translate Dotted Decimal IP Address into 32 Bit Address.
13. Configure Host IP, Subnet Mask and Default Gateway in a System in LAN(TCP/IP Configuration)

4KE07 OPERATING SYSTEM - LAB

Course Pre-requisite: Basic computer programming

Course Objectives:

1. To make students aware of the kernel and shell structure of the operating systems.
2. To make students aware of the purpose, structure and functions of operating systems
3. To equip students with understanding of the various scheduling algorithms in OS.
4. To make students aware of understanding of memory management in different OS.

Course Outcomes : On completion of the course, the students will be able to

1. Explain memory management issues like external fragmentation, internal fragmentation.
2. Illustrate multithreading and its significance.
3. List various protection and security mechanisms of OS.
4. Analyze and solve the scheduling algorithms.
5. Analyze the deadlock situation and resolve it.
6. Compare various types of operating systems

List of Experiments:

This is a sample list of Experiments, **minimum 12 experiments** are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

4KE08 MICROPROCESSOR & INTERFACING - LAB

Course Pre-requisite: Computer Programming, Number System

Course Objectives: In this lab student will learn about' Microprocessor and Interfacing' in regards to digital computer, microprocessor architecture, programming with 8086 microprocessor and different peripherals**.**

Course Outcomes : On completion of the course, the students will be able to

1. Analyze the internal workings of the microprocessor
2. Design and develop programs in Assembly Language Programming
3. Describe 8086 microprocessor and its architecture; also understand instruction processing during the fetch-decode-execute cycle.
4. Design and Test assembly language programs using 8086 microprocessor instruction set.
5. Demonstrate the implementation of standard programming constructs, including control structures and functions, in assembly language
6. Illustrate and realize the Interfacing of memory & various I/O devices with 8086 microprocessor

List of Experiments:

This is a sample list of Experiments; **minimum 12 experiments** are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. Installation and Introduction of TASM Assembler.
2. Write a program for addition of two 8-bits numbers and two 16-bits numbers.
3. Write a program for subtraction of two 8-bits numbers and two 16-bits numbers.
4. Write a program for multiplication of two 8-bits numbers.
5. Write a program for division of two 8-bits numbers
6. Write a program to check whether a given number is even or odd.
7. Write a program to demonstrate Logical Group and Shift Rotate Instructions.
8. Write a program to check whether a given number is positive or negative.
9. Write a program to find greatest of two 8-bits signed &unsigned numbers.
10. Block Transfer Program
11. Write a program to find Factorial of a number using loop instruction.
12. Write a program to find cube of a given number using Subroutine.
13. Write a program to find square of a given number using Subroutine.
14. Write a program to find square of a given number using Macro.
15. Write a program to find whether the string is palindrome or not.
16. To convert BCD Number Program
17. Write a program to perform Reverse of the String
18. Write a program to transfer 10-bytes from one memory bank to another memory bank.
19. Program for sorting an array for 8086 microprocessor.
20. To write an assembly language program to arrange the given numbers in descending order.
21. Program for searching for a number/character in a string for 8086 microprocessor.

4KE09 C-SKILL-LAB II

Course Pre-requisite: Basic knowledge of scripting language, Programming language, Basic understanding of Electronic concepts.

Course Objectives: To develop an ability to design and implement static and dynamic website and to develop embedded systems with the help of Raspberry Pi/Ardino.

Course Outcomes : On completion of the course, a student will be able to

1. Develop client server program and web applications
2. Make use of project-based experience for web application development.
3. Create embedded systems using Raspberry Pi/Ardino

List of Experiments:

This is a sample list of Experiments, **minimum 12 experiments** are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. Introduction to PHP and configure it to work with Apache Web Server.
2. Design web pages for your college containing a description of the courses, departments, faculties, library etc, use href, list tags.
3. Create your class timetable using table tag.
4. Create user Student feedback form (use textbox, text area , checkbox, radio button, select box etc.)
5. Create your resume using HTML tags also experiment with colors, text , link , size and also other tags you studied.
6. Design a web page of your home town with an attractive background color, text color, an Image, font etc. (use internal CSS).
7. Develop a JavaScript to display today's date.
8. Write a JavaScript to design a simple calculator to perform the following operations: sum, product, difference and quotient.
9. Write an HTML page that contains a selection box with a list of 5 countries. When the user selects a country, its capital should be printed next to the list. Add CSS to customize the properties of the font of the capital (color, bold and font size).
10. Write a PHP program to keep track of the number of visitors visiting the web page and to display this count of visitors, with proper headings.
11. Write a PHP program to display a digital clock which displays the current time of the server.
12. Write the PHP programs to do the following: a. Implement simple calculator operations. b. Find the transpose of a matrix.
13. Write a PHP program to sort the student records which are stored in the database using selection sort.
14. Study and Install IDE of Arduino and different types of Arduino.
15. Write program using Arduino IDE for Blink LED.
16. Write Program for RGB LED using Arduino.
17. Study the Temperature sensor and write a Program for monitor temperature using Arduino.
18. Study and Implement RFID, NFC using Arduino. • Study and implement MQTT protocol using Arduino.
19. Study and Configure Raspberry Pi.
20. WAP for LED blink using Raspberry Pi.
21. Study and Implement Zigbee Protocol using Arduino / Raspberry Pi.
22. Create Smart Plugs with Arduino and Raspberry Pi.
23. Interfacing digital sensors with raspberry pi.
24. Creating a webpage to control I-O devices, Reading data from sensor and passing to web page.
25. Implement a program to access Analog sensor via wifi with HTML Web server.

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SYLLABUS OF B.E. SEM. III & IV (I.T.) [C.B.C.S.]

Semester-III

3IT01/3KS01/3KE01 ENGINEERING MATHEMATICS-III

Course Objectives:-

- Find general solutions of linear differential equations with constant coefficients using the roots of the auxiliary equation.
- Calculate the Laplace Transform of basic functions using the definition.
- Apply Laplace transform to find solution of linear differential equations. And solve problems related to Fourier Transform
- Compute and interpret the correlation coefficient.
- Compute the Analytic function and Complex Analysis.
- Perform vector differentiation and integration to analyze the vector fields and apply to compute line, surface and volume integrals.

Course Outcomes:

After successfully completing the course, the students will be able to:

1. Demonstrate the knowledge of differential equations and linear differential equations .
2. Apply Laplace transform to solve differential equations.
3. Demonstrate the use of Fourier Transform to connect the time domain and frequency domain.
4. Demonstrate the basic concepts of probability and statistics.
5. Apply the knowledge of Complex Analysis.
6. Apply the knowledge of vector calculus to solve physical problems.

SECTION-A

UNIT-I: **Ordinary differential equations**:- Complete solution, Operator D, Rules for finding commplementary function, the inverse operator, Rules for finding the particular integral, Method of variation of parameters, Cauchy's and Legendre's linear differential equations. (7)

UNIT-II: **Laplace Transform:-** 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 . (7)

UNIT-III: **a) Applications of Laplace Transform:-** Solution of Linear differential equations, Simultaneous differential equation by Laplace transform method

b) Fourier Transform:- Definition, standard forms, Fourier transforms, properties of Fourier transforms, Convolution theorem, Fourier sine and Fourier cosine transforms and integrals, inverse Fourier transforms.(7)

SECTION-B

UNIT-IV: **a) 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) P p + Qq = R (Lagranges Form); (v) z = px + qy + f(p,q) (Clairauts form)

b) Statistics Curve fitting: Least Square Method, Coefficient of Correlations, Lines of Regression. (7)

UNIT-V: **Complex Analysis: -** Functions of complex variables, Analytic function, Cauchy- conditions, Harmonic function, Harmonic conjugate functions, Milne's Method, conformal mappings (translation, rotation, magnification and bilinear transformation), Expansion of function in Taylor's and Laurent's series. (7)

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 (without proof), line, surface, volume integrals, irrotational Solenoidal Vector fields. (7)

Text Books:

1. Elements of Applied Mathematics Vol. II by P. N. Wartikar and J.N. Wartikar,
2. Higher Engg. Mathematics by B.S. Grewal.

Reference Books:

1. Advancing Engg. Mathematics by E.K.Kreyzig.
2. A text book of Differential Calculus by Gorakh Prasad.
3. A Text Book of Applied Mathematics by P.N.Wartikar and J.N.Wartikar.
4. Engineering Mathematics by Ravish R Singh, Mukul Bhatt.

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3IT02 Discrete Structure & Graph Theory

Course Objectives:

- Increase Critical thinking and analytical problem-solving skills and awareness of computer related ethics to discrete Mathematical Logic.
- Apply appropriate discrete mathematical concepts and operations to interpret data and to solve problems.
- Identify problem and analyze it in terms of its significant parts and the information needed to solve problems based on sets, relation, function and recursion.
- Formulate and evaluate possible solutions to problem and select the chosen solution based on Boolean algebra.
- Construct graphs and trees, interpret them, and draw appropriate conclusion.

Course Outcomes:

After successfully completing the course, the students will be able to:

- Identify basic terminology of Mathematical Logic, Theory of inference & Predicate calculus.
- Identify, illustrate, and solve engineering problems on the basis of set theory.
- Identify and Design an Algebraic Structures and groups
- Examine and formulate the concept of Lattices & Boolean Algebra to solve engineering problems.
- Design and interpret data using graphs, trees and related algorithms.

UNIT I : Mathematical Logic : Statements & Notation , Connectives , Normal forms , The Theory of Inference for the Statement Calculus , Predicate Calculus , The Inference 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, Application of Residue Arithmetic to Computers.

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, Coloring Graphs.

UNIT VI: Trees, Tree Searching, Minimal spanning trees, Simple Precedence Grammars, , rooted tree, expression tree, B tree, Distance between spanning trees of a graph. PERT and Related Techniques.

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

REFERENCE BOOKS:

1 G Shankar Rao, "Discrete Mathematical Structures", New Age International, 2002 ISBN:81-224-1424-9.
2 Kenneth H. Rosen, " Discrete Mathematics and its Applications", 7th Edition, McGraw Hill Edition.
3. S.K. Chakraborty & B.K.Sarkar ;"Discrete Mathematics" OXFORD.
4. Bernard Kolman,Robert C.Busby, Sharon Ross: "Discrete Mathematical Structures" Third Edition PHI.

3IT03 OBJECT ORIENTED PROGRAMMING

Course 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.

Course Outcomes:

- Apply Object Oriented approach to design software.
- Implement programs using classes and objects.
- Specify the forms of inheritance and use them in programs.
- Analyze polymorphic behavior of objects.
- Design and develop GUI programs.
- Develop Applets for web applications

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, Polymorphism, Method Overloading Method Overriding, super keyword, final keyword, Abstract class. **Interfaces, Packages and Enumeration:** Interface, Packages, java.lang package, Enum type.

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.

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, Text field 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).

3IT04 ASSEMBLY LANGUAGE PROGRAMMING

Course Objectives :

1. Able to understand the architecture and organization of microprocessor 8086/8088 .
2. Able to understand different addressing modes & instruction format of 8086 & apply in 8086 programming.
3. Able to understand instruction set, control flow instruction and apply the fundamentals of assembly level programming of microprocessor through use of any Open Source Software.(TASM,NASM etc.)
4. Able to understand stack, subroutine. Recursion & apply in 8086 programming.

Course Outcomes ;

After successful completion of this course the student will be able to

1. To draw and explain internal architecture of 8086 with its register organization.
2. Able apply instruction format 7 addressing modes in 8086 programming.
3. Able to apply control flow instruction in 8086 programming through use of any Open Source Software.(TASM,NASM etc.)
4. Able to apply stack & subroutine concept in 8086 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.

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 instructions: logical instructions, Shift and rotate instructions 8086 programming: 8086 flag register and Flag control instructions control flow and jump instructions, Loops & loop handling instructions. 8086 programming using these instructions.

Unit IV: Stack and Subroutines,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.

Unit VI: 8086 Interrupt Mechanism, types and priority , Interrupt vector table, Interrupt Instructions, External hardware-interrupt interface signals & interrupts sequence. Programmable Interrupt Controller 8259: Block & pin diagram, internal architecture, Software interrupts, Nonmaskable interrupt, Internal Interrupt functions.

Text Book: Avtar Singh & Walter A. Triebel: The 8088 and 8086 Microprocessors, Programming, Interfacing, Software, Hardware, and Applications, PHI, 2003.

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.

3IT05 ANALOG AND DIGITAL ELECTRONICS

Course Objectives :

- To understand the basic operation and applications of analog devices such as BJT and JFET
- To introduce analog ICs like Op-Amp and Timer
- To study and develop skills to design basic combinational and Sequential logic circuits
- To lay foundation for understanding computer architecture and organization

Course Outcomes :

On completion of the course learner will be able to-

- Understand the basic applications of BJT.
- Get acquainted with analog ICs like Op-Amp IC-741 and Timer IC-555
- Discriminate the working of sinusoidal and non-sinusoidal waveform generators.
- Apply the concept of K-map to simplify logic expressions.
- Design and implement Combinational circuits
- Explore the applications of Sequential circuits

UNIT I:

Introduction to Analog Circuits: Transistor as an amplifier. Need of biasing, Potential divider bias circuit, Faithful amplification of CE amplifier, Transistor as an electronic switch, Construction and working of JFET.

UNIT II:

Operational Amplifier: Block diagram of Op-Amp, ideal Op-Amp parameters. Applications of op-amp: Inverting & Non-Inverting Amplifier, Voltage follower, Summing Amplifier, Subtractor, Comparator.

UNIT III:

Wave Generators:

Transistorized Oscillators: Barkhausen Criterion, R-C Phase Shift Oscillator, Transistor crystal oscillator Timer IC 555: Block diagram**,** working, Astable multivibrator, Monostable multivibrator.

UNIT IV: Introduction to Digital Circuits: Logic gates, Standard logic expression forms, SOP, POS, Logic expression realization & minimization using K-map (upto 4 variables only). Half Adder, Full Adder, Half subtractor, Full subtractor.

UNIT V: Logic Circuits: Difference between Combinational and Sequential circuits, Code convertors (BCD, Excess-3 and Gray), Multiplexers, De-multiplexers and Decoders.

Flip Flops: SR flip-flop, JK flip-flop, D flip-flop and T flip-flop.

UNIT VI: Sequential Circuits: Difference between Asynchronous & Synchronous sequential circuits, Asynchronous counters, Mod counter, Up-Counter, Down-Counter. Working of shift Registers, SISO, SIPO, PISO and PIPO. Application of Shift Register as a Ring Counter.

Text Books:

1. V.K.Mehta, Rohit Mehta: Principles of Electronics (S.CHAND)
2. Gayakwad R.A.: Op-Amps & Linear Integrated circuits (PHI)
3. Jain R.P. Modern Digital Electronics (TMH)

Reference Books:

1. N.N.Bhargava, D.C.Kulshreshtha, S.C.Gupta: Basic Electronics & Linear circuits, (TTTI)
2. S. Salivahanan: Electronics Devices & circuits, Third Edition
3. John P. Hayes: Introduction to Digital Logic Design{Pearson)
4. Anand Kumar: Fundamentals of Digital Circuits (PHI)

3IT06 OBJECT ORIENTED PROGRAMMING - LAB

Practical based on the syllabus of Object Oriented Programming (3IT03)

Following list is an indicative list and the subject teacher is free to design his/her own list of experiments based on the syllabus of Object Oriented Programming (3IT03)

1. Write a program to demonstrate various data-types used in java and also perform the type casting.
2. Demonstrate the use of this keyword in java.

3. Write a program in java to demonstrate various OOP'S (Inheritance, Polymorphism, and Abstraction) concepts in java.
4. Create User defined Packages in Java
5. Write a program in java to set the priority of thread in order.
6. Demonstrate the strings are immutable in java and create mutable strings in java.
7. Write a program in java which demonstrates the exception caught because of invalid input.
8. Write java program to create a registration form using AWT.
9. Write a Java program to demonstrate the use of AWT components namely buttons, labels, text boxes, menus with event handling.
10. Write a program in java to copy certain text of one file to another newly created file in java using java I/O operations.
11. Write a program in java to connect java to oracle or MySql Database using JDBC drivers
12. Demonstrate the various List interfaces in java.
13. Write a program in java to show use of generic classes and methods

Students are advised to explore the Virtual Labs Developed by Ministry of Human Resource Development Government of India available at http://www.vlab.co.in/broad-area-computer-science-and-engineering

3IT07 ASSEMBLY LANGUAGE PROGRAMMING - LAB

Practical based on the syllabus of Assembly Language Programming (3IT04)

Following list is an indicative list and the subject teacher is free to design his/her own list of experiments based on the syllabus of Assembly Language Programming (3IT04). Study experiments are highly discouraged.

1. Executing various debugging commands.
2. Write a program to manipulate the two given operands with general arithmetic operators +, -, *, /
3. Write a program in TASM to store given a number XY i.e. 0X in BX register and 0Y in CX register
4. Program for block transfer from one segment to another segment
5. Write a program in TASM to find out no. of positive and negative numbers from a given series of a signed no.
6. Program to sort the given array in ascending and descending order.
7. Program for Addition/Subtraction of 2 numbers using FAR/NEAR procedure
8. Program to find out Factorial of any given number using recursive procedure.
9. Program to add two BCD numbers.
10. Program for BCD to HEX conversion.
11. Program for HEX to BCD conversion.
12. Program to display System Date/Time.
13. Program to find whether no. is Prime or not.
14. Execute various commands on 8086 Microprocessor Trainer kit.

Students are advised to explore the Virtual Labs Developed by Ministry of Human Resource Development Government of India available at http://www.vlab.co.in/broad-area-computer-science-and-engineering

3IT08 ANALOG & DIGITAL ELECTRONICS - LAB

Practical based on the syllabus of Analog & Digital Electronics (3IT05)

Following list is an indicative list and the subject teacher is free to design his/her own list of experiments based on the syllabus of Analog & Digital Circuits (3IT05)

1) To study the input and output characteristics of transistor connected in Common Emitter (CE) configuration.
2) Implementation of Op-amp as an inverting amplifier.
3) Implementation of Op-amp as a non-inverting amplifier.
4) Study of Astable Multivibrator using IC 555 and find the frequency of output square wave.
5) To study and verify the Truth Table of different Logic gates using TTL ICs (7400, 7402, 7404, 7408, 7427, 7432, 7486 etc.).
6) Study and verify the truth table of Half adder and Full adder using logic gates.
7) Study and verify the truth table of Half Subtractor and Full Subtractor using logic gates
8) Implementation of 4bit parallel adder using IC-7483 .

9) Study the working of Multiplexer using one of the ICs like 74151A, 74152, 74153, 74157.
10) Study the working of De-Multiplexer and Decoder using one of the ICs like74138,74154,74156
11) Study the working and Verification of truth table of SR, JK, T and D Flip Flops.
12) Implementation of 3 bit asynchronous counter using JK Flip Flop.
13) Implementation of 3 bit Shift Register using D Flip Flop.

Students are advised to explore the Virtual Labs Developed by Ministry of Human Resource Development Government of India available at http://www.vlab.co.in/broad-area-computer-science-and-engineering

3IT09 COMPUTER SKILL LAB - I

This practical lab must cover the following aspects for Python:

1. Basics for python programming that consists of the study of various data types in Python, implementation of control structures and loops, functions (pre-defined and user defined), file handling commands and functions.
2. The lab must also cover the concepts related to networking using python.
3. OOP concepts study and its programming using python libraries.
4. The lab must cover the part of UI deigning using python (Django, Flask, etc.).
5. The plotting of graphs using various libraries such as (matplotlib, seaborn, etc.).
6. The lab must also give a brief introduction regarding the a concept of machine learning or a learning algorithm implementation.
7. An introduction to the data science track can be given by conducting and including an experiment on data manipulation using (Numpy, Pandas, etc.)

The following list is an indicative list and the subject teacher is free to design his/her own list of experiments based on Python, R etc.

1. To study the various data types in Python.
2. To study dictionaries, data frames and tuples in Python
3. To study the control structures and loops in Python.
4. To study the various Functions (pre-defined and User Defined) in Python.
5. To study the various File handling and i/o in Python.
6. To study the concepts related to Networking in Python.
7. To study various OOP concepts using Python.
8. To study UI design using various libraries in Python.
9. To Study Plotting of Graphs using the various libraries in Python.
10. To study basic data manipulation using Python Libraries.
11. To study a learning algorithm using Python.
12. Mini Project (based on all the above mentioned concepts)

Students are advised to explore the Virtual Labs Developed by Ministry of Human Resource Development Government of India available at http://www.vlab.co.in/broad-area-computer-science-and-engineering

SEMESTER - IV

4IT01 COMPUTER ORGANIZATION & ARCHITECTURE

Course Objectives :

- How Computer Systems work & the basic principles.
- Instruction Level Architecture and Instruction Execution.
- The current state of art in memory system design.
- How I/O devices are accessed and its principles.
- To provide the knowledge on Instruction Level Parallelism.
- To impart the knowledge on micro programming.
- Concepts of advanced pipelining techniques.

Course outcomes :

- Ability to understand the basic structure of computer including functional units, addressing modes, stacks, queues, subroutines, etc.
- Ability to understand the basic processing unit of computer, execution of a complete instruction.
- Ability to understand about input/output organization of computer including interrupt, DMA, buses, interfaces, etc.
- Ability to understand the concepts of RAM, ROM, cache memory, virtual memory.
- Ability to understand number representation, Booth's algorithm, different peripheral devices.

Unit-I Basic structure of computer: hardware & software, 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. Micro-programmed control; microinstructions.

Unit-III I/O organization: accessing I/O devices, interrupts, direct memory access, bus arbitration: centralized and distributed. I/O hardware: processor bus (Synchronous & Asynchronous).

Unit-IV Memory Unit: basic concepts, semiconductor RAM memories, internal organization, static & dynamic RAMs, ROMs. speed, size & cost considerations.

Unit-V Cache memories: performance considerations. Virtual memories, address translation. Multiprocessor: The Use of Multiprocessors, Symmetric Multiprocessor and Clusters.

Unit-VI Arithmetic; number representation. Design of fast adders, signed addition and subtraction. Multiplication of positive numbers, sequential multiplication, fast multiplication, Booths' algorithm for multiplication, integer division, restoring and non-restoring division.

Text-Books:

1. "Computer Organization" 5th Edition by V.Carl Hamacher & S.Zaky, McGraw-Hill (ISE).
2. "Computer Organization and Architecture: Designing for Performance", 10th Edition by William Stallings, Pearson Education.

References:

1. "Computer Organization and Design: The Hardware/Software Interface", 5th Edition by David A. Patterson and John L. Hennessy, Elsevier.
2. "Computer Architecture and Organization", 3rd Edition by John P. Hayes, WCB/McGraw-Hill.
3. Design and Architecture", 2nd Edition by Vincent P. Heuring and Harry F. Jordan, Pearson Education.
4. "Structured Computer Organization", 5th Edition by Tenanbaum A.S., Pearson Education.

4IT02 DATA COMMUNICATION & NETWORKING

Course Objectives :

- To understand the fundamental concepts of computer networking.
- To familiarize the students with basic taxonomy and terminology of data communication.
- To introduce the students to advanced networking concept and network reference models.
- To lay foundation for understanding the students to network design, simulation, modeling and analysis.

Course Outcomes :

- On completion of the course learner will be able to-
- Understand the principles and fundamental concept of computer networks.
- Understand and explain data communication system with its techniques and applications.
- Identify various error detection and correction techniques in data transmission.
- Evaluating the network addresses and learning routing mechanism protocols.
- Design TCP connection and analyze upper OSI layer functions and services.
- Explore the network design and its applications to digital world.

UNIT-I: Introduction (Hours: 06)

Types of Network; Network Topologies; OSI Vs TCP\IP Model; Network Devices: Bridge, Switch, Router; Transmission Medium: Guided media, Unguided media; Time and Frequency Domain, Types of Signals: Analog, Digital, Composite, Periodic, Aperiodic Signal.

UNIT-II: Data Encoding and Multiplexing (Hours: 06)

Data conversions: Digital-to-Digital, Analog-to-Digital, Digital-to-Analog; Configuring DTE-DCE Interface, Manchester and Differential Manchester encoding; Shannon Capacity; Multiplexing: FDM, WDM, TDM; Multiplexing Application: Mobile Telephone System.

UNIT-III: Data Link Layer (Hours: 06)

Design Issues: Services to Network Layer, Framing, Flow control; Error Control: Parity Bits, Hamming Code, Cyclic Redundancy Check (CRC); Data Link Protocols: Synchronous and Asynchronous Protocols, CSMA/CD, WAN Connectivity Protocols: PPP and HDLC.

UNIT-IV: Addressing and Routing (Hours: 06)

Switching Techniques, IPv4 Addressing Scheme, IPv6 addressing Overview, Subnetting, Evaluating Network Address by router, Routing Protocols: Distance Vector, Link State; Ethernet Networks: Token Ring, FDDI.

UNIT-V: Networking and Services (Hours: 06)

Transport Layer Services, TCP/UDP Protocols, TCP Segment, TCP Connection, Upper OSI Layers: Session Layer, Presentation Layer, Application Layer functions and services.

UNIT-VI: Network Design and Applications (Hours: 06)

Network Layout, Network Design Metrics, Network design traceability, WWW, DNS, Voice over IP; Introduction and Comparison of mobile network system and its applications: 2G, 3G, 4G.

Text Books:

1. Fourauzan B., "Data Communications and Networking", 5th Edition, Tata McGraw-Hill, Publications.
2. Andrew S. Tenenbaum, “Computer Networks”, PHI, ISBN 81-203-2175-8.

Reference Books:

1. William Stallings, “Data & Computer Communications”, (6/e) Pearson Education.
2. Wehrle, Klaus, Gunes, Mesut, Gross, James, "Modeling and Tools for Network Simulation", Springer, ISBN: 978-3-642-12330-6
3. J.Freey, “Computer Communication & Networks”, AEW Press.
4. Bhushan Trivedi, “Computer Networks” OXFORD.

4IT03 OPERATING SYSTEM

Course Objectives :

- To introduce basic concepts and different types of operating systems, concept of process and thread.
- To understand the scheduling of processes and concurrency control with synchronization
- To understand the concept deadlock and basic Memory Management
- To understand Virtual Memory management concepts.
- To understand the concept of File System management.
- To understand the concept of Disk Management, Scheduling and Protection and Security.

Course Outcomes :

- Fundamental understanding of the role of Operating Systems, concept of a process and thread.
- To apply the concept of process scheduling and concurrency control to different scenarios.
- To understand and apply the concept deadlock and basic Memory Management
- To realize virtual memory management schemes.
- To realize the concept of File system management.
- To understand and apply the concept of Disk Management, Scheduling and Protection and Security.

Unit I :

Introduction: Operating System (OS definition),OS Evolution, OS Services, Process Concept ,Process Scheduling ,Operations on Processes, Cooperating & Inter-process Communication, Threads: Multithreading Models, Threading Issues ,Java Threads. (6 Hrs)

Unit II : CPU Scheduling: Concepts, Scheduling Criteria, Scheduling Algorithms, Process Synch.: The Critical Section Problem ,Synchronization Hardware, Semaphores, Monitors. (6 Hrs)

Unit III : Deadlocks: Definition& Characterization. Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock. Memory Management: Background, Swapping, Contiguous Memory Allocation schemes ,Paging, Segmentation. (6 Hrs)

Unit IV : Virtual Memory: Background, Demand Paging, Process Creation, Page Replacement policies, Allocation of Frames, Thrashing. (6 Hrs)

Unit V : File-System Interface: Directory Structure, File-System Mounting, File Sharing, Protection, File-System Structure, File-System Implementation, Directory Implementation, Allocation Methods Free-Space Management, File Recovery. (6 Hrs)

Unit VI: I/O Systems: Overview, I/O Hardware, Application I/O Interface , Kernel I/O Subsystem, Transforming I/O to Hardware Operations. Disk Scheduling ,Disk Management ,Swap-Space Management ,RAID Structure. (6 Hrs)

Text Book:
Avi Silberschatz, P.B.Galvin, G.Gagne: "Operating System Concepts" (6th Edn) John Wiley & Sons Publication.

Reference Books:

1. A.S Tanenbaum "Modern Operating Systems" Pearson Education.
2. William Stallings "Operating Systems" Prentice-Hall.
3. D M Dhamdhere "Operating Systems" Tata McGraw-Hill.

4IT04 DATA STRUCTURE

Course Objectives :

- To understand the role of Data Structure in memory management
- To acquire knowledge of different types of data structures like: array, types of array, linked list, stacks, queues, trees, and their memory representation
- To learn the fundamental concept of data structure and emphasize the importance of it in developing and implementing efficient algorithms
- To analyze complexity of algorithms in terms of time and memory space
- To Understand data structure, types of data structure and their common applications
- To study the use of algorithms to perform the operations on data structure such as traversing, insertion, deletion, searching, sorting and merging
- To understand importance and applications of linear and non-linear data structure
- To obtained knowledge and skill of Sorting Methods such as: Bubble Sort, Quick Sort, Merge Sort, Selection Sort and Bucket Sort
- To Learn and acquire knowledge about the use of Tree and Graph in applications

Course Outcomes :

- Define fundamental features of array, linked-list, stack, queue, tree and graph
- Write the algorithms to perform various operations such as: Search, Insertion, Deletion, Sort etc
- Implement algorithms for various operations on linear and non-linear data structure
- Classify the linear data structures such as Array, Linked-List, Stack, Queue and non-linear data Structures such as Tree and Graph with their applications
- Implement linear data structures: Array, Linked-list, Stack, Queue using suitable language C,C++
- Implement non-linear data structure: Tree, Graph using C or C++
- know different types of sorting methods and their algorithms
- Choose appropriate algorithm for Searching 9: Perform operations of traverse, insertion, deletion.

UNIT I :
Algorithms and Linear Data Structure: Array Introduction: Data, Data Structure and their types. Algorithm and their Complexity, String processing operations, Pattern matching algorithms: fast and slow. Array: Types of array, memory representation of array, Algorithm and operations on Array: traversing, searching, insertion, deletion. Applications (7 Hrs)

UNIT II:
Algorithms and Linear Data Structure: Linked List (LL) Linked List: Features, Representation of Linked List in memory using array, Types of LL, Algorithms and operations onto LL: traversing, insertion, deletion, searching & their implementation, Applications (5 Hrs)

UNIT III
Linear Data Structure: Stack and Queue Stack: Definition, Memory representation of Stacks using array and Linked List. Operations on to Stack: Push and Pop. Stack Applications: Recursion, Solve arithmetic expressions, tower of Hanoi etc. Queue: Definition, Memory representation of Queue using array and Linked List, Types of queue, Operations on queues: Traversing, Insertion, Deletion, Searching. Applications (6 Hrs)

UNIT IV
Sorting, Sorting Methods and its Algorithms Simple Sorting Algorithms, Bubble Sort, Quick Sort, Insertion Sort, Selection Sort, Heap Sort, Merge Sort, Bucket Sort and their Applications. (6 Hrs)

UNIT V :
Non-Linear Data Structure: Tree Trees: Terminology, Types, Binary trees and their representation in memory, traversing in binary trees using stacks. Binary Search Trees, searching, inserting and deleting nodes in binary trees, Heap tree, Path length & Huffman's algorithm, Spanning Trees, Basic concepts of Kruskal's and Prim's Algorithm, B+ tree. (6 Hrs)

UNIT VI :
Non-Linear Data Structure: Graph Graph: Definitions, Sequential and Linked-list representation of Graphs, Warshalls' algorithm, Bridges in graph, Johnsons algorithm. Graph Traversals: Breadth First Search, Depth First Search, Topological Sort, Shortest Path Algorithms: Unweighted Shortest Paths, Basic concepts of Dijkstra's Algorithm. (6 Hrs)

Text Books:

1. Mark Allen Weiss, 'Data Structures and Algorithm Analysis in C++', 3/e, Florida International University, ISBN 0-321-37531-9
2. Seymour Lipschutz, 'Theory & Problems of Data Structures', Schaum's Outline Series (Mc Graw-Hill) International Editions.

Reference Books:

1. John Hubbard: 'Schaum's Outline DataStructure with C++', ISBN-13: 978-0071353458
2. Jean-Paul Tremblay, Paul G. Sorenson, P. G. Sorenson, 'An Introduction to Data Structures With Applications', (McGraw-Hill Computer Science Series), ISBN-13: 978-0070651579
3. Ellis Horowitz, Sartaj Sahni, Rajasekaran , 'Computer Algorithms/C++', 2nd edition, 2019.

4 IT 05 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. (8)

Unit II : Indian Parliament : Composition and powers, President of India : Election and Powers. Council of Ministers and Prime Minister (8)

Unit III : Impact of Science and Technology on culture and Civilization. Human Society: Community Groups. Marriage and Family: Functions, Types and problems. (8)

SECTION - B

Unit IV: Production : Factors of production, Laws of return, Forms of Business Organisation. (8)

Unit V : Banking : Functions of Central and Commercial Banks. Introduction to GST, Market : Forms, perfect, imperfect competition and monopoly. (8)

Unit VI: Nature and scope of Economics : Special significance of Economics to Engineers. Economics of Development : Meaning, Characteristics of under development, obstacles to Economic growth and vicious circle of poverty. (8)

Books Recommended :

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

4IT06 DATA COMMUNICATION & NETWORKING - LAB

Practical based on the syllabus of Data Communication & Networking (4IT02)

Following list is an indicative list and the subject teacher is free to design his/her own list of experiments based on the syllabus of Data Communication & Networking Lab (4IT02)

1. To study computer Networks and Its topology.
2. To study and implement digital –to- digital conversion, analog-to-digital conversion, digital to analog conversion
3. To implement and check flow control in DLL
4. To Study and Implement Asynchronous Protocols
5. To Study and Implement synchronous Protocols
6. To implement packet switching in network
7. To implement Circuit switching in network
8. To Demonstrate and study working of various networking devices like switch,router etc

Students are advised to explore the Virtual Labs Developed by Ministry of Human Resource Development Government of India available at http://www.vlab.co.in/broad-area-computer-science-and-engineering

IT07 OPERATING SYSTEM - LAB

Practical based on the syllabus of Operating System (4IT03)

Following list is an indicative list and the subject teacher is free to design his/her own list of experiments based on the syllabus of Operating System (4IT03)

Students are advised to explore the Virtual Labs Developed by Ministry of Human Resource Development Government of India available at http://www.vlab.co.in/broad-area-computer-science-and-engineering

1. To study basics of shell programming.
2. To study the creation of process using fork system call.
3. To implement FCFS scheduling algorithm.
4. To implement SJF scheduling algorithm.
5. To implement Priority scheduling algorithm.
6. To implement Round Robin scheduling algorithm.
7. To implement Best Fit algorithm of memory management.
8. To implement First Fit algorithm of memory management.
9. To implement FCFS disk scheduling algorithm.
10. To implement SCAN disk scheduling algorithm.
11. To implement the process synchronization using semaphore concept.

4IT08 DATA STRUCTURE - LAB

Practical based on the syllabus of Data Structure (4IT04)

Following list is an indicative list and the subject teacher is free to design his/her own list of experiments based on the syllabus of Data Structure (4IT04)

Students are advised to explore the Virtual Labs Developed by Ministry of Human Resource Development Government of India available at http://www.vlab.co.in/broad-area-computer-science-and-engineering

1. Program to implement Bubble Sort.
2. Program to implement Linear Search & Binary Search
3. Program to perform various operations on Linked List.
4. Program to perform various operations on Stack.
5. Program to reverse the elements in the stack using recursion.
6. Program to perform various operations on Queue.
7. Program to convert a given infix expression into its postfix Equivalent.
8. Program to create a binary search tree of characters.
9. Programs for implementing the following sorting methods to arrange a list of integers in ascending order:
    a. Insertion Sort
    b. Selection Sort
10. Program to implement graph traversal algorithms:
    a) Depth first traversal b) Breadth first traversal

4IT09 COMPUTER SKILL LAB - II

The following list is an indicative list and the subject teacher is free to design his/her own list of experiments based on Raspberry Pi with Adrino etc.

1 Familiarization with Raspberry Pi and perform necessary software installation.
2 To interface LED with Raspberry Pi and write a program to turn ON LED for 1 sec after every 2 seconds.
3 To interface Push button/Digital sensor (IR/LDR) with Raspberry Pi and write a program to turn ON LED when push button is pressed or at sensor detection.
4 To interface DHT11 sensor with Raspberry Pi and write a program to print temperature and humidity readings.
5 To interface OLED with Raspberry Pi and write a program to print temperature and humidity readings on it.
6 To interface Bluetooth with Raspberry Pi and write a program to send sensor data to smartphone using Bluetooth.
7 To interface Bluetooth with Raspberry Pi and write a program to turn LED ON/OFF when '1'/'0' is received from smartphone using Bluetooth.
8 Write a program on Raspberry Pi to upload temperature and humidity data to thingspeak cloud.
9 Write a program on Raspberry Pi to retrieve temperature and humidity data from thingspeak cloud.
10 To install MariaDB database on Raspberry Pi and perform basic SQL queries.
11 Connect to MariaDB through Python 3 program
12 Explore Scientific Python 3 ecosystem and perform image processing with NumPy and Matplotlib

Students are advised to explore the Virtual Labs Developed by Ministry of Human Resource Development Government of India available at http://www.vlab.co.in/broad-area-computer-science-and-engineering

REFERENCE BOOKS:

1) "Raspberry Pi by Example"by Ashwin Pajankar: PACKT PUBLICATIONS
2) "Raspberry Pi Amazing Projects " by Ashwin Pajankar: PACKT PUBLICATIONS
3) "20 Easy Raspberry Pi Projects: Toys, Tools, Gadgets, and More!" By : Rui Santos , Sara Santos No Starch Press
4) " IoT Fundamental" by Devid Hanes Publishers: CISCO
5) "Raspberry Pi Cookbook for Python Programmers" by Tim Cox Publishers: PACKT

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SYLLABUS FOR BE ELECTRICAL ENGINEERING / (ELECTRICAL &ELECTRONICS ENGINEERING) / ELECTRICAL ENGINEERING (ELECTRONICS & POWER) SEMESTER PATTERN CHOICE BASED CREDIT GRADE SYSTEM

3EE01 /3 EP01 /3EX01 ENGINEERING MATHEMATICS - III

Course Outcomes:

After successfully completing the course, the students will be able to:

1. Demonstrate the knowledge of differential equations and partial differential equations, applied to electrical engineering systems.
2. Apply Laplace transform to solve differential equations.
3. Demonstrate the use of Fourier Transform to connect the time domain and frequency domain.
4. Apply Z Transform to solve of various Linear Difference equations with constant coefficients.
5. Apply the knowledge of vector calculus to solve physical problems.
6. Demonstrate the basic concepts of probability and statistics.

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. Applications to electrical circuits. (7)

UNIT-II:

Laplace Transforms: definition, standard forms, properties of Laplace transform, inverse Laplace transform, Laplace transform of some basic functions, initial and final value theorem, convolution theorem, Laplace transform of Periodic Function, Impulse Function, Unit Step Function. Solution of linear differential equation using Laplace transform. (7)

UNIT-III:

a) Partial differential equation of first order and first degree of following type-

(i) f (p, q) = 0; (ii) f (p, q, z)=0; (iii) f (p, q, x, y) = 0; (iv) Pp + Qq =R (Lagrange's Form); (v) Clairaut form Z = px + qy + f(p, q)

b) Fourier transforms- Definition, standard forms, inverse Fourier transform Fourier sine and Fourier cosine transforms and integrals. (7)

SECTION-B

UNIT-IV:

a) Difference Equation:- solution of difference equations of first order, solution of difference equations of higher order with constant coefficient.

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. (7)

UNIT-V:

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 (without proof), Irrotational and Solenoidal vector fields, Line Integral, Stokes and Divergence Theorem. (7)

UNIT-VI:

Statistics & Probability: Axioms, conditional probability, Bay's theorem, mathematical expectations, probability distributions: Binomial, Poisson and Normal. (7)

Books Recommended:

1. Elements of Applied Mathematics by P. N. Wartikar and J. N. Wartikar
2. Advancing Engineering Mathematics by E. K. Kreyzig.
3. Advance Engineering Mathematics by B. S. Grewal
4. Integral Transforms by Goyal & Gupta.
5. Statistical Methods by S.G. Gupta

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3EE02/3 EP02/3EX02 ELECTRICAL CIRCUIT ANALYSIS

Course Outcomes:

After completing this course studentwill be able to:

1. Analyze electric and magnetic circuits using basic circuital laws
2. Analyze the circuit using Network simplification theorems.
3. Solve circuit problems using concepts of electric network topology.
4. Evaluate transient response of different circuits using Laplace transform
5. Evaluate two-port network parameters and network functions

Unit I:

a] Terminal Element Relationships: V-I relationship for Dependent &Independent , Voltage and Current Sources., Source Transformations. Source Functions: unit impulse, unit step, unit ramp and interrelationship, sinusoidal input, generalized exponential input.

Magnetic Circuits: concept of self and mutual inductance, dot convention, coefficient of coupling, composite magnetic circuit, Analysis of series and parallel magnetic circuits.

b] Basic Nodal and mesh Analysis: Introduction, Nodal analysis, super node analysis, mesh analysis, super mesh analysis.

Unit II:

Network Theorems: Superposition theorem, Thevenin'stheorem, Norton's theorem, Maximum power transfer theorem, Reciprocity theorem, Millman's theorem, Substitution theorem, Compensation theorem, Tellegen's theorem

Unit III :

Graph Theory and Network Equation:-Graph of a network, Trees and loops, Tie-set and cut set matrix of a network, Network equilibrium equations, duality-network transformation.

Unit IV:

a] **Transformation of a Circuit into s-domain:** LaplaceTransformed equivalent of inductance, capacitance and mutual inductance, Impedance and admittance in the transform domain, Node Analysis and Mesh Analysis of the transformed circuit. Complete Solution ofLinear Differential Equations for Series RC, Parallel RC, Series RL, Parallel RL, Series RLC, Parallel RLC and Coupled Circuits-for step Inputs. Natural Response, Transient Response, Determination of initial conditions.

Unit V :

Two Port Networks: Two port networks: Open circuit impedance parameters, Short circuit admittance parameters, Transmission parameters, Hybrid parameters, Condition for reciprocity and symmetry of a two port network, Interrelationship between parameters, Interconnection of two port networks , Input impedance in terms of two port network parameters, Output impedance, Image impedance.

Unit VI :

Network functions: Ports and terminal pairs, Network functions, poles and zeros, Necessary conditions for driving point function, Necessary conditions for transfer function. Applications of network analysis in driving network functions, positive real functions, driving point and transfer impedance function.

Text Book: Network Analysis, M.E. Van Valkenburg, PHI, 2005.

Reference Books:

1. Circuits & Networks – Analysis, Design & Synthesis by M.S.Sukhija, T.K.Nagasarkar, OxfordUniversity Press, 2010.
2. Circuit and Network Analysis, SudhakarShyammohan, Tata Mc Graw Hill, 2005.
3. Network Analysis, P. Ramesh babu, SciTech Publications, Chennai, 2009.

3EE03/3 EP03/3EX03 ELECTRICAL MACHINE - I

Course Outcomes:

After Completing this course, students will be able to:

1. Explain the construction and working of DC Machines.
2. Illustrate the different Characteristics, types, their applications and parallel Operation of D.C. Generators.
3. Demonstrate the various characteristics, starting, speed control and braking operation on DC motors
4. Analyze the performance of DC machines by conducting the various tests on it.
5. Determine the parameters of equivalent circuits, performance parameters of single phase transformer and merits & demerits of autotransformer
6. Explain the construction, working, different connections, applications and testing of three phase transformer.

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. Generators, Parallel Operation of D.C. Generators, Introduction to testing of D. C. Generators as per Indian standard.

Unit III :
D.C. Motors: Types, Characteristics & Modified Characteristics, Applications of D.C. Motors. Starting, Electric Braking, Speed Control of DC Motors. Losses, efficiency and testing of DC Motors.

Unit IV :
Single phase Transformer: Working Operation, EMF Equation, and separation of core losses in to its component. Equivalent Circuit, Parallel Operation. Open Circuit, Short Circuit & Sumpner's test on transformer as per Indian standard. Single phase Autotransformer: - construction, working, merits, demerits and its application.

Unit V :
Three Phase Transformer: Construction, Working, Types, connections, vector group connections, open delta Connection, OC, SC, Heat run test, load test, magnetic balance, vector group test on three phase transformer.

Unit VI :
Three Phase Transformer: Three-winding transformer, On load & Off load tap changers, Scott Connection, Power transformer and Distribution transformer. Waveforms of no load current & inrush current phenomenon.

Text Book:
Electrical Machines by D P Kothari & I J Nagrath Published by Tata McGraw-Hill Book Comp. New Delhi.

Reference Books:
1) C. Dawes: Electrical Engineering, Vol.I: Direct current (IV Edition), (McGraw Hill Book Company)
2) H. Cotton: Advance Electrical Technology, (Wheeler publication)
3) Indian Standard Guide for testing DC Machine. IS: 9320-1979, (Indian Standards Institution, New Delhi.)
4) Indian Standard Specification for safety transformer. IS: 1416-1972, (Indian Standards Institution, New Delhi.)

3EE04/3 EP04 – ENERGY RESOURCES AND GENERATION

Course Outcomes:
A student, on completion of this course, will be able to:
1. Explain the operation of Thermal, Hydro, Nuclear and Diesel power plants.
2. Summarize solar energy conversion, solar radiation measuring instruments, wind energy conversion and their applications.
3. Outline the principle and operation of fuel cells, ocean & tidal energy conversion, and other non-conventional energy resources.
4. Determine the various factorsand curves related to electrical load & generating plant.

Unit I:
Conventional and non conventional energy sources, Indian Energy Scenario.
Thermal and hydro power plant: Layout of Thermal power plant, Selection of site, working of various parts: Economizer, air preheater, condenser, cooling tower, ash &coal handling plant, advantages & disadvantages
Layout of Hydro power plant, classification of hydro power plant according to available head, nature of load, functions of different components and their working, mini and micro hydro-electric power generation, advantages & disadvantages.

Unit II :
Nuclear and Diesel power plant: nuclear fission and fusion, Layout of Nuclear power plant, Selection of site, Functions of different components of nuclear plant, types of nuclear reactors , advantages & disadvantages of different nuclear reactors, nuclear waste disposal., safety measures.
Layout of Diesel power plant, functions of different components of diesel plant, advantages & disadvantages.

Unit III :
Solar Energy and its measurement: Solar cell, array & module, 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, types of solar collectors, energy balance equation and collector efficiency.

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 cell 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 ,classification of WEC systems ,generating system, applications of wind energy.

Unit V :
Ocean, Tidal & Other non-conventional energy resources: Ocean energy resources, ocean energy routes, ocean thermal energy conversion, basic principle of tidal power, components of tidal power plants, operation methods of utilization of tidal energy, estimation of power and energy in single and double basin tidal system,. Operating principles of energy from biomass, energy from biogas, geothermal energy, MHD power generation, energy from urban and rural waste.

Unit VI :
Load-Generation factors: connected load, maximum demand, demand factor, load factor, diversity factors, plant capacity and utilization factor, types of loads, load curve, chronological load curve, load duration curve, energy load curve, energy duration curve, load survey, base load and peak load station.

Text Book: Generation of electrical energy by B.R.Gupta, Eurasia Publishing House, New Delhi.

Reference Books:

1. Non conventional energy resources. By G.D.Rai, Khanna Publishers New Delhi
2. Solar energy by S.P.Sukhatme Tata McGraw Hill Publication
3. Principles of Power System by V.K.Mehta, S.Chand publication.
4. Conventional energy technology by S.B.Pandya, Tata McGraw Hill Publication.

3EE05/3 EP05ELECTRONIC DEVICES AND CIRCUITS

Course Outcomes:
After successfully completing the course, the students will be able to :

1. Demonstrate the knowledge of semiconductor physics and PN Junction Diode
2. Analyze the rectifier and regulator circuits.
3. Analyze the operational parameters of BJT
4. Analyze various multistage amplifier circuits
5. Demonstrate the knowledge of JFET, MOSFET, UJT and their operational parameters

UNIT-I:
P-N Junction diode theory, Energy bands in intrinsic and extrinsic silicon, carrier transport, diffusion current , drift current, mobility and resistivity, generation and recombination of carriers, PN junction diode , zener diode, zener diode as voltage regulator, Numericals based on voltage regulator (line and load regulation, Numericals based on resistivity, conductivity, mass action law)

UNIT-II:
Half wave, full wave center tapped full wave and bridge rectifier. Filters-C, LC and their analysis, clipping and clamping, Numericals based on clipping and clamping

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

UNIT-IV

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-V :

FETs (JFET & MOSFET): Types, Characteristics and parameters (u, gm &Rds), Applications of FET amplifiers, UJT: Characteristics, working, UJT as relaxation oscillator.

UNIT-VI :

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

Text Book: Millman's Electronic Devices & Circuits by J.Millman, C.Halkias, Satyabrata Jit TMH 3rd ed, 2nd reprint 2011.

Reference Books:

1. Electronic Devices and Circuits 5/e – David Bell Oxford University Press
2. Microelectronic Circuits 5/3 – Sedranad Smith Oxford University Press
3. Boylestad R. and "Electronics Devices & Circuits", Prentice Hall of India Private Limited, New Delhi (Fifth Edition), 1993.

3EE06/3 EP06/3EX06 ELECTRICAL CIRCUIT ANALYSIS LAB

Minimum eight experiments based on the syllabus content of 3EP02 Electrical Circuit Analysis. The intensive list of experiment is given below.

1. Verification of output response of series R-C circuit for step input
2. Study of dot convention and determination of
   A) Mutual inductance
   B) Coupling coefficient of b transformer
3. Verification of Mesh and Node analysis.
4. Verification of Superposition theorem.
5. Verification of Thevenin's theorem.
6. Verification of Maximum Power Transfer theorem.
7. Verification of reciprocity theorem.
8. Study of Milliman's theorem& verification.
9. Verification of Norton's theorem.
10. Determination of ABCD parametersT-network &Π-network.
11. Study of Tie set and Cut set schedule for a given network.
12. MATLAB simulation for o/p verification of any theorem.
13. Determination of Z and Y parameter.
14. Determination of hybrid parameter.

3EE07/3 EP07/3EX07 ELECTRICAL MACHINES - I LAB.

Minimum eight experiments based on the syllabus content of 3EP03Electrical Machines – I.

The indicative list of experiments is given below.

1. Plot the OCC of DC generator and find its critical resistance and critical speed.
2. To study the build-up of DC shunt generator, calculate critical resistance at different speeds.
3. Plot/Compare: External, Internal Characteristics of DC Shunt/series/compound generator.
4. Calculate the efficiency and voltage regulation of DC generator by the direct load test.
5. Speed Control of DC Shunt motor by armature control & Field Control method.
6. Perform the direct load test on DC series/shunt/compound motor to plot its performance characteristics, and determine its efficiency and speed regulation.
7. Conduct the Swinburn's test on DC machine to estimate its performance at any desired load condition.
8. Conduct the Hopkinson's test on DC Machine to analyze its performance.
9. Perform Electric Braking Operation on DC shunt Motor.
10. Conduct the Polarity test and Ratio test on transformer
11. Calculate the Equivalent circuit parameters of single-phase transformer by performing OC & SC test on itand determine its efficiency and voltage regulation.

12. Perform the direct load test on single phase/three phase transformer and determine its efficiency and voltage regulation.
13. Conduct back to back test (Sumpner's test)on two single phase transformers and determine the temperature rise.
14. Conduct the magnetic balance test on three phase transformer.
15. Conduct the vector group test on three phase transformer.
16. Conversion of three phase to two phase supply system using Scott Connection
17. Capture the waveform of inrush current of single phase/three phase transformer using DSO.

Reference:

S.G.Tarnekar, P.K.Kharbanda, S.B.Bodkhe, S.D.Naik and D.J.Dahigaonkar"Laboratory Courses in Electrical Engineering", S. Chand & Co. New Delhi, 2013.

3EE08/3 EP08/3EX08 ELECTRONIC DEVICES & CIRCUITS LAB

Minimum eight experiments based on the syllabus content of 3EP05Electronic Devices & Circuits. The intensive list of experiment is given below.

1. To study and verify V-I characteristics of semiconductor diode
2. To study and verify V-I characteristics of Zener diode.
3. To verify the performance of half wave rectifier circuit with and without filter.
4. To verify the performance of full wave bridge rectifier circuit and determination of load regulation.
5. To verify the performance of Zener voltage regulator.
6. To verify characteristics of bipolar junction transistor
7. To study and perform C-E amplifier gain with variation of load resistance.
8. To study and verify the characteristics of FET
9. To study UJT as a relaxation oscillator
10. To study phase shift oscillator & determine frequency of oscillation
11. To study characteristics of MOSFT
12. To study clipper circuits using diodes
13. To study clamper circuits using diodes
14. To study and verify operation of cascade amplifiers
15. To verify operation of transistor as a switch

3EE09/3 EP09/3EX09 ELECTRICAL TECHNOLOGY - LAB

Perform minimum Eight practicals / demonstration from the following list and prepare the report as a term work for this laboratory.

1. Introduction to standard symbols used in wiring diagrams
2. Introduction to different wiring accessories.
3. Demonstration of different types of wirings eg. Domestic wiring, commercial wiring, Industrial wiring.
4. Connection of Staircase wiring, Godown wiring, fluorescent lamp. Ceiling fan, air cooler etc
5. Domestic wiring diagrams
6. Connections of switch board, MCB and energy meter
7. Testing and electrical Maintenance of domestic appliances like lamps, electric iron, heater, geyser, air cooler, fan, microwave-oven, induction heater, etc.
8. Insulation resistance and earth resistance measurement
9. Conduct the load survey for domestic/commercial /Industrial consumers
10. Illumination system Design (selection of type and number of lamps required for any location)
11. Calculation of Energy bill for LT & HT consumers.
12. Safety precautions while working with electrical system
13. Demonstration of first aid treatment after getting electric shock.
14. Study of various components of solar power plant.
15. Design calculation of small capacity roof top solar power plant

SEMESTER – IV

4EE01/4EP01/4EX01 ELECTROMAGNETIC FIELDS

Course outcomes :

At the end of the course the student should be able to:

1. Demonstrate the basic mathematical concepts related to electromagnetic vector fields.
2. Apply the principles of electrostatics to the solutions of problems relating to electric field and electric potential, boundary conditions and electric energy density.
3. Apply the principles of magneto statics to the solutions of problems relating to magnetic field.
4. Apply Maxwell's equation in different forms (differential and integral) to diverse engineering problems.

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, Poison and Laplace equations.

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

Unit IV :
Magnetic fields: Biot-Savart law, Ampere's law in integral and differential form. Continuity equation, time of relaxation. Vector and Scalar 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

Text Book: "Engineering Electromagnetics", by Hayt W.H. Tata Mc-Graw Hill publication

Reference Books:

1. Electromagnetic fields by TVS Arun Murthy S Chand & Co
2. Principles and applications of Electromagnetic fields by Plansycollin , Mc-Graw Hill Books Co.
3. Foundations of electromagnetic theory by John Reitz, Addison Wesley Pub Co.
4. Basic electromagnetic field by Herbert Neelf, Harber International education
5. Introduction to electromagnetic, Derucy and Johnson, Mc-Graw Hill Books Co.

4EE02/4EP02/4EX02 ELECTRICAL MEASUREMENTS & INSTRUMENTATION

Course Outcomes:

A student completing this course, should be able to:

1. Classify the various measuring instruments like PMMC, MI, Electrodynamometer, and Induction type instruments for measurement of current, voltage, power, and energy.
2. Demonstrate the construction & working of Instrument Transformers and special purpose meters.
3. Analyze various methods for measurement of resistance, inductance, and capacitance using AC/DC bridges.
4. Explain the working of various Digital measuring instruments.
5. Explain the generalized Instrumentation system & working of different transducers.

Unit-I: Analog Instruments - Classification of measuring instrument, Different torques in measuring instrument, Analog Ammeter, Voltmeter, Electrodynamic type Construction, ,theory of operation, torque equation, errors, merits and demerits of each type.

Unit II : Wattmeter and Energy meter-Construction, theory of operation, torque equation, errors, merits and demerits of each type.
Analysis of three phase balanced load:- Blondell's theorem, Measurement of active and reactive power in single phase and three phase circuits.

Unit III : Instrument transformers- C.T.and P.T., Importance, theory and construction, phasor diagram, causes of errors, testing, and applications.
Special Instruments- Frequency meter, Power factor meter, Phase sequence indicator, Synchroscope and Stroboscope.

Unit IV: Measurement of circuit parameters- Different methods of measurement of low, medium, high value of resistance, sensitivity and accuracy of different methods. AC and DC bridges, Wheat -stone, Kelvin, Maxwell ,Wein , Hay , De-Sauty ,Schering , Owen , Anderson's bridge.

Unit V:
Digital methods of measurements, Introduction to A/D, D/A techniques , F/V and V/F conversion techniques , Digital voltmeter (DVM), ammeter, wattmeter, multi-meter and Electronic energy meter, Sources of error, Inherent error in digital meters.

Unit VI:
Generalized Instrumentation system- characteristics of measurement and Instrumentation system. Transducers: Definition, classification, Specification, selection, loading effect, Displacement, velocity transducers, Force and torque transducers, Resistive, inductive, Capacitive, strain gauge transducers, Piezoelectric, current and voltage transducers. Elastic-members (Bellows, Bourdon tube, Diaphragm)

Text Book: A.K. Sawhney, 'Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai& Co (P) L

Reference Books:

1. E.W.Golding&F.C.Widdis, 'Electrical Measurements & Measuring Instruments', A.H.Wheeler& Co.
2. Albert D. Helfrick& William D. Cooper, 'Modern Electronic Instrumentation & Measurement Techniques', Prentice Hall of India, .
3. Joseph. J. Carr, 'Elements of Electronic Instrumentation & Measurements', III edition, Pearson Education.
4. Bouwens, A.J., "Digital Instrumentation", McGraw Hill.

4EP03 CONTROL SYSTEMS

Course Outcomes:

After completing this course, student will be able to:

1. Demonstrate the fundamental concepts of automatic Control and mathematical modeling of the Systems.
2. Determine the transfer function of control system components.
3. Analyze the time response of various systems and performance of controllers.
4. Evaluate the stability of linear systems using various methods.

Unit I : Introduction to automatic control
Open loop and closed loop system, servo-mechanisms, mathematical modeling of physical systems, transfer functions, block diagrams and signal flow graphs. Effect of feedback on sensitivity to parameter variation and reduction of the noise.

Unit II : Control System Components
Electrical / Electro-mechanical components such as A.C./D.C. servomotors, stepper motors, synchros, potentiometers, tacho-generators, encoders, their functional analysis and operating characteristics and their application.

Unit III: Time response analysis:

Time response of first and second order systems to standard inputs. Time response specifications, types of system, error analysis, error coefficients, steady state errors, dynamic error series. Approximate methods for higher order system, proportional, derivative and integral control.

Unit IV: Stability
Stability of control systems, characteristics equation, impulse response, Routh-Hurwitz stability criterion, relative stability. Root Locus: construction of root locus, determination of roots from root locus conditions on variable parameter for stability, effect of addition of poles and zeros.

Unit V: Frequency response methods
Frequency response of linear system, specification, Logarithmic frequency response (Bode) plots from transfer function for various systems. Polar plots for various systems. Estimation of approximate transfer functions from the frequency response.

Unit VI: Stability analysis from frequency response : Gain margin and Phase margin; Stability analysis from Bode plots. Nyquist criterion, Nyquist plots and stability analysis.

Books Recommended:

Text Book: Nagrath I.J., Gopal M.: Control System Engineering, Wiley Eastern.

Reference Books:

1. Control Engineering, D.Ganesh Rao, k. Chennavenkatesh, 2010, PEARSON
2. Ogata K.: Modern Control Systems, Prentice Hall of India.
3. Control Systems by K.R.Varmah TMH edition 2010
4. Linear Control Systems, Ashfaq Hussain, Haroon Ashfaq, Dhanpat Rai & co.

4EP04 NUMERICAL METHODS & OPTIMIZATION TECHNIQUES

Course Outcome:
After completing this course students will be able to

1. Solve linear and Simultaneous Equations with the help of Numerical Methods.
2. Apply various Numerical methods to fit the curve.
3. Solve Numerical differentiation, integration, and Differential Equations.
4. Solve linear, non linear and dynamic optimization problem by various methods.
5. Determine the optimum scheduling by using CPM and PERT.

Unit I:
(a)Absolute, relative and percentage errors and analysis, Solution of Algebraic and Transcendental equations: Bisection Method, False Position method, Newton Raphson methods, Successive approximation method

(b) **Solution of Simultaneous Algebraic Equations**: matrix inverse method, Gauss elimination method,Iterative method-Jacobi's Method, Gauss Seidel Method; Eigen values of a matrix.

Unit II:
(a) Curve fitting by Least Square Method, Correlations and Regression.

(b) Newton's forward and backward interpolation method, Newton's Divided Difference Method, Lagrange's Interpolation method, Interpolation with Cubic Splines.

Unit III:
Numerical differentiation by Taylor series method, Maximum and minimum values, Numerical Integration by Trapezoidal, Simpsons one third and three eight rules, Numerical solution to differential equations by Taylor Series, Euler's method, RungeKutta second and fourth order methods

Unit IV:
Basics of Optimization Techniques, Linear programming - standard form, definitions and theorems, graphical method, simplex method, two phase simplex method, balanced and unbalanced transportation problems.

Unit V:
Non linear programming: unimodal function, Fibonancci search method and golden section method, Steepest descent method, conjugate gradient method, unconstraint optimization, direct search method.

Unit VI:
Dynamic programming: multistage decision processes, principle of optimality, sub optimization, calculus and tabular method of solution, conversion of final value problem into initial value problem.

CPM and PERT: introduction, Network representation of project, critical path, Probability of completion of project, optimum scheduling by CPM, crashing of project.

Books Recommended:

Text Books:
1. Introductory Methods of Numerical Analysis; S. S. Sastry (PHI)
2. Engineering Optimization – Theory & Practice; S. S. Rao (New Age International Pvt. Ltd.)

Reference Books:

1. Mathematical Statistics by J. N. Kapoor, Tata McGraw Hill Pub. Co. Ltd
2. Numerical Methods in Engineering and Science; B. S. Grewal (Khanna Publishers)
3. PERT and CPM- Principles & Application; L. S. Srinath (Affiliated East-West press pvt. Ltd)
4. Optimization for Engineering Design - Algorithms and Examples byKalyan Moy Deb, PHI Pub.

4EE04/ 4EP05 /4EX04 ANALOG AND DIGITAL CIRCUITS

Course Outcomes:

After completing the course, students will be able to

1. Explain the principles of operational amplifiers, parameters of op-amp
2. Illustrate the linear and nonlinear applications of op-amp
3. Demonstrate the knowledge of Voltage regulator and Timer ICs
4. Describe the working of Logic families andtheir applications.
5. Demonstrate the knowledge of combinational and sequential circuits and its application

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

Unit II:
Linear and Non-linear Application of Op-amp: Inverting and non inverting amplifiers, voltage follower, integrator, differentiator differential amplifier, op amp as adder subtractor, op amp as a log and antilog amplifier

Sinusoidal RC-phase shift and Wein bridge oscillators, clipping, clamping and comparator circuits using op-amps.

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

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

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

Books Recommended:-

Text Book: Millman, Microelectronics, 2nd Ed., McGraw Hill.

Reference Books:

1. Gayakwad, Op-Amp & LLG, 2nd Ed.
2. Malvino& Leach, Digital Principles & Applications, 4th Ed., McGraw Hill.
3. K.B.Botkar, Integrated Electronics (Khanna Publishers.)

4EE07/ 4EP06 /4EX06 ELECTRICAL MEASUREMENTS & INSTRUMENTATION- LAB

Minimum eight experiments based on the syllabus content of 4EP02 Electrical Measurements & Instrumentation. The intensive list of experiment is given below.

1. Measurements of Low resistance by using Kelvin double Bridge.
2. Measurements of Medium resistance by Ammeter Voltmeter method/Wheatstone Bridge
3. Measurement of High resistance by Loss of Charge method.
4. Measurement of Insulation resistance by using Megger

5. Measurement of unknown Inductance using Maxwell Bridge/Hay Bridge/Anderson Bridge
6. Measurement of Unknown Capacitance by Desauty Bridge/Schering Bridge
7. Measurement of frequency using Wien Bridge
8. Extension of range of ammeter using shunt/CT.
9. Extension of range of voltmeter using multiplier/PT.
10. Calibration of Wattmeter by Phantom loading
11. Calibration of energy meter to detect the error in it.
12. Measurement of active & reactive power measurement in 1 phase / 3 phase circuit.
13. Measurement of rotational speed using stroboscope
14. Conversion of non electrical quantity into its equivalent electrical quantity using proper transducer.
15. Compare the accuracy, preciseness, sensitivity of Analog & Digital Measuring Instruments.

4EP07 CONTROL SYSTEM LAB

Minimum eight experiments based on the syllabus content of 4EP03Control System. The intensive list of experiment is given below.

1. Study of Potentiometer
2. Study of A.C. Synchro and its characteristics
3. Determination of Transfer Function of D.C. Generator
4. Determination Of Transfer Function of D.C.Servomotor and Its Characteristics
5. Performance Characteristics of a D.C. Motor Angular Position Control System
6. Determination Of Frequency Response of Given R-C Network
7. Determination Of Transfer Function of A.C. Tacho-Generator
8. Experimental Study Of The Operating Characteristics of a Small Stepper Motor and Its Controller
9. Study Closed Loop PI Controller System and Its Time Response to Different Input.
10. Experimental Study of Position Control of DC Motor using Ardiuno
11. Experimental Study of Time Domain Analysis of Second Order Control System
12. Study AC Position Control System

4EE09/ 4EP08 /4EX08 ANALOG AND DIGITAL CIRCUIT LAB

Minimum eight experiments based on the syllabus content of 4EP05Analog & Digital Circuit. The intensive list of experiment is given below.

1. To Plot Frequency Response Of Non-Inverting Mode Of Op-Amp Using IC741 and Determine the Bandwidth & Maximum Gain
2. To Plot Frequency Response Of Inverting Mode Of Op-Amp Using IC741 and Determine the Bandwidth & Maximum Gain
3. To Perform Op-Amp as Differentiator Using IC741 .
4. Design The Circuit for Supplying 5V,25mA As A Low Voltage Regulator Using IC 723
5. Verification Of Truth Table Of Various Logic Gates Using ICs
6. To Study and Verify The Operation Of SR and MS ,JK Flip Flop
7. To Verify The Operation Of Multiplexer Using IC74153.
8. To Design And Verify Function Of Decade Counterusing IC 7490
9. To Verify The Truth Table Of 4 Bit Comparator
10. To Perform Op-Amp As Integrator Using IC741
11. A stable Multi-vibrator Using IC 555timer
12. To Study And Verify The Operation Of Half-Adder And Full-Adder.

4EE10/ 4EP09 /4EX09 ELECTRONIC TECHNOLOGY LAB

Perform Minimum Eight experiments / demonstration based on the following contentand prepare the report as a term work for this laboratory.

- **Study of electronic Components:** Identification of components, name, types, symbol, size, rating and application.
- **Handling Electronic Components:** Finding values and testing (using DMM), test working condition, fault detection.
- **Working with breadboards:** understanding the breadboards for component mounting, working with small circuits on breadboard

- **Soldering:**Soldering skill tips- use of proper soldering Iron, Metal, Flux**,** Cleaning, Tinning etc., mounting components on zero PCB, testing of small circuits mounted on zero PCB. De-soldering of components
- **PCB Layout and design:** Understanding different PCBs, Working on PCB Layout (Software), PCB etching, drilling on PCB, Mounting components on PCB, Working with small circuits on PCB and their testing
- **Electronic circuit Simulation:** Familiarizing with the simulation software, simulation and result validation of simple circuit with software.

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SYLLABUS OF B.E. (ELECTRICAL) SEM. III & IV [C.B.C.S.]

3EE01/3 EP01/3EX01 ENGINEERING MATHEMATICS -III

Course Outcomes:
After successfully completing the course, the students will be able to:

1. Demonstrate the knowledge of differential equations and partial differential equations, applied to electrical engineering systems.
2. Apply Laplace transform to solve differential equations.
3. Demonstrate the use of Fourier Transform to connect the time domain and frequency domain.
4. Apply Z Transform to solve of various Linear Difference equations with constant coefficients.
5. Apply the knowledge of vector calculusto solve physical problems.
6. Demonstrate the basic concepts of probability and statistics.

UNIT-I:
(a) **Statistics:**Introduction, Curve fitting by method of least square, change of scale, fitting of straight line and parabola, correlation, regression. Application of statistics to electrical engineering.

(b) **Probability**: Axioms, conditional probability, Bay'stheorem,mathematical expectations, probability distributions:Binomial, Poisson and Normal.Application of probability to electrical engineering.

UNIT-II:
(a)Partial differential equation (PDE)of first order and first degree of following type-

(i) f (p, q) = 0; (ii) f (p, q, z) =0; (iii) f (p, q, x, y) = 0; (iv) Pp + Qq =R (Lagrange's Form); (v) Clairaut form Z = px + qy + f(p, q) . Applications of PDE to electrical circuits.

(b)DifferenceEquation: -Solution of difference equations of first order, solution of difference equations of higher order with constant coefficient.Applications of difference equations to electrical engineering.

UNIT-III:
Laplace Transforms: Definition, standard forms, properties of Laplace transform, inverse Laplace transform, Laplace transform of some basic functions, initial and final value theorem, convolution theorem, Laplace transform of Periodic Function, Impulse Function, Unit Step Function. Solution of linear differential equation using Laplace transform.

UNIT-IV:
Fourier Transforms- Definition, standard forms, properties of Fourier transform,inverse Fourier transform, Fourier Transform of some basic functions.Fourier transform of Periodic Function, Impulse Function, Unit Step Function.Fourier cosine transforms. Applications of Fourier Transforms in electrical engineering.

UNIT-V:
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-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, Line Integral, Stokes and Divergence Theorem. Application of Vector calculus to electromagnetics.

Text Book: Elements of Applied Mathematics by P.N.Wartikar and J.N.Wartikar.

Reference Books:

1. Statistical Methods by S.G. Gupta
2. Advance Engineering Mathematics by B.S.Grewal
3. Integral Transforms by Goyal & Gupta.

3EE02/3 EP02/3EX02 ELECTRICAL CIRCUIT ANALYSIS

Course Outcomes:

After completing this course student twill be able to:

1. Analyze electric and magnetic circuits using basic circuital laws
2. Analyze the circuit using Network simplification theorems.
3. Solve circuit problems using concepts of electric network topology.
4. Evaluate transient response of different circuits using Laplace transform
5. Evaluate two-port network parameters and network functions

Unit I:

[a] Terminal Element Relationships: V-I relationship for Dependent &Independent , Voltage and Current Sources., Source Transformations. Source Functions: unit impulse, unit step, unit ramp and interrelationship, sinusoidal input, generalized exponential input.

Magnetic Circuits: concept of self and mutual inductance, dot convention, coefficient of coupling, composite magnetic circuit, Analysis of series and parallel magnetic circuits.

[b] Basic Nodal and mesh Analysis: Introduction, Nodal analysis, super node analysis, mesh analysis, super mesh analysis.

Unit II:

Network Theorems: Superposition theorem, Thevenin'stheorem, Norton's theorem, Maximum power transfer theorem, Reciprocity theorem, Millman's theorem, Substitution theorem, Compensation theorem, Tellegen's theorem

Unit III :

Graph Theory and Network Equation:-Graph of a network, Trees and loops, Tie-set and cut set matrix of a network, Network equilibrium equations, duality-network transformation.

Unit IV:

a] **Transformation of a Circuit into s-domain:** LaplaceTransformed equivalent of inductance, capacitance and mutual inductance, Impedance and admittance in the transform domain, Node Analysis and Mesh Analysis of the transformed circuit. Complete Solution ofLinear Differential Equations for Series RC, Parallel RC, Series RL, Parallel RL, Series RLC, Parallel RLC and Coupled Circuits-for step Inputs. Natural Response, Transient Response, Determination of initial conditions.

Unit V :

Two Port Networks: Two port networks: Open circuit impedance parameters, Short circuit admittance parameters, Transmission parameters, Hybrid parameters, Condition for reciprocity and symmetry of a two port network, Interrelationship between parameters, Interconnection of two port networks , Input impedance in terms of two port network parameters, Output impedance, Image impedance.

Unit VI :

Network functions: Ports and terminal pairs, Network functions, poles and zeros, Necessary conditions for driving point function, Necessary conditions for transfer function. Applications of network analysis in driving network functions, positive real functions, driving point and transfer impedance function.

Text Book: Network Analysis, M.E. Van Valkenburg, PHI, 2005.

Reference Books:

1. Circuits & Networks – Analysis, Design & Synthesis by M.S.Sukhija, T.K.Nagasarkar, OxfordUniversity Press, 2010.
2. Circuit and Network Analysis, SudhakarShyammohan, Tata Mc Graw Hill, 2005.
3. Network Analysis, P. Ramesh babu, SciTech Publications, Chennai, 2009.

3EE03/3 EP03/3EX03 ELECTRICAL MACHINES – I

Course Outcomes:

After Completing this course, students will be able to:

1. Explain the construction and working of DC Machines.
2. Illustrate the different Characteristics, types, their applications and parallel Operation of D.C. Generators.
3. Demonstrate the various characteristics, starting, speed control and braking operation on DC motors
4. Analyze the performance of DC machines by conducting the various tests on it.
5. Determine the parameters of equivalent circuits, performance parameters of single phase transformer and merits & demerits of autotransformer
6. Explain the construction, working, different connections, applications and testing of three phase transformer.

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. Generators, Parallel Operation of D.C. Generators, Introduction to testing of D. C. Generators as per Indian standard.

Unit III :
D.C. Motors: Types, Characteristics & Modified Characteristics, Applications of D.C. Motors. Starting, Electric Braking, Speed Control of DC Motors. Losses, efficiency and testing of DC Motors.

Unit IV :
Single phase Transformer: Working Operation, EMF Equation, and separation of core losses in to its component. Equivalent Circuit, Parallel Operation. Open Circuit, Short Circuit & Sumpner's test on transformer as per Indian standard.

Single phase Autotransformer: - construction, working, merits, demerits and its application.

Unit V :
Three Phase Transformer: Construction, Working, Types, connections, vector group connections, open delta Connection, OC, SC, Heat run test, load test, magnetic balance, vector group test on three phase transformer.

Unit VI :
Three Phase Transformer: Three-winding transformer, On load & Off load tap changers, Scott Connection, Power transformer and Distribution transformer. Waveforms of no load current & inrush current phenomenon.

Text Book: Electrical Machines by D P Kothari & I J Nagrath TMH. New Delhi.

Reference Books:

1) C. Dawes: Electrical Engineering, Vol.I: Direct current (IV Edition), (McGraw Hill Book Company)
2) H. Cotton: Advance Electrical Technology, (Wheeler publication)
3) Indian Standard Guide for testing DC Machine. IS: 9320-1979, (Indian Standards Institution, New Delhi.)
4) Indian Standard Specification for safety transformer. IS: 1416-1972, (Indian Standards Institution, New Delhi.)

3EE04/3 EP04 ENERGY RESOURCES AND GENERATION

Course Outcomes:
A student, on completion of this course, will be able to:

1. Explain the operation of Thermal, Hydro, Nuclear and Diesel power plants.
2. Summarize solar energy conversion, solar radiation measuring instruments, wind energy conversion and their applications.
3. Outline the principle and operation of fuel cells, ocean & tidal energy conversion, and other non-conventional energy resources.
4. Determine the various factorsand curves related to electrical load & generating plant.

Unit I :
Conventional and non conventional energy sources, Indian Energy Scenario.
Thermal and hydro power plant: Layout of Thermal power plant, Selection of site, working of various parts: Economizer, air preheater, condenser, cooling tower, ash &coal handling plant, advantages & disadvantages
Layout of Hydro power plant, classification of hydro power plant according to available head, nature of load, functions of different components and their working, mini and micro hydro-electric power generation, advantages & disadvantages.

Unit II :
Nuclear and Diesel power plant: nuclear fission and fusion, Layout of Nuclear power plant, Selection of site, Functions of different components of nuclear plant, types of nuclear reactors , advantages & disadvantages of different nuclear reactors, nuclear waste disposal., safety measures.
Layout of Diesel power plant, functions of different components of diesel plant, advantages & disadvantages.

Unit III :
Solar Energy and its measurement: Solar cell, array & module, 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, types of solar collectors, energy balance equation and collector efficiency.

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 cell 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 ,classification of WEC systems ,generating system, applications of wind energy.

Unit V :
Ocean, Tidal & Other non-conventional energy resources: Ocean energy resources, ocean energy routes, ocean thermal energy conversion, basic principle of tidal power, components of tidal power plants, operation methods of utilization of tidal energy, estimation of power and energy in single and double basin tidal system,. Operating principles of energy from biomass, energy from biogas, geothermal energy, MHD power generation, energy from urban and rural waste.

Unit VI :
Load-Generation factors: connected load, maximum demand, demand factor, load factor, diversity factors, plant capacity and utilization factor, types of loads, load curve, chronological load curve, load duration curve, energy load curve, energy duration curve, load survey, base load and peak load station.

Text Book : Generation of Electrical Energy by B.R.Gupta, Eurasia Publishing House, New Delhi.

Reference Books:

1. Non conventional energy resources. By G.D.Rai, Khanna Publishers New Delhi
2. Solar energy by S.P.Sukhatme Tata McGraw Hill Publication
3. Principles of Power System by V.K.Mehta, S.Chand publication.
4. Conventional energy technology by S.B.Pandya, Tata McGraw Hill Publication.

3EE05/3 EP05ELECTRONIC DEVICES AND CIRCUITS

Course Outcomes:

After successfully completing the course, the students will be able to :

1. Demonstrate the knowledge of semiconductor physics and PN Junction Diode
2. Analyze the rectifier and regulator circuits.
3. Analyze the operational parameters of BJT
4. Analyze various multistage amplifier circuits
5. Demonstrate the knowledge of JFET, MOSFET, UJT and their operational parameters

UNIT-I:
P-N Junction diode theory, Energy bands in intrinsic and extrinsic silicon, carrier transport, diffusion current , drift current, mobility and resistivity, generation and recombination of carriers, PN junction diode , zener diode, zener diode as voltage regulator, Numericals based on voltage regulator (line and load regulation, Numericals based on resistivity, conductivity, mass action law)

UNIT-II:
Half wave, full wave center tapped full wave and bridge rectifier. Filters-C, LC and their analysis, clipping and clamping, Numericals based on clipping and clamping

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

UNIT-IV :
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-V :
FETs (JFET & MOSFET): Types, Characteristics and parameters (u, gm &Rds), Applications of FET amplifiers, UJT: Characteristics, working, UJT as relaxation oscillator.

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

Text Book :
Millman's Electronic Devices & Circuits by J.Millman, C.Halkias, Satyabrata Jit TMH 3rd ed, 2nd reprint 2011.

Reference Books:

1. Electronic Devices and Circuits 5/e – David Bell Oxford University Press
2. Microelectronic Circuits 5/3 – Sedranad Smith Oxford University Press
3. Boylestad R. and "Electronics Devices & Circuits", Prentice Hall of India Private Limited, New Delhi (Fifth Edition), 1993.

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3EE06/3 EP06/3EX06 ELECTRICAL CIRCUIT ANALYSIS - LAB

Minimum eight experiments based on the syllabus content of 3EE02/3 EP02/3EX02Electrical Circuit Analysis. The intensive list of experiment is given below :

1. Verification of output response of series R-C circuit for step input
2. Study of dot convention and determination of
   A) Mutual inductance
   B) Coupling coefficient of b transformer
3. Verification of Mesh and Node analysis.
4. Verification of Superposition theorem.
5. Verification of Thevenin's theorem.
6. Verification of Maximum Power Transfer theorem.
7. Verification of reciprocity theorem.
8. Study of Milliman's theorem& verification.
9. Verification of Norton's theorem.
10. Determination of ABCD parametersT-network &Π-network.
11. Study of Tie set and Cut set schedule for a given network.
12. MATLAB simulation for o/p verification of any theorem.
13. Determination of Z and Yparameter.
14. Determination of hybrid parameter.

3EE07/3 EP07/3EX07 ELECTRICAL MACHINES - I LAB

Minimum eight experiments based on the syllabus content of 3EE03/3 EP03/3EX03Electrical Machines – I.

The indicative list of experiments is given below.

1. Plot the OCC of DC generator and find its critical resistance and critical speed.
2. To study the build-up of DC shunt generator, calculate critical resistance at different speeds.
3. Plot/Compare: External, Internal Characteristics of DC Shunt/series/compound generator.
4. Calculate the efficiency and voltage regulation of DC generator by the direct load test.
5. Speed Control of DC Shunt motor by armature control & Field Control method.

6. Perform the direct load test on DC series/shunt/compound motor to plot its performance characteristics, and determine its efficiency and speed regulation.
7. Conduct the Swinburn's test on DC machine to estimate its performance at any desired load condition.
8. Conduct the Hopkinson's test on DC Machine to analyze its performance.
9. Perform Electric Braking Operation on DC shunt Motor.
10. Conduct the Polarity test and Ratio test on transformer
11. Calculate the Equivalent circuit parameters of single-phase transformer by performing OC & SC test on itand determine its efficiency and voltage regulation.
12. Perform the direct load test on single phase/three phase transformer and determine its efficiency and voltage regulation.
13. Conduct back to back test (Sumpner's test)on two single phase transformers and determine the temperature rise.
14. Conduct the magnetic balance test on three phase transformer.
15. Conduct the vector group test on three phase transformer.
16. Conversion of three phase to two phase supply system using Scott Connection
17. Capture the waveform of inrush current of single phase/three phase transformer using DSO.

. **Reference:** S.G.Tarnekar, P.K.Kharbanda, S.B.Bodkhe, S.D.Naik and D.J.Dahigaonkar"Laboratory Courses in Electrical Engineering", S. Chand & Co. New Delhi, 2013.

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3EE08/3 EP08/3EX08 ELECTRONIC DEVICES & CIRCUITS - LAB

Minimum eight experiments based on the syllabus content of 3EE05/3 EP05/3EX04Electronic Devices & Circuits. The intensive list of experiment is given below :

1. To study and verify V-I characteristics of semiconductor diode
2. To study and verify V-I characteristics of Zener diode.
3. To verify the performance of half wave rectifier circuit with and without filter.
4. To verify the performance of full wave bridge rectifier circuit and determination of load regulation.
5. To verify the performance of Zener voltage regulator.
6. To verify characteristics of bipolar junction transistor
7. To study and perform C-E amplifier gain with variation of load resistance.
8. To study and verify the characteristics of FET
9. To study UJT as a relaxation oscillator
10. To study phase shift oscillator & determine frequency of oscillation
11. To study characteristics of MOSFT
12. To study clipper circuits using diodes
13. To study clamper circuits using diodes
14. To study and verify operation of cascade amplifiers
15. To verify operation of transistor as a switch

3EE09/3 EP09/3EX09 ELECTRICAL TECHNOLOGY - LAB

Perform **minimum Eight** practicals /demonstrations from the following list and prepare the report as a term work for this laboratory.

1. Introduction to standard symbols used in wiring diagrams
2. Introduction to different wiring accessories.
3. Demonstration of different types of wirings eg. Domestic wiring, commercial wiring, Industrial wiring.
4. Connection of Staircase wiring, Godown wiring, fluorescent lamp. Ceiling fan, air cooler etc
5. Domestic wiring diagrams
6. Connections of switch board, MCB and energy meter
7. Testing and electrical Maintenance of domestic appliances like lamps, electric iron, heater, geyser, air cooler, fan, microwave-oven, induction heater, etc.
8. Insulation resistance and earth resistance measurement
9. Conduct the load survey for domestic/commercial /Industrial consumers
10. Illumination system Design (selection of type and number of lamps required for any location)
11. Calculation of Energy bill for LT & HT consumers.
12. Safety precautions while working with electrical system
13. Demonstration of first aid treatment after getting electric shock.
14. Study of various components of solar power plant.
15. Design calculation of small capacity roof top solar power plant

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SEMESTER IV

4EE01/4EP01/4EX01 ELECTROMAGNETIC FIELDS

Course outcomes :

At the end of the course the student should be able to:

1. Demonstrate the basic mathematical concepts related to electromagnetic vector fields.
2. Apply the principles of electrostatics to the solutions of problems relating to electric field and electric potential, boundary conditions and electric energy density.
3. Apply the principles of magneto statics to the solutions of problems relating to magnetic field.
4. Apply Maxwell's equation in different forms (differential and integral) to diverse engineering problems.

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, Poison and Laplace equations.

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

Unit IV :
Magnetic fields: Biot-Savart law, Ampere's law in integral and differential form. Continuity equation, time of relaxation. Vector and Scalar 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:

Text Book: Engineering Electromagnetics by Hayt W.H. Tata Mc-Graw Hill publication.

Reference Books:

1. Electromagnetic fields by TVS Arun Murthy S Chand & Co

2. Principles and applications of Electromagnetic fields by Plansycollin , Mc-Graw Hill Books Co.

3. Foundations of electromagnetic theory by John Reitz, Addison Wesley Pub Co.

4. Basic electromagnetic field by Herbert Neelf, Harber International education

5. Introduction to electromagnetic, Derucy and Johnson, Mc-Graw Hill Books Co.

4EE02/4EP02/4EX02 ELECTRICAL MEASUREMENTS & INSTRUMENTATION

Course Outcomes:

A student completing this course, should be able to:

Classify the various measuring instruments like PMMC, MI, Electrodynamometer, and Induction type instruments used for measurement of current, voltage, power, and energy.

1. Demonstrate construction & working of Instrument Transformers and special purpose meters.
2. Analyze various methods for measurement of resistance, inductance, capacitance using bridges.
3. Explain the working of various Digital measuring instruments.
4. Explain the generalized Instrumentation system & working of different transducers used for measurement of various non electrical quantities.

Unit-I :
Analog Instruments - Classification of measuring instrument, Different torques in measuring instrument, Analog Ammeter, Voltmeter, Electrodynamic type Construction, ,theory of operation, torque equation, errors, merits and demerits of each type.

Unit II :

Wattmeter and Energy meter-Construction, theory of operation, torque equation, errors, merits and demerits of each type. Analysis of three phase balanced load:- Blondell's theorem, Measurement of active and reactive power in single phase and three phase circuits.

Unit III :

Instrument transformers- C.T.and P.T., Importance, theory and construction, phasor diagram, causes of errors, testing, and applications. Special Instruments- Frequency meter, Power factor meter, Phase sequence indicator, Synchroscopeand Stroboscope.

Unit IV:
Measurement of circuit parameters- Different methods of measurement of low, medium, high value of resistance, sensitivity and accuracy of different methods. AC and DC bridges, Wheat -stone, Kelvin, Maxwell , Wein , Hay , De-Sauty ,Schering , Owen , Anderson's bridge.

Unit V:
Digital methods of measurements, Introduction to A/D, D/A techniques , F/V and V/F conversion techniques , Digital voltmeter (DVM), ammeter, wattmeter, multimeter and Electronic energy meter, Sources of error, Inherent error in digital meters.

Unit VI:
Generalized Instrumentation system- characteristics of measurement and Instrumentation system. Transducers: Definition, classification, Specification, selection, loading effect, Displacement, velocity transducers, Force and torque transducers, Resistive, inductive, Capacitive, strain gauge transducers, Piezoelectric, current and voltage transducers. Elastic-members (Bellows, Bourdon tube, Diaphragm)

Text Book: A.K. Sawhney, 'Electrical & Electronic Measurements and Instrumentation', Dhanpat Rai & Co (P) Ltd.

Reference Books:

1. E.W.Golding&F.C.Widdis, 'Electrical Measurements & Measuring Instruments', A.H.Wheeler& Co.
2. Albert D. Helfrick& William D. Cooper, 'Modern Electronic Instrumentation & Measurement Techniques', Prentice Hall of India, .
3. Joseph. J. Carr, 'Elements of Electronic Instrumentation & Measurements', III edition, Pearson Education.
4. Bouwens, A.J., "Digital Instrumentation", McGraw Hill

4EE03/4EX03 POWER SYSTEM – I

Course Outcomes:

At the end of the course the student should be able to:

1. Calculate the transmission line parameters like resistance, inductances and capacitances.
2. Explain the various configurations of line conductors and their effects on the line parameters.
3. Estimate the electrical characteristics of transmission lines and hence to evaluate the performance of the lines.
4. Draw the single line diagram of any electrical system.
5. Perform the per unit calculation of any electrical system.
6. Apply knowledge of voltage control and power factor improve methods practically.
7. Perform the load flow or power flow methods to any electrical system.
8. Design HV, EHV lines, insulators used.
9. Evaluate the mechanical parameters of line supports.
10. draw the various underground cable configurations and to calculate their electrical parameters.

Unit I
Transmission line parameters: Calculation of resistance, inductance and capacitance of single phase and three phase transmission lines, skin effect and proximity effect, transposition, G.M.D. & G.M.R. methods, double circuit lines, bundled conductors, effect of earth on capacitance, interference with communication lines.

Unit II
Electrical characteristics of transmission line : V-I characteristics of short, medium and long lines, A, B, C, D constants, nominal Π and nominal T representations, Ferranti effect, corona phenomenon, effect of corona. Representation of power systems: per unit system and one-line reactance diagrams

Unit III

Voltage control and power factor improvement: Receiving and sending end power circle diagrams, methods of voltage control and power factor improvement, use of static VAR generators and synchronous phase modifiers.

Unit IV

Load flow studies: Load flow problem, classification of buses, network modelling, Y-bus matrix, load flow equation, Gauss-Seidel and Newton-Raphson methods, and comparison of these methods.

Unit V

Mechanical design: Materials used, types of insulators, comparison of pin type and suspension type insulators, voltage distribution and string efficiency, methods of increasing string efficiency, grading rings and arcing horns. Line supports for LV, HV and EHV, sag calculation.

Unit VI

Underground cables: Material used for conductor & insulation, different types of cables and their manufacture, parameters of underground cable, grading of cable.

Text Book: C.L.Wadhwa, Engineering Electrical Power Systems, , 6th Edition 2010, New Age International Pub.

Reference Books:

1.Power System Engineering by D.P.Kothari, I.J.Nagrath TMH 2nd edition, 9th reprint 2010.
2.Power System Analysis, N.V.Ramana, PEARSON education, 2010.
3.Power System Analysis, Arthur R. Bergen, Vijay Vittal,2nd Edition, 2009, Pearson Education.

4EE04/ 4EP05 /4EX04 ANALOG AND DIGITAL CIRCUITS

Course Outcomes:

After completing the course, students will be able to

1. Explain the principles of operational amplifiers, parameters of op-amp
2. Illustrate the linear and nonlinear applications of op-amp
3. Demonstrate the knowledge of Voltage regulator and Timer ICs
4. Describe the working of Logic families andtheir applications.
5. Demonstrate the knowledge of combinational and sequential circuits and its application

Unit I:

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

Unit II:

Linear and Non-linear Application of Op-amp: Inverting and non inverting amplifiers, voltage follower, integrator, differentiator differential amplifier, op amp as adder subtractor, op amp as a log and antilog amplifier

Sinusoidal RC-phase shift and Wein bridge oscillators, clipping, clamping and comparator circuits using op-amps.

Unit III:

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

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

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

Text Book: Millman, Microelectronics, 2nd Ed., McGraw Hill.

Reference Books:

1. Gayakwad, Op-Amp & LLG, 2nd Ed.
2. Malvino& Leach, Digital Principles & Applications, 4th Ed., McGraw Hill.
3. K.B.Botkar, Integrated Electronics (Khanna Publishers.)

4EE05/4EX05 SIGNALS & SYSTEMS

Course Outcomes:

After completing the course, students will be able to

1. Understand importance and applications of signals and systems
2. Classify Systems into various categories
3. Perform convolution of Analog and Discrete time signals
4. Convert Analog signal into discrete signal by using Sampling Method
5. Apply CTFT,Z-Transform, DTFT, FFT for the analysis of Various Signals and Systems

SECTION-A

Unit-I :
Introduction to Signals and Systems: Signals and Systems, Classification of Signals, Classification of Systems, Some Ideal Signals, Energy and Power Signals, Discretization of Continuous-Time Signals, Analysis of Continuous-Time Systems, Time 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, 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 form 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

Books Recommended:

1. Signals and systems, Oppenheim and Schafer Prentice Hall India of India 2nd Edition 1997

2. Principles of Linear Systems & Signals, 2E (international version) – Lathi B. P. Oxford University Press

3. Signals &Systems, Smarajit Ghosh, PEARSON education, 2006.

4. Signals And Systems , S. Haykin, 2nd Edition, John Wiley And Sons 1999.

5. Analog And Digital Signal Processing , Ambardar A, 2/3; Thomson Learning-2005.

4EE07/ 4EP06 /4EX0 ELECTRICAL MEASUREMENTS & INSTRUMENTATION - LAB

Minimum Eight experiments based on the syllabus content of 4EE02/4EP02/4EX02Electrical Measurements & Instrumentation. The intensive list of experiment is given below.

1. Measurements of Low resistance by using Kelvin double Bridge.
2. Measurements of Medium resistance by Ammeter Voltmeter method/Wheatstone Bridge
3. Measurement of High resistance by Loss of Charge method.
4. Measurement of Insulation resistance by using Megger
5. Measurement of unknown Inductance using Maxwell Bridge/Hay Bridge/Anderson Bridge
6. Measurement of Unknown Capacitance by Desauty Bridge/Schering Bridge
7. Measurement of frequency using Wien Bridge
8. Extension of range of ammeter using shunt/CT.
9. Extension of range of voltmeter using multiplier/PT.
10. Calibration of Wattmeter by Phantom loading
11. Calibration of energy meter to detect the error in it.
12. Measurement of active & reactive power measurement in 1 phase / 3 phase circuit.
13. Measurement of rotational speed using stroboscope
14. Conversion of non electrical quantity into its equivalent electrical quantity using proper transducer.
15. Compare the accuracy, preciseness, sensitivity of Analog & Digital Measuring Instruments.

4EE08/4EX07 POWER SYSTEMS I - LAB

Minimum Eight experiments based on the syllabus content of 4EE03/4EX03 Power System – I

The intensive list of experiment is given below.

1. To study the performance of a transmission line (using a nominal T and π methods).
2. To calculate A,B,C,D parameters for a transmission line by using nominal T method (either using model or simulation).
3. To calculate A,B,C,D parameters for a transmission line by using nominal π method (either using model or simulation).
4. To study skin effect, proximity effect and Ferranti effect in transmission line.
5. To study Corona phenomenon and corona loss and its control in transmission line.
6. To study conversion of single line diagram to impedance diagram and reactance diagram for a typical power system.
7. To draw the circle diagram for a typical power system.
8. Study of a tap changing transformer (ON and OFF load tap changing).
9. Study of static VAR generator and synchronous condenser.
10. Load flow study for a typical power system (A simulation).
11. To study different types of insulators used in power system.
12. To conduct a dry and wet test on a pin type insulator.
13. To conduct a flashover test on a suspension type insulator.
14. To study a horn gap.
15. To study different types of power cables.
16. To study testing of cables.

Note: One may use models, simulation, numerical, drawing sheets or Experimentation for conducting the above experiments.

4EE09/ 4EP08 /4EX08 ANALOG AND DIGITAL CIRCUIT - LAB

Minimum Eight experiments based on the syllabus content of 4EE04/ 4EP05 /4EX04Analog & Digital Circuit. The intensive list of experiment is given below.

1. To Plot Frequency Response Of Non-Inverting Mode Of Op-Amp Using IC741 and Determine the Bandwidth & Maximum Gain
2. To Plot Frequency Response Of Inverting Mode Of Op-Amp Using IC741 and Determine the Bandwidth & Maximum Gain
3. To Perform Op-Amp as Differentiator Using IC741 .
4. Design The Circuit for Supplying 5V,25mA As A Low Voltage Regulator Using IC 723
5. Verification Of Truth Table Of Various Logic Gates Using ICs
6. To Study and Verify The Operation Of SR and MS ,JK Flip Flop
7. To Verify The Operation Of Multiplexer Using IC74153.
8. To Design And Verify Function Of Decade Counterusing IC 7490
9. To Verify The Truth Table Of 4 Bit Comparator

10. To Perform Op-Amp As Integrator Using IC741
11. A stable Multi-vibrator Using IC 555timer
12. To Study And Verify The Operation Of Half-Adder And Full-Adder

4EE10/ 4EP09 /4EX09 ELECTRONIC TECHNOLOGY - LAB

Perform **Minimum Eight** experiments / demonstration based on the following contents and prepare the report as a term work for this laboratory.

- **Study of electronic Components:** Identification of components, name, types, symbol, size, rating and application.
- **Handling Electronic Components:** Finding values and testing (using DMM), test working condition, fault detection.
- **Working with breadboards:** understanding the breadboards for component mounting, working with small circuits on breadboard
- **Soldering:**Soldering skill tips- use of proper soldering Iron, Metal, Flux**,** Cleaning, Tinning etc., mounting components on zero PCB, testing of small circuits mounted on zero PCB. De-soldering of components
- **PCB Layout and design:** Understanding different PCBs, Working on PCB Layout (Software), PCB etching, drilling on PCB, Mounting components on PCB, Working with small circuits on PCB and their testing
- **Electronic circuit Simulation:** Familiarizing with the simulation software, simulation and result validation of simple circuit with software.

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SYLLABUS OF SEM. III & IV B.E. (ELECTRICAL & ELECTRONICS ENGG.)

Semester-III

3EE01/3 EP01/3EX01 ENGINEERING MATHEMATICS -III

Course Outcomes:

After successfully completing the course, the students will be able to:

1. Demonstrate the knowledge of differential equations and partial differential equations, applied to electrical engineering systems.
2. Apply Laplace transform to solve differential equations.
3. Demonstrate the use of Fourier Transform to connect the time domain and frequency domain.
4. Apply Z Transform to solve of various Linear Difference equations with constant coefficients.
5. Apply the knowledge of vector calculusto solve physical problems.
6. Demonstrate the basic concepts of probability and statistics.

UNIT-I:

(a) **Statistics:**Introduction, Curve fitting by method of least square, change of scale, fitting of straight line and parabola, correlation, regression. Application of statistics to electrical engineering.

(b) **Probability**: Axioms, conditional probability, Bay'stheorem,mathematical expectations, probability distributions:Binomial, Poisson and Normal.Application of probability to electrical engineering.

UNIT-II:

(a)Partial differential equation (PDE)of first order and first degree of following type-

(i) f (p, q) = 0; (ii) f (p, q, z) =0; (iii) f (p, q, x, y) = 0; (iv) Pp + Qq =R (Lagrange's Form); (v) Clairaut form Z = px + qy + f(p, q) . Applications of PDE to electrical circuits.

(b)DifferenceEquation: -Solution of difference equations of first order, solution of difference equations of higher order with constant coefficient.Applications of difference equations to electrical engineering.

UNIT-III:

Laplace Transforms: Definition, standard forms, properties of Laplace transform, inverse Laplace transform, Laplace transform of some basic functions, initial and final value theorem, convolution theorem, Laplace transform of Periodic Function, Impulse Function, Unit Step Function. Solution of linear differential equation using Laplace transform.

UNIT-IV:

Fourier Transforms- Definition, standard forms, properties of Fourier transform,inverse Fourier transform, Fourier Transform of some basic functions.Fourier transform of Periodic Function, Impulse Function, Unit Step Function.Fourier cosine transforms. Applications of Fourier Transforms in electrical engineering.

UNIT-V:

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-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, Line Integral, Stokes and Divergence Theorem. Application of Vector calculus to electromagnetics.

Text Book: Elements of Applied Mathematics by P.N.Wartikar and J.N.Wartikar.

Reference Books:

1. Statistical Methods by S.G. Gupta
2. Advance Engineering Mathematics by B.S.Grewal
3. Integral Transforms by Goyal & Gupta.

3EE02/3 EP02/3EX02 ELECTRICAL CIRCUIT ANALYSIS

Course Outcomes:

After completing this course studentwill be able to:

1. Analyze electric and magnetic circuits using basic circuital laws
2. Analyze the circuit using Network simplification theorems.
3. Solve circuit problems using concepts of electric network topology.
4. Evaluate transient response of different circuits using Laplace transform
5. Evaluate two-port network parameters and network functions

Unit I:

a] Terminal Element Relationships: V-I relationship for Dependent &Independent , Voltage and Current Sources., Source Transformations. Source Functions: unit impulse, unit step, unit ramp and interrelationship, sinusoidal input, generalized exponential input.

Magnetic Circuits: concept of self and mutual inductance, dot convention, coefficient of coupling, composite magnetic circuit, Analysis of series and parallel magnetic circuits.

b] Basic Nodal and mesh Analysis: Introduction, Nodal analysis, super node analysis, mesh analysis, super mesh analysis.

Unit II:

Network Theorems: Superposition theorem, Thevenin'stheorem, Norton's theorem, Maximum power transfer theorem, Reciprocity theorem, Millman's theorem, Substitution theorem, Compensation theorem, Tellegen's theorem

Unit III :

Graph Theory and Network Equation:-Graph of a network, Trees and loops, Tie-set and cut set matrix of a network, Network equilibrium equations, duality-network transformation.

Unit IV:

a] **Transformation of a Circuit into s-domain:** LaplaceTransformed equivalent of inductance, capacitance and mutual inductance, Impedance and admittance in the transform domain, Node Analysis and Mesh Analysis of the transformed circuit. Complete Solution ofLinear Differential Equations for Series RC, Parallel RC, Series RL, Parallel RL, Series RLC, Parallel RLC and Coupled Circuits-for step Inputs. Natural Response, Transient Response, Determination of initial conditions.

Unit V :

Two Port Networks: Two port networks: Open circuit impedance parameters, Short circuit admittance parameters, Transmission parameters, Hybrid parameters, Condition for reciprocity and symmetry of a two port network, Interrelationship between parameters, Interconnection of two port networks , Input impedance in terms of two port network parameters, Output impedance, Image impedance.

Unit VI :

Network functions: Ports and terminal pairs, Network functions, poles and zeros, Necessary conditions for driving point function, Necessary conditions for transfer function. Applications of network analysis in driving network functions, positive real functions, driving point and transfer impedance function.

Text Book: Network Analysis, M.E. Van Valkenburg, PHI, 2005.

Reference Books:

1. Circuits & Networks – Analysis, Design & Synthesis by M.S.Sukhija, T.K.Nagasarkar, OxfordUniversity Press, 2010.
2. Circuit and Network Analysis, SudhakarShyammohan, Tata Mc Graw Hill, 2005.
3. Network Analysis, P. Ramesh babu, SciTech Publications, Chennai, 2009.

3EE03/3 EP03/3EX03 -ELECTRICAL MACHINE - I

Course Outcomes:

After Completing this course, students will be able to:

1. Explain the construction and working of DC Machines.
2. Illustrate the different Characteristics, types, their applications and parallel Operation of D.C. Generators.
3. Demonstrate the various characteristics, starting, speed control and braking operation on DC motors
4. Analyze the performance of DC machines by conducting the various tests on it.
5. Determine the parameters of equivalent circuits, performance parameters of single phase transformer and merits & demerits of autotransformer
6. Explain the construction, working, different connections, applications and testing of three phase transformer.

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. Generators, Parallel Operation of D.C. Generators, Introduction to testing of D. C. Generators as per Indian standard.

Unit III

D.C. Motors: Types, Characteristics & Modified Characteristics, Applications of D.C. Motors. Starting, Electric Braking, Speed Control of DC Motors. Losses, efficiency and testing of DC Motors.

Unit IV

Single phase Transformer: Working Operation, EMF Equation, and separation of core losses in to its component. Equivalent Circuit, Parallel Operation. Open Circuit, Short Circuit & Sumpner's test on transformer as per Indian standard.
Single phase Autotransformer: - construction, working, merits, demerits and its application.

Unit V : Three Phase Transformer: Construction, Working, Types, connections, vector group connections, open delta Connection, OC, SC, Heat run test, load test, magnetic balance, vector group test on three phase transformer.

Unit VI :

Three Phase Transformer: Three-winding transformer, On load & Off load tap changers, Scott Connection, Power transformer and Distribution transformer. Waveforms of no load current & inrush current phenomenon.

Text Book: Electrical Machines by D P Kothari & I J Nagrath, Tata McGraw-Hill , New Delhi.

Reference Books:

1) C. Dawes: Electrical Engineering, Vol.I: Direct current (IV Edition), (McGraw Hill Book Company)
2) H. Cotton: Advance Electrical Technology, (Wheeler publication)
3) Indian Standard Guide for testing DC Machine. IS: 9320-1979, (Indian Standards Institution, New Delhi.)
4) Indian Standard Specification for safety transformer. IS: 1416-1972, (Indian Standards Institution, New Delhi.)

3EX04 ELECTRONIC DEVICES AND CIRCUITS

Course Outcomes:
After successfully completingthecourse, thestudents will be ableto

1. Demonstrate the knowledge of semiconductor physics and PN Junction Diode
2. Analyze the rectifier and regulator circuits.
3. Analyze the operational parameters of BJT
4. Analyze various multistage amplifier circuits
5. Demonstrate the knowledge of JFET, MOSFET, UJT and their operational parameters

UNIT-I:
P-N Junction diode theory, Energy bands in intrinsic and extrinsic silicon, carrier transport, diffusion current , drift current, mobility and resistivity, generation and recombination of carriers, PN junction diode , zener diode, zener diode as voltage regulator, Numericals based on voltage regulator (line and load regulation, Numericals based on resistivity, conductivity, mass action law)

UNIT-II: Half wave, full wave center tapped full wave and bridge rectifier. Filters-C, LC and their analysis, clipping and clamping, Numericals based on clipping and clamping

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

UNIT-IV
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-V :
FETs (JFET & MOSFET): Types, Characteristics and parameters (u, gm &Rds), Applications of FET amplifiers, UJT: Characteristics, working, UJT as relaxation oscillator.

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

Text Book:
Millman's Electronic Devices & Circuits by J.Millman, C.Halkias, Satyabrata Jit TMH 3rd ed, 2nd reprint 2011

Reference Books:

1. Electronic Devices and Circuits 5/e – David Bell Oxford University Press
2. Microelectronic Circuits 5/3 – Sedranad Smith Oxford University Press
3. Boylestad R. and "Electronics Devices & Circuits", Prentice Hall of India Private Limited, New Delhi (Fifth Edition), 1993.

3EX05 ELECTRONIC COMMUNICATION THEORY

Course Outcomes:
After successfully completing the course, the students will be able to

- Understand different types of communication noise
- Perform the signal analysis and transformation
- Understand the concept of wave propagation and RF transmission lines
- get acquaint with basic Antenna Theory

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.

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.

Unit III: Probability and Random Signal Theory: Probability, Random variable, PDF Random processes, stationarity, Mean, Correlation and Covariance Functions.

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.

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.

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.

Text Books:

(1) Kennedy G.: "Electronic Communication System" Tata Mc-Graw Hill Co., NewDelhi (Third Edition)
(2) SimonHaykin : Communication System, John Wiley, Eastern Ltd., New York, (Third Edition), 1994.

Reference Books :

(1) CollinsDennis,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, McHill Co, Tokyo, 1994 (2/e.)

3EE06/3 EP06/3EX06 ELECTRICAL CIRCUIT ANALYSIS LAB

Minimum eight experiments based on the syllabus content of 3EE02/3 EP02/3EX02Electrical Circuit Analysis. The intensive list of experiment is given below.

1. Verification of output response of series R-C circuit for step input
2. Study of dot convention and determination of
    A) Mutual inductance
    B) Coupling coefficient of b transformer
3. Verification of Mesh and Node analysis.
4. Verification of Superposition theorem.
5. Verification of Thevenin's theorem.
6. Verification of Maximum Power Transfer theorem.
7. Verification of reciprocity theorem.
8. Study of Milliman's theorem& verification.
9. Verification of Norton's theorem.
10. Determination of ABCD parametersT-network &Π-network.
11. Study of Tie set and Cut set schedule for a given network.
12. MATLAB simulation for o/p verification of any theorem.
13. Determination of Z and Yparameter.
14. Determination of hybrid parameter.

3EE07/3 EP07/3EX07 ELECTRICAL MACHINES - I LAB

Minimum eight experiments based on the syllabus content of 3EX03Electrical Machines – I.

The indicative list of experiments is given below.

1. Plot the OCC of DC generator and find its critical resistance and critical speed.
2. To study the build-up of DC shunt generator, calculate critical resistance at different speeds.
3. Plot/Compare: External, Internal Characteristics of DC Shunt/series/compound generator.
4. Calculate the efficiency and voltage regulation of DC generator by the direct load test.
5. Speed Control of DC Shunt motor by armature control & Field Control method.

6. Perform the direct load test on DC series/shunt/compound motor to plot its performance characteristics, and determine its efficiency and speed regulation.
7. Conduct the Swinburn's test on DC machine to estimate its performance at any desired load condition.
8. Conduct the Hopkinson's test on DC Machine to analyze its performance.
9. Perform Electric Braking Operation on DC shunt Motor.
10. Conduct the Polarity test and Ratio test on transformer
11. Calculate the Equivalent circuit parameters of single-phase transformer by performing OC & SC test on itand determine its efficiency and voltage regulation.
12. Perform the direct load test on single phase/three phase transformer and determine its efficiency and voltage regulation.
13. Conduct back to back test (Sumpner's test)on two single phase transformers and determine the temperature rise.
14. Conduct the magnetic balance test on three phase transformer.
15. Conduct the vector group test on three phase transformer.
16. Conversion of three phase to two phase supply system using Scott Connection
17. Capture the waveform of inrush current of single phase/three phase transformer using DSO.

Reference:

S.G.Tarnekar, P.K.Kharbanda, S.B.Bodkhe, S.D.Naik and D.J.Dahigaonkar"Laboratory Courses in Electrical Engineering", S. Chand & Co. New Delhi, 2013.

3EE08/3 EP08/3EX08 ELECTRONIC DEVICES & CIRCUITS LAB

Minimum eight experiments based on the syllabus content of 3EE05/3 EP05/3EX04 Electronic Devices & Circuits. The intensive list of experiment is given below.

1. To study and verify V-I characteristics of semiconductor diode
2. To study and verify V-I characteristics of Zener diode.
3. To verify the performance of half wave rectifier circuit with and without filter.
4. To verify the performance of full wave bridge rectifier circuit and determination of load regulation.
5. To verify the performance of Zener voltage regulator.
6. To verify characteristics of bipolar junction transistor
7. To study and perform C-E amplifier gain with variation of load resistance.
8. To study and verify the characteristics of FET
9. To study UJT as a relaxation oscillator
10. To study phase shift oscillator & determine frequency of oscillation
11. To study characteristics of MOSFT
12. To study clipper circuits using diodes
13. To study clamper circuits using diodes
14. To study and verify operation of cascade amplifiers
15. To verify operation of transistor as a switch

3EE09/3 EP09/3EX09 ELECTRICAL TECHNOLOGY LAB

Perform minimum Eight practicals / demonstration from the following list and prepare the report as a term work for this laboratory.

1. Introduction to standard symbols used in wiring diagrams
2. Introduction to different wiring accessories.
3. Demonstration of different types of wirings eg. Domestic wiring, commercial wiring, Industrial wiring.
4. Connection of Staircase wiring, Godown wiring, fluorescent lamp. Ceiling fan, air cooler etc
5. Domestic wiring diagrams
6. Connections of switch board, MCB and energy meter
7. Testing and electrical Maintenance of domestic appliances like lamps, electric iron, heater, geyser, air cooler, fan, microwave-oven, induction heater, etc.
8. Insulation resistance and earth resistance measurement
9. Conduct the load survey for domestic/commercial /Industrial consumers
10. Illumination system Design (selection of type and number of lamps required for any location)
11. Calculation of Energy bill for LT & HT consumers.
12. Safety precautions while working with electrical system
13. Demonstration of first aid treatment after getting electric shock.
14. Study of various components of solar power plant.
15. Design calculation of small capacity roof top solar power plant

SEMESTER – IV

4EE01/4EP01/4EX01 ELECTROMAGNETIC FIELDS

Course outcomes :

At the end of the course the student should be able to:

1. Demonstrate the basic mathematical concepts related to electromagnetic vector fields.
2. Apply the principles of electrostatics to the solutions of problems relating to electric field and electric potential, boundary conditions and electric energy density.
3. Apply the principles of magneto statics to the solutions of problems relating to magnetic field.
4. Apply Maxwell's equation in different forms (differential and integral) to diverse engineering problems.

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, Poison and Laplace equations.

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

Unit IV : Magnetic fields: Biot-Savart law, Ampere's law in integral and differential form. Continuity equation, time of relaxation. Vector and Scalar 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:

Text Book: Engineering Electro- magnetics by Hayt W.H. Tata Mc-Graw Hill publication

Reference Books:

1. Electromagnetic fields by TVS Arun Murthy S Chand & Co
2. Principles and applications of Electromagnetic fields by Plansycollin , Mc-Graw Hill Books Co.
3. Foundations of electromagnetic theory by John Reitz, Addison Wesley Pub Co.
4. Basic electromagnetic field by Herbert Neelf, Harber International education
5. Introduction to electromagnetic, Derucy and Johnson, Mc-Graw Hill Books Co.

4EE02/4EP02/4EX02 ELECTRICAL MEASUREMENTS & INSTRUMENTATION

Course Outcomes:

A student completing this course, should be able to:

1. Classify the various measuring instruments like PMMC, MI, Electrodynamometer, and Induction type instruments for measurement of current, voltage, power, and energy.
2. Demonstrate the construction & working of Instrument Transformers/special purpose meters.
3. Analyze various methods for measurement of resistance, inductance, capacitance using bridges.
4. Explain the working of various Digital measuring instruments.
5. Explain the generalized Instrumentation system & working of different transducers used for measurement of various non electrical quantities.

Unit-I :
Analog Instruments - Classification of measuring instrument, Different torques in measuring instrument, Analog Ammeter, Voltmeter, Electrodynamic type Construction, ,theory of operation, torque equation, errors, merits and demerits of each type.

Unit II : Wattmeter and Energy meter-Construction, theory of operation, torque equation, errors, merits and demerits of each type. Analysis of three phase balanced load:- Blondell's theorem, Measurement of active and reactive power in single phase and three phase circuits.

Unit III :

Instrument transformers- C.T.and P.T., Importance, theory and construction, phasor diagram, causes of errors, testing, and applications.

Special Instruments- Frequency meter, Power factor meter, Phase sequence indicator, Synchroscopeand Stroboscope.

Unit IV:

Measurement of circuit parameters- Different methods of measurement of low, medium, high value of resistance, sensitivity and accuracy of different methods. AC and DC bridges, Wheat -stone, Kelvin, Maxwell , Wein , Hay , De-Sauty ,Schering , Owen , Anderson's bridge

Unit V:

Digital methods of measurements,Introduction to A/D, D/A techniques , F/V and V/F conversion techniques , Digital voltmeter (DVM), ammeter, wattmeter, multimeter and Electronic energy meter, Sources of error, Inherent error in digital meters

Unit VI:

Generalized Instrumentation system- characteristics of measurement and Instrumentation system. Transducers: Definition, classification, Specification, selection, loading effect, Displacement, velocity transducers, Force and torque transducers, Resistive, inductive, Capacitive, strain gauge transducers, Piezoelectric, current and voltage transducers. Elastic-members (Bellows, Bourdon tube, Diaphragm)

Text Book: A.K. Sawhney, 'Electrical & Electronic Measurements and Instrumentation', Dhanpat Rai& Co (P) Ltd.

Reference Books:

1. E.W.Golding&F.C.Widdis, 'Electrical Measurements & Measuring Instruments', A.H.Wheeler& Co.
2. Albert D. Helfrick& William D. Cooper, 'Modern Electronic Instrumentation & Measurement Techniques', Prentice Hall of India, .
3. Joseph. J. Carr, 'Elements of Electronic Instrumentation & Measurements', III edition, Pearson Education.
4. Bouwens, A.J., "Digital Instrumentation", McGraw Hill.

. **4EE03/4EX03 POWER SYSTEM - I**

Course Outcomes:

At the end of the course the student should be able to:

1. Calculate the transmission line parameters like resistance, inductances and capacitances.
2. Explain the various configurations of line conductors and their effects on the line parameters.
3. Estimate the electrical characteristics of transmission lines and hence to evaluate the performance of the lines.
4. Draw the single line diagram of any electrical system.
5. Perform the per unit calculation of any electrical system.
6. Apply knowledge of voltage control and power factor improve methods practically.
7. Perform the load flow or power flow methods to any electrical system.
8. Design HV, EHV lines, insulators used.
9. Evaluate the mechanical parameters of line supports.
10. draw the various underground cable configurations and to calculate their electrical parameters.

Unit I :

Transmission line parameters: Calculation of resistance, inductance and capacitance of single phase and three phase transmission lines, skin effect and proximity effect, transposition, G.M.D. & G.M.R. methods, double circuit lines, bundled conductors, effect of earth on capacitance, interference with communication lines.

Unit II :

Electrical characteristics of transmission line : V-I characteristics of short, medium and long lines, A, B, C, D constants, nominal Π and nominal T representations, Ferranti effect, corona phenomenon, effect of corona. Representation of power systems: per unit system and one-line reactance diagrams

Unit III :

Voltage control and power factor improvement: Receiving and sending end power circle diagrams, methods of voltage control and power factor improvement, use of static VAR generators and synchronous phase modifiers.

Unit IV : Load flow studies: Load flow problem, classification of buses, network modelling, Y-bus matrix, load flow equation, Gauss-Seidel and Newton-Raphson methods, and comparison of these methods.

Unit V :

Mechanical design: Materials used, types of insulators, comparison of pin type and suspension type insulators, voltage distribution and string efficiency, methods of increasing string efficiency, grading rings and arcing horns. Line supports for LV, HV and EHV, sag calculation.

Unit VI :

Underground cables: Material used for conductor & insulation, different types of cables and their manufacture, parameters of underground cable, grading of cable.

Text Book: C.L.WadhwaEngineering Electrical Power Systems, , 6th Edition 2010, New Age International Pub.

Reference Books:

1.Power System Engineering by D.P.Kothari, I.J.Nagrath TMH 2nd edition, 9th reprint 2010
2.Power System Analysis, N.V.Ramana, PEARSON education, 2010.
3.Power System Analysis, Arthur R. Bergen, Vijay Vittal,2nd Edition, 2009, Pearson Education.

4EE04/ 4EP05 /4EX04 ANALOG AND DIGITAL CIRCUITS

Course Outcomes:

After completing the course, students will be able to

1. Explain the principles of operational amplifiers, parameters of op-amp
2. Illustrate the linear and nonlinear applications of op-amp
3. Demonstrate the knowledge of Voltage regulator and Timer ICs
4. Describe the working of Logic families andtheir applications.
5. Demonstrate the knowledge of combinational and sequential circuits and its application

Unit I:

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

Unit II:

Linear and Non-linear Application of Op-amp: Inverting and non inverting amplifiers, voltage follower, integrator, differentiator differential amplifier, op amp as adder subtractor, op amp as a log and antilog amplifier

Sinusoidal RC-phase shift and Wein bridge oscillators, clipping, clamping and comparator circuits using op-amps.

Unit III:

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

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

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

Text Book: Millman, Microelectronics, 2nd Ed., McGraw Hill.

Reference Books:

1. Gayakwad, Op-Amp & LLG, 2nd Ed.
4. Malvino& Leach, Digital Principles & Applications, 4th Ed., McGraw Hill.
5. K.B.Botkar, Integrated Electronics (Khanna Publishers.)

4EE05/4EX05 SIGNALS & SYSTEMS

Course Outcomes:
After completing the course, students will be able to

1. Understand importance and applications of signals and systems
2. Classify Systems into various categories
3. Perform convolution of Analog and Discrete time signals
4. Convert Analog signal into discrete signal by using Sampling Method
5. Apply CTFT,Z-Transform, DTFT, FFT for the analysis of Various Signals and Systems.

Unit-I :
Introduction to Signals and Systems: Signals and Systems, Classification of Signals, Classification of Systems, Some Ideal Signals, Energy and Power Signals, Discretization of Continuous-Time Signals, Analysis of Continuous-Time Systems, Time 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, 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.

Unit-IV :
Sampling: Representation of a continuous–Time Signal by its Samples; The Sampling Theorem; Reconstruction of Signals form 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

Text Book: Signals and systems, Oppenheim and Schafer PHI. 2nd Edition 1997

Reference Books:
1. Signals &Syatems, Smarajit Ghosh, PEARSON education, 2006
2. Signals And Systems , S.Haykin, 2nd Edition, John Wiley And Sons 1999
3. Analog And Digital Signal Processing , Ambardar A, 2/3; Thomson Learning-2005

4EX06 ELECTRICAL MEASUREMENTS & INSTRUMENTATION- LAB

Minimum eight experiments based on the syllabus content of 4EE02/4EP02/4EX02Electrical Measurements & Instrumentation. The intensive list of experiment is given below.

1. Measurements of Low resistance by using Kelvin double Bridge.
2. Measurements of Medium resistance by Ammeter Voltmeter method/Wheatstone Bridge

3. Measurement of High resistance by Loss of Charge method.
4. Measurement of Insulation resistance by using Megger
5. Measurement of unknown Inductance using Maxwell Bridge/Hay Bridge/Anderson Bridge
6. Measurement of Unknown Capacitance by Desauty Bridge/Schering Bridge
7. Measurement of frequency using Wien Bridge
8. Extension of range of ammeter using shunt/CT.
9. Extension of range of voltmeter using multiplier/PT.
10. Calibration of Wattmeter by Phantom loading
11. Calibration of energy meter to detect the error in it.
12. Measurement of active & reactive power measurement in 1 phase / 3 phase circuit.
13. Measurement of rotational speed using stroboscope
14. Conversion of non electrical quantity into its equivalent electrical quantity using proper transducer.
15. Compare the accuracy, preciseness, sensitivity of Analog & Digital Measuring Instruments.

4EX07 POWER SYSTEMS I LAB

Minimum eight experiments based on the syllabus content of 4EE03/4EX03 Power System - I

The intensive list of experiment is given below.

1. To study the performance of a transmission line (using a nominal T and π methods).
2. To calculate A,B,C,D parameters for a transmission line by using nominal T method (either using model or simulation).
3. To calculate A,B,C,D parameters for a transmission line by using nominal π method (either using model or simulation).
4. To study skin effect, proximity effect and Ferranti effect in transmission line.
5. To study Corona phenomenon and corona loss and its control in transmission line.
6. To study conversion of single line diagram to impedance diagram and reactance diagram for a typical power system.
7. To draw the circle diagram for a typical power system.
8. Study of a tap changing transformer (ON and OFF load tap changing).
9. Study of static VAR generator and synchronous condenser.
10. Load flow study for a typical power system (A simulation).
11. To study different types of insulators used in power system.
12. To conduct a dry and wet test on a pin type insulator.
13. To conduct a flashover test on a suspension type insulator.
14. To study a horn gap.
15. To study different types of power cables.
16. To study testing of cables.

Note: One may use models, simulation, numerical, drawing sheets or Experimentation for conducting the above experiments.

4EX08 ANALOG AND DIGITAL CIRCUIT LAB

Minimum eight experiments based on the syllabus content of 4EE04/ 4EP05 /4EX04Analog & Digital Circuit. The intensive list of experiment is given below.

1. To Plot Frequency Response Of Non-Inverting Mode Of Op-Amp Using IC741 and Determine the Bandwidth & Maximum Gain
2. To Plot Frequency Response Of Inverting Mode Of Op-Amp Using IC741 and Determine the Bandwidth & Maximum Gain
3. To Perform Op-Amp as Differentiator Using IC741 .
4. Design The Circuit for Supplying 5V,25mA As A Low Voltage Regulator Using IC 723
5. Verification Of Truth Table Of Various Logic Gates Using ICs
6. To Study and Verify The Operation Of SR and MS ,JK Flip Flop
7. To Verify The Operation Of Multiplexer Using IC74153.
8. To Design And Verify Function Of Decade Counterusing IC 7490
9. To Verify The Truth Table Of 4 Bit Comparator
10. To Perform Op-Amp As Integrator Using IC741
11. A stable Multi-vibrator Using IC 555timer
12. To Study And Verify The Operation Of Half-Adder And Full-Adder

4EX09 ELECTRONIC TECHNOLOGY LAB

Perform Minimum Eight experiments / demonstration based on the following contentand prepare the report as a term work for this laboratory.

- **Study of electronic Components:** Identification of components, name, types, symbol, size, rating and application.
- **Handling Electronic Components:** Finding values and testing (using DMM), test working condition, fault detection.
- **Working with breadboards:** understanding the breadboards for component mounting, working with small circuits on breadboard
- **Soldering:**Soldering skill tips- use of proper soldering Iron, Metal, Flux**,** Cleaning, Tinning etc., mounting components on zero PCB, testing of small circuits mounted on zero PCB. De-soldering of components
- **PCB Layout and design:** Understanding different PCBs, Working on PCB Layout (Software), PCB etching, drilling on PCB, Mounting components on PCB, Working with small circuits on PCB and their testing
- **Electronic circuit Simulation:** Familiarizing with the simulation software, simulation and result validation of simple circuit with software.

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NOTIFICATION

No. 90 /2020 Date : 26/10//2020

Subject : Implementation of new Syllabi of Semester III & IV B.E. (Chemical) / B. Text. E./ B.Tech. (Chem.) (Tech.) (Food, Pulp & Paper, Oil & Paint and Petrochemical Tech.) (C.B.C.S.) as per A.I.C.T.E. Model Curriculum …

It is notified for general information of all concerned that the authorities of the University have accepted to implement new Syllabi of Semester III & IV of of B.E.(Chemical)/B.Text.E./B.Tech. (Chem.) (Tech.) (Food, Pulp & Paper, Oil & Paint and Petrochemical Tech.) (C.B.C.S.) as per A.I.C.T.E. Model Curriculum to be implemented from the academic session 2020-21 & onwards as per **"Appendix-A"** as given :

Sd/-
(Dr.T.R.Deshmukh)
Registrar

"**Appendix – A**"

SYLLABUS OF B.TEXT. ENGG. SEM. III & IV C.B.C.S.]

3 TX 01 Textile Fibre -I

Course objectives :

1) To gain basic knowledge about essential and desirable properties of textile fibres and their classification.
2) To gain the knowledge about various textile natural fibres.
3) To understand various methods for analyzing fibre structure.

Course outcomes :

After the completion of Textile Fibre –I course, students will able to demonstrate,
1) the essential and desirable properties of Textile fibre and their classification
2) the physical, chemical and biological properties of cotton fibre
3) the physical, chemical and biological properties of jute and flax
4) the physical, chemical and biological properties of wool
5) the physical, chemical and biological properties of Silk
6) the various methods for analyzing fibre structure

SECTION-A

Unit-I: Definition of fibre, Classification of Textile fibres, Essential and desirable properties of Textile fibres, Polymers: Definition, Types of polymers, Requirements of fibre forming polymers. Basic structure of fibre: Concept of molecular weight, Degree of polymerization, Orientation and crystallinity, effect of orientation and crystallinity on the properties of fibres.

Unit-II: Cotton: Introduction, structure of Cotton fibre, fibre morphology, cotton polymer system, Physical, chemical and biological properties, Applications. Introduction to Banana, Pineapple fibres and their distinctive features and applications.

Unit-III: Jute: Cultivation and Extraction of Jute fibre, Structure of jute fibre, physical, chemical and biological properties, Applications. Flax: Retting and extraction process, structure of flax fibre, physical, chemical and biological properties, Applications. Introduction to hemp, ramie fibres and their distinctive features and applications.

SECTION-B

Unit-IV: Wool: Types of wool, grading of wool, Structure of wool, chemical composition, polymer system of wool, Physical, chemical and biological properties, Applications. Introduction to fibres like, mohair, camel, alpaca and their distinctive features and applications.

Unit-V: Silk: Types of silk, Production of silk (life cycle, reeling), Structure of silk, chemical composition, polymer system of silk, Physical, chemical and biological properties, Applications, blending opportunities in silk.

Unit-VI: Analysis of fibre structure: Introduction, crystal structure, and polymer crystals. i) X-ray diffraction: Bragg's law, X-ray diffractometer. ii) Electron microscopy: Principle and working of Transmission and scanning electron microscope. iii) Spectroscopy: Principle and working of IR-Spectroscopy and NMR-Spectroscopy. Introduction to thermal analysis of polymers.

Text Books :

1. Textile Fibres – Vol.-I by V.A.Shenai
2. Fibre Science and Technology by S.P. Mishra.

Reference Books :

1. Textile Fibres by H.V.S. Murthy
2. Textile Science- Gohl and Vilensky
3. Hand book of Textile Fibres Vol. I & II by Gordon & Cook.
4. Polymer science- V. Gowarikar
5. Investigation of Physical Properties of textile fibres- Hearle & Meredith.

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3TX02 YARN MANUFACTURING - I

Course Objectives:

1. To gain basic knowledge about various preparatory spinning processes, viz blowroom, carding, drawing and combing.

2. To gain the knowledge about modern aspects of various preparatory spinning processes viz blow room, carding, drawing and combing.

3. To understand various parameters influencing performance ofpreparatory spinning processes.

Course Outcomes:

After the completion of yarn manufacturing course, students will able to -

1. Explain about the concept of ginning and blowroom process and description regarding ginning machines and basics of opening and cleaning.
2. Explain about the concept of blowroom process and description regarding blowroom machines.
3. Explain about the concept of carding process and description about carding machines.
4. Explain about the concept of drawing process and description about drawframe machines.
5. Explain about the concept of combing preparatory and combing process and description regarding combing preparatory machines and basics of combing process.
6. Explain about the concept of combing process and description regarding combing machines.

SECTION-A

Unit-I Ginning: Objectives, classification, different ginning machines, machine parameters, ginning performance. Baling and pressing–objectives, baling and pressing machines, bale specifications and recent developments in ginning machine.

Blowroom: Basics of opening and cleaning, historical review of conventional blowroom machines, degree of opening and cleaning, opening intensity and cleaning efficiency, process flow chart of spinning process.

Unit-II Modern blowroom: Introduction, objectives, its features, modern opening and cleaning machines-automatic bale openers, pre-cleaners, fine openers, fine cleaners, multi roll technology, multi-function separators. Chute feed system, automatic waste collection system. Production and cleaning efficiency calculations.

Mixing-objectives, need of mixing, modern mixing machines. Blending-objectives, selection of blend constituents, blending techniques, modern blending machines, compatibility requirements, blend irregularity.

Unit-III Carding: Objectives, modern carding machines, features of new generation cards, operating regions, selection of card clothing, transfer efficiency-definition, importance, factors affecting transfer efficiency, autolevellers-basic principle, types, working, different settings of card, production and cleaning efficiency calculations, recent developments in carding machine-on line nep control, auto can changer, automatic suction system, sliver information system etc.

SECTION -B

Unit-IV Drawing: Objectives, principle of drafting, modern drawframe machine, types of drafting system, types of draft, roller setting, rollers slip and drafting waves. Autolevellers- principle, types, working, process parameters affecting drawing performance. Production and draft calculations. Recent developments in drawframe machine.

Unit-V Combing preparatory: Objectives, importance, parameters of comber lap, methods of comber lap preparation, different sequences of combing preparatory machines. Process parameters, production calculations and recent developments in combing preparatory machines.

Combing: Objectives, basics of combing process and combing operation

Unit-VI Combing: Modern comber, combing cycle, timing diagram, settings and its importance, fractionating efficiency. Forward and backward feed. Comber noil, influence of combing operation on sliver quality. Automation in comber-automatic noil collection, automatic material handling. Production calculations and technical specifications of modern comber machine.

Text Books :

1. 'Manual of Textile Technology', by Klein W, Vol. I – III.
2. 'Spun Yarn Technology', by Oxtoby E.
3. 'Fundamental of Spun Yarn Technology,' by Lawrence C A.
4. 'Handbook of Yarn Production', by Lord P R.

Reference Books :

1. Manual of Cotton Spinning Vol. II, Part-I by P. Lord.
2. Manual of Cotton Spinning Vol. II, Part-II by Shirley.
3. Opening Cleaning and Picking by Dr. Zoltan S. Szaloki,
4. Cotton Ginning, Textile Progress, The Textile Institute Publication.
5. Blow room and Carding- Training Program conducted by NCUTE, IIT, Delhi.
6. Essential calculations of practical cotton spinning by T.K. Pattabhiraman.
7. Elements of Blowroom and Carding by Dr. A. R. Khare.

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3TX03 FABRIC MANUFACTURING – I

Course objectives :

1) To gain basic knowledge about various weaving preparatory processes viz. winding, warping sizing.
2) To gain the knowledge about modern aspects various weaving preparatory process viz. winding, warping sizing.
3) To understand various key parameters of influencing performance of weaving preparatory process viz. winding, warping sizing.

Course Outcomes :

After the completion of Fabric Manufacturing –I course, students will able to demonstrate

1) Knowledge about the concept of winding process and description regarding high speed winding machines.
2) Knowledge about the automatic winding machines
3) Knowledge about the concept of warping process and description about high speed warping machines
4) Knowledge about the automatic warping machines
5) Knowledge about the concept of sizing process & description about sizing machines
6) Knowledge about control systems, ingredients, and cooling elements related to sizing process.

Section A

Unit I: Brief outline of the process involve in weaving, Yarn quality attributes, Uster yarn quality, objectionable faults & its classification as per Uster calssimate. Winding: Objectives:- High speed winding process, geometrical aspects of winding machines, description about tensioners, slub catchers, winding unit, anti-patterning and safety devices. Concept of cone angle, angle of wind, wind per traverse, production efficiency speed, time, calculation related to winding process.

UNIT II: Automatic cone and cheese winding machines, methods of yarn joining, splicing and knotting. Concept of P& Q winding and their applications, construction details of automatic winding machines:- Creel, unwinding tension regulation unit, splicer, EYC, automatic package doffing clearing and dust removal Splicing: - Types viz. mechanical, pneumatic, aqua and thermal. Splice quality assessment. EYC: - optical and capacitance

UNIT III: Internal and between machine material flow with respect to winding, brief description about pirn winding process. Warping: - Objectives and classification of warping process, construction details about beam warping: viz. Creel, tensioner, stop motions and head stock drive. Modern developments in warping: - Designing creels, various modern types of creel, pre tensioner, automatic tension regulation system

Section B

UNIT IV: Modern developments with respect to head stock of beam warping. Auto leasing, drive, breaks and doffing and donning systems. Sectional warping: - objective, constructional details of sectional warping process, auto-leasing, drum traverse, cone angle adjustment and beam traverse. Calculation related to production, speed, time, efficiency of warping machines

UNIT V: Concept of yarn weaveability. Sizing :- Necessity and objectives, constructional details and calculations regarding slasher sizing and multi-cylinder sizing. Study of modern sizing elements viz. creels, unwinding tension control, saw box, yarn drying methods, head stock weavers beam pressing and doffing.

Unit VI: Sizing control systems viz. size paste level, temperature, stretch, moisture control, driving arrangement of sizing machines, crawl speed, production calculation speed, time, and efficiency. Concept of optimum size pick up and add-on different sizing ingredients with respect to properties, cooking methods and there testing. Description about size paste cooking plants, types of sizing: Heavy, medium, light and pure. Sizing of polyester, PV, PC, blends.

Text Books:

1. Yarn Preparation (Vol-1 and 2) By R.Sengupta.
2. Sizing Method, Material and Mechanism By D.B.Ajgaokar Andtalukdar.

Reference Books:

1. 'Weaving Calcutions', By R. Sengupta
2. 'Textile Mathematics (Vol-3)', By J.E.Booth
3. 'Weaving Technology And Operation', By Allan Armored Andwalter S Sondhelm.
4. 'Weaving Technology', By N.M.Kulkarni
5. 'Weaving Machine : Mechanism And Material', By M.K.Talukdar.

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3TX04 Textile Testing- I

Course objectives:

1) To gain basic knowledge about various statistical techniques used in textile testing field
2) To learn various testing methodologies used in the evaluation of fibre characteristics.
3) To understand the evaluation of basic yarn properties

Course outcomes:

After the completion of Textile Testing –I course, students will able to

1) Demonstrate knowledge of statistic applications in Textile testing field
2) Demonstrate the statistical analysis of various testing results
3) Explain the various sampling methods and moisture properties of textile
4) Demonstrate knowledge of measurement of various types of fibre parameters
5) Explain about various count of yarn and there measurement
6) Explain the evaluation of tensile properties and evenness of yarn

SECTION A

Unit- I: Introduction to textile testing, Tested quality schemes,

Element of Statistics: Graphical presentation of Data, Measures of Location like Mean, Mode, Median, Quartiles, Percentiles. Measures of Dispersion: Range, Quartile Deviation, Percentage Mean Deviation, Standard Deviation, Coefficient of Variation %, Variance. Comparison of frequency distribution

Unit -II : Population values and sample values, estimation of population characteristics from samples and the use of confidence intervals; determination of number of tests to be carried out to give chosen degree of accuracy; test of significance of means and variance, quality control charts, selection of samples for testing; random and biased samples,

Unit -III: Different types of sampling methods of textile materials, sampling for raw cotton testing. selection of sample for testing, fibre sampling from combed slivers, roving and yarns, yarn sampling, fabric sampling. Moisture regain, moisture content and RH %, effect of regain on fibre properties

Testing of Fibre properties - Historical review of fibre length and strength testing: fibre sorter, analysis of sorter diagram, Stelometer.

SECTION B

Unit IV: Fibre fineness: Airflow principle, Micronaire testers. Maturity: Maturity ratio, Maturity Coefficient – testing methods of maturity, Shirley trash analyzer. Advance Fibre Testing: High Volume Instruments (HVI): length, strength, maturity, trash and color modules. Advanced Fibre Information System (AFIS): length, nep and trash modules, Introduction to Instron testing.

Unit V: Yarn Dimension: Count, Direct and Indirect yarn numbering , Count conversion , Measurement of count: Spun and plied yarns. Measurement of Yarn diameter

Twist: Helical geometry, Twist angle, Effect of twist on yarn and fabric properties, measurement of twist by different methods.

Unit VI: Tensile Testing : Terminology and definitions load elongation curves, stress strain curve, initial young modulus, yield point, work of rupture, work factor, elastic recovery, instantaneous and time dependent effects, creep, Types of tensile testing machines: CRL, CRE and CRT principle, various types of measuring instruments and their working principles, factors affecting tensile properties. Evenness: Principle of measurement, Periodic Variation and Spectrogram. Electronic capacitance tester, Causes and effect of Irregularity.

Reference Books:

1) Principles of Textile Testing -J.E. Booth
2) Physical Testing of Textiles - B.P.Saville
3) Textile Testing - Grover and Hamby.
4) Handbook of Technical Textiles:- Anand and Harrocks.
5) Testing and Quality Management- V. K. Kothari

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3 TX 05 Thermal Science and Air Conditioning

Course Objectives :

- To understand the properties of steam and use of boilers in textile industries.
- To understand the basic knowledge about fluid dynamics and its application in textile industry.
- To understand the basic knowledge about refrigeration and air conditioning and their applications in textile industries.

Course Outcomes :

At the end of the course, students will be able to-

CO1- To understand the properties of steam, its types and applications in textile field.
CO2- To describe construction and working of different types of steam boilers their accessories and mountings.
CO3- To describe the concept of fluid dynamics and fluid flow applications in textile industries.
CO4- To describe the function of different types of compressors and their applications in textile industry.
CO5- To describe the function of different types of pumps and refrigeration systems.
CO6- To understand the function of the air conditioning system and its applications in textile industries.

SECTION-A

UNIT I: Properties of Steam: Brief overview about the use of steam in textile industries, Formation 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 and Steam Table and their use. Difference between Vapor and Gas, Dryness Fraction and Measurement of by Separating, Throttling, and Combine Calorimeter, Specific application of steam in textile industries and processes. (6)

UNIT II: Steam Boiler: Flow Diagram for Steam Power Plant with basic units such as Steam Generator, Turbine, Condenser and Pump, Classification of Boilers, Principal Parts of Steam Boiler and their functions, Characteristics of a Good Steam Boiler, Factor Affecting the Selection of Boilers, Historical Review of Fire Tube Boiler and Water Tube Boiler. Introduction of High Pressure Boilers such as LaMont Boiler, Loeffler Boiler, Benson Boiler, and Velox Boiler.Uses of Boiler in Textile Industry such as Spinning, Weaving, Chemical Processing and others.

Boiler Mounting and Accessories :- Boiler Mountings- Devices for proper functioning and safety such as Safety Valve, Water Level Indicator, Pressure Gauge, Fusible Plug, Blow-off Cock, Feed Check Valve, Steam Stop Valves, Man Hole and Mud Box. Boiler Accessories-Devices for improving Boiler Efficiency such as Superheater, Economizer, Air Preheater. Boiler Draught (Draft), Function of Draught, Classification of Boiler Draught. **(6)**

UNIT III: Fluid Dynamics: Introduction to the study of fluid motion its uses in textile industry, Mechanical Properties of Fluids and their influence on flow characteristics, Types of Flows, Stream Lines, Potential Lines, Flow Net, Continuity Equation, Bernoulli's Equation, Venturimeter.

Fluid flow applications in Textile Processing- Air Jet Spinning, Nozzle design and performance in Air Jet Spinning, Spun bonding process of Non-Woven, Fabric like Structures, Textile Wet Processing, Air-Jet and Water Jet weft insertion mechanisms. **(6)**

SECTION- B

UNIT IV: Air Compressor : Introduction, Classification of Air Compressor, Cycle of operation, Use of Compressed air in Textile Industry such as spinning machine and weaving machine, Introduction to Pneumatic System, Study of various Pneumatic Circuit, and its Component, like Valves Filter, Regulator, Accumulator, Lubricator. Application of Pneumatic circuits in Textile Machines. **(6)**

UNIT V: Pump and Refrigeration: Introduction of Pump used in Textile Industry, Classification of Pump, Centrifugal Pumps, main parts & working, work done, efficiency, Brief Introduction of Reciprocating Pump.

Refrigeration- Introduction to Refrigeration, Application of Refrigeration, Elements of Refrigeration System, Unit of Refrigeration, Coefficient of Performance (COP), Various Refrigeration System such as Ice Refrigeration, Air Refrigeration System, Vapour Compression Refrigeration System, Vapour Absorption Refrigeration System. **(6)**

UNIT VI: Air Conditioning: Concept of Psychometry and Psychometrics terms, Definitions, Psychometric Relations, Psychometric Chart, Psychometric Processes- Mixing of Air Streams, Sensible Heating, Sensible Cooling, Humidification, Dehumidification. Methods and Features of Modern Humidification plant in Textile Mills, Effect of Moisture on Textile Fibers, sling Psychrometer, Use of psychometric chart. (Numerical related to psychometric).Importance of Humidity Control in Textile Processing. Air Conditioning System- Introduction, Air Conditioning Cycle, Classification of Air Conditioning System, Central System, Zoned System, Unitary System, Unitary Central System. **(6)**

Books Recommended:-

Text Books :

1) Thermal Engineering-P.L.Balaney.(Khanna Publication)
2) Fluid Mechanics and Hydraulic Machine by Dr.R.K.Bansal
3) A course in Refrigeration and Air Conditioning – S. C. Arora, S. Domkundwar.(Khanna Publication.)

References Books :

1) Refrigeration & Air Conditioning – P. N. Ananthnarayanan. (TMH Publication)
2) Elements of Heat Engine–R.C.Patel, C.J.Karamchandani.(Charter Publication)
3) Thermal Enginneering B.K.Sarkar.(TMH Publication)
4) Thermal Engineering-S.Domkundalwar.(Khanna Publication)
5) A Textbook of Engineering Thermodynamics by R.K.Rajput.
6) Thermal Engineering by R.S.Khurmi & Gupta.
7) Refrigeration & Air conditioning by R. K.Rajput.
8) Pneumatic Systems by Majumdar.
9) Hydraulics & Pneumatics by Andrew &Parr.
10) Humidification & Air conditioning by S. P.Patel.
11) Textile Humidification by K. G.Vaze.

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Semester-IV
4 TX 01 Textile Fibre - II

Course objectives :

1) To gain basic knowledge about polymers and their extrusion methods.
2) To gain the knowledge about major synthetic fibres and their properties.
3) To understand texturing and its various methods.

Course outcomes :

After the completion of Textile Fibre –II course, students will able to demonstrate,

1) the various extrusion methods of synthetic fibres
2) the manufacturing and properties of regenerated fibres
3) the manufacturing and properties of Polyamide and Polyester fibres
4) the manufacturing and properties of Polyacrylonytrile, Polyvinyl and Polyethylene fibres
5) the concepts of mechanical, thermal and optical properties
6) the various methods of texturing

SECTION-A

Unit-I: Manmade fibres: Definitions of regenerated & synthetic fibres, heterochain and carbon chain fibres, Addition and condensation polymerization, Study of intra-polymer and inter-polymer forces in fibre polymer. Concept of thermoplastic and thermoset material. Introduction to melt spinning, dry spinning and wet spinning.

Unit-II: Regenerated fibres: i)Viscose rayon: Manufacturing process, Physical and chemical properties, Applications, ii)Cuprammnium rayon: Manufacturing process, Physical and chemical properties, Applications. iii) High wet modulus and Polynosic rayon: Manufacturing process, Physical and chemical properties, Applications. iv)Introduction to Acetate & Triacetate fibres

Unit-III: Synthetic fibres: i) Polyamide Fibres: Nylon-6, Nylon-66, Raw materials, manufacturing process, Microscopic structure, Physical and chemical properties, Applications. ii) Polyester fibre: Raw materials, manufacturing process, Microscopic structure, Physical and chemical properties, Applications.

SECTION-B

Unit-IV: Synthetic fibres: i) Polyacrylonitrile fibres: Acrylic and Modacrylic fibres: Raw materials, manufacturing process, Microscopic structure, Physical and chemical properties, Applications. ii) Polyvinyl alcohol and Polyvinyl chloride fibres: Raw materials, manufacturing process, Microscopic structure, Physical and chemical properties, Applications. iii) Polyethylene & Polypropylene fibres: Raw materials, manufacturing process, Microscopic structure, Physical and chemical properties, Applications.

Unit-V: Tensile properties: Terms and definitions, Study of stress-strain curve and related properties, importance of tensile properties, factors influencing tensile properties of fibres, Bending and Shear properties, Torsion and Compression properties, Introduction to optical, thermal, frictional and dielectric properties.

Unit-VI: Texturizing: Introduction to various methods of texturizing: Draw Texturising, - sequential (False twist process) and simultaneous draw texturising,. Air Jet Texturizing: - Principle and working of machine. Other Texturising Methods:- Stuffer box crimping, Edge Crimping, Knit-de-knit, Gear crimping. Properties of air and draw textured yarn.

Text Books:

1. Textile Science- Gohl and Vilensky
2. Man Made Fibres – R.W. Moncrieff.

References Books:

1. Hand book of Textile Fibres Vol. I & II by Gordon & Cook.
2. Textile Fibres – Vol.-I by V.A.Shenai
3. Physical Properties of Textile Fibres by W.E. Morton and J.W.S. Hearle,
4. Textile Fibres by H.V.S. Murthy Man Made Fibres – R.W. Moncrieff.

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4TX02 Yarn Manufacturing - II

Course Objectives:

1. To gain basic knowledge about various spinning processes, viz speed frame, ring spinning and doubling.

2. To gain the knowledge about modern aspects of various spinning processes viz speed frame, ring spinning and doubling.

3. To understand various parameters influencing performance of spinning processes.

Course Outcomes:

After the completion of yarn manufacturing course, students will able to -

1. Explain the concept of speed frame process and description regarding speed frame machines.
2. Explain the concept of ring spinning process and description regarding ring spinning machines.
3. Explain the concept of ring spinning process and description about ring spinning machines–principle of drafting, different drafting systems.
4. Explain the concept of ring spinning process and description about ring spinning machines –spinning geometry, spinning triangle.
5. Explain the concept of doubling process and description regarding doubling machines.
6. Explain the concept of fancy yarns and description regarding fancy yarn manufacturing machines.

SECTION- A

Unit-I Speed frame: Objectives, modern speed frame machine, top arm drafting system, flyer, spindle and presser, bobbin and flyer leading winding principle. Differential and building mechanisms. Various parameters affecting roving quality and production. Draft, twist and production calculations. Recent developments in speed frame machine-Auto bobbin transport system etc.

Unit-II Ring frame: Objectives, principle of ring spinning, modern ring frame machine. Details of creel, rings, travelers, importance of ring and traveler profile, balloon control ring, lappet, traveler clearers, suction system. Types of spindles, spindle drives and spindle centering. Building mechanism, building of cops. Compact spinning-principle, different compact spinning systems, structure and properties of compact yarns.

Unit-III Drafting process: Importance, principle of drafting, types of drafting system, top arm drafting system and its advantages, offset drafting, types of draft, top and bottom rollers, cots, aprons, spacers, drafting parameters, different weighing systems- advantages and limitations, factors affecting roller settings and drafting performance, drafting force, roller slip, drafting waves and floating fibres. Production and draft calculations.

SECTION - B

Unit-IV Spinning geometry: Importance, ideal yarn geometry, formation of twist, spinning triangle, spinning angle, spinning tension, balloon formation. Yarn structure and properties. Yarn faults-causes and remedies, end breakages-causes and remedies. Recent developments in ring spinning- ring/travelers systems, automatic doffing, on line quality control, individual spindle monitoring, automatic data acquisition and automatic cop transfer.

Unit-V Doubling: Objectives, types of doubled yarn, effects of twist direction, concept of balance of twist, properties of folded yarn, methods of ply twisting–ring doubling machines, two stage twisting and up twister. Two for one twister- principle, design and constructional details of TFO machine, advantages over ring doubling machine, recent developments in TFO machines, production calculations.

Unit-VI Fancy yarns**:** Basic principle of fancy yarn, classification of fancy yarns, different methods of fancy yarn production - spinning techniques used for the production of fancy yarns, structure of multi-count, slub yarn, spiral, gimp, loop, snarl, knop, covered yarns, diamond, boucle yarns, caterpillar and metallic yarns. Properties and applications of fancy yarns.

Text Books :

1. Manual of Textile Technology by Klein W,
2. A Practical Guide to Ring Spinning by Klein W,
3. Fundamental of Spun Yarn Technology by Lawrence C A,
4. Handbook of Yarn Production by Lord P R,

Reference Books:

1. Drawing, Combing and speed frame by Zoltan, S. Szaloki,
2. Draw frame, combing and speed frame by J. H. Black;
3. Spun Yarn Technology by Eric Oxtoby.
5. Elements of ring frame and doublings by Dr. A. R. Kahre.
6. Advances in Spinning by S. M. Ishtiaque
7. Two for one twister technology by H. S. Kulkarni and HVS Murthy.

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4TX03 Fabric Manufacturing –II

Course objectives :

1) To gain basic knowledge about fabric formation by weaving processes.
2) To gain the knowledge about automatic weaving and dobby shedding.
3) To gain the knowledge about jacquard shedding and various fabric and machines defects.

Course outcomes :

After the completion of Fabric Manufacturing –II course, students will able to demonstrate

1) Knowledge about the concept of fabric forming by weaving
2) Knowledge about the various weaving mechanisms.
3) Kinematics, energy and productivity analysis of shuttle weaving machines
4) Knowledge about the dobby shedding principle and it related machinery
5) Knowledge about jacquard shedding principle & its related machinery.
6) Knowledge about the various warp way, weft way and loom faults.

SECTION-A

Unit I: Classification of different fabric forming process viz. weaving, knitting, breading. Non woven: - Brief description of all methods & there application. Looming: - Working principle of drawing in with respect to plan, twill and satin weave. Study of warp tying, leasing, reaching in, warp knotting and drop pinning processes

Unit II: Weaving:- classification of motions, Shedding:- Classification of shedding principle, types of shed, head movement, shed geometry , reversing motion Brief description about shuttle picking and crank beat up

Unit III: Brief description about warp protection system, weft stop motion and temple**.** Complexity of shuttle picking, kinematics of sley, weaving resistance, bumping condition. Analysis of energy utilization in shuttle picking, limitation of conventional let-up, take-up system. Calculation regarding reed count, average pick, efficiency and production of weaving machine. Automatic loom: - limitation of plain loom and brief description about automatic loom, cop changing mechanism, shuttle protector.

SECTION-B

Unit IV: Historical review of shuttle changing looms. Automatic let-off and positive take up system Historical review of about weft mixing by drop box motion. Dobby shedding: - objectives, classification, climax cam dobby, positive and rotary dobby, method of pegging, dobby setting during weave change

Unit V: Jacquard shedding:- objectives, classification, principal parts , figuring capacity, harness, working principle of Double lift double cylinder jacquard, open shed jacquard, electronic jacquard comparison between various electronic jacquards weave setting of jacquard during weave change

Unit VI: Fabric defect & value less:- Various fabric grading system and its procedure. Fabric defects:- warp and weft defects with causes and remedies, various loom faults with respect to their causes and remedies, various dobby & jacquard related machines and fabric faults with their causes and remedies.

Text Book:

Weaving Machine, Mechanism Management By D.B.Ajagaonkar And M.K.Talukdar .

References Books:

1) Weaving Operation by Allen Armorod
2) Fancy Weaving by K.T. Aswani.
3) Weaving Mechanism vol.II by N.N.Bannarji.
4) Principle of weaving by R. Marks and A.T.C. Robinson.

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4TX04 TEXTILE TESTING — II

Course objectives:

1) To gain knowledge about evaluation of basic fabric properties.
2) To gain knowledge about evaluation of **comfort** properties of textile fabric
3) To gain knowledge about evaluation of basic garment properties by various testing methods.

Course outcomes:

Alter the completion of textile testing—I course, students will able to

I) demonstrate the knowledge about evaluation of service ability of fabric
2) demonstrate the knowledge about the evaluation of dimensional stability of fabric
3) Explain the evaluation of low stress mechanical properties of fabric
4) Demonstrate the knowledge about the evaluation of thermal properties of fabric
5) Demonstrate the knowledge about testing of various parameters of garment
6) Demonstrate the knowledge about quality evaluation of garments

SECTION-A

Unit -I: Fabric Dimension: Length, Width, Thickness, their measurement, Fabric weight per unit area and per length, threads per inch in woven fabric, ends and picks per inch, crimp of yarn in fabric, shrinkage. measurement of crimp, cloth cover and fabric geometry. Serviceability: Introduction, Snagging, Pilling, Factors affecting pilling of fabric Pilling test, Abrasion resistance, factors affecting abrasion resistance. Abrasion tests, wear. Wearer Trials.

Unit -II : Dimensional stability: Introduction, hygral expansion, relaxation shrinkage, swelling shrinkage, felting shrinkage, methods of measuring dimensional stability. Hydraulic bursting strength tester. Tear strength tester .

Flammability terms used relating to flammability, factors affecting flame resistance, flammability testing and flame proofing.

Unit- III : Fabric handle evaluation (Total hand value), Low stress mechanical properties viz.: tensile, shearing, bending, compression and surface friction, Drape, crease recovery, Kawabata system. Colour fastness testing: Introduction, outline of colour fastness tests. Colour fastness to washing, rubbing, light, heat (sublimation), perspiration, sea water, chlorinated water, dry cleaning agents.

SECTION- B

Unit- IV: Comfort: Introduction. Thermal Comfort, heat balance, heat loss, air permeability and its measurement, Effect of air permeability on fabric properties, Measurement of thermal resistance and transmittance of fabrics.

Moisture trasport, sensorial comfort, water absorption, water repellency. Measurement of water vapour permeability and water permeability.

Unit- V: Testing of Garments : Test related to garment appearance and performance such as measurement of seam pucker, seams slippage, seam strength and buffer strength, stitching defects. Different types of defects in fabrics-major and minor faults, fabric inspection system-4 point system

Unit- VI: Quality control in pattern making, grading-maker making, spreading – Quality control of trims and accessories-zippers and buttons. Garments Inspection and measuring guide processing. cutting, stitching in garment industry, tolerance and quality standard for finished garments.

REFFERENCE BOOKS :

1) Principles of Textile Testing – J.E. Booth
2) Physical Testing of Textiles – B.P. Saville
3) Science of Clothing Comfort – V.K.Kothari
4) Testing and Quality Management – V.K. Kothari
5) An Introduction of Quality Control for the Apparel Industry- Pradip V. Mehta.
6) Managing Quality in Apparel Industry – S.K. Bhardwaj and Pradip V. Mehata

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4TX05 GARMENT MANUFACTURING TECHNOLOGY

Course Objectives :

1. To provide the understanding about the scenario of industrial apparel sector.
2. To provide the knowledge about various production processes involved in garment manufacturing.
3. To provide the knowledge about the various industrial production systems and use of CAD and CAM in garment industry.

Course Outcomes :

After completion of the course students will be able to :

1. Explain the apparel industry scenario in form of its structure, types, size, labor, products etc.
2. Explain the various technological aspects and production process involved in pattern making and sizing.
3. Explain the various technological aspects and production process involved in cutting and sewing operations.
4. Explain the various technological aspects and production process involved fusing process.
5. Explain the various technological aspects and production process involved in garment finishing and its inspections.
6. Analyze the various production systems and demonstrate the knowledge about the use of CAD-CAM in garment manufacturingh.

UNIT-I :
World and Indian Scenario of garment industry: Size, various sectors, structure, type of products and business developments in recent years. Overview of export related activities in apparel industry. Brief outline of various steps involved in industrial garment manufacturing process.
Pattern making: Measurement process, size chart and measuring of sizes, definition of various garments parts and positions.

UNIT-II :
Pattern making methods: Bespoke, industrial block method, basic block construction, block preparation and corrections. Figure analysis- body ideals, body proportion, height and weight distribution, body parts, individual figure analysis and body measurement of all age groups. Muslin pattern, commercial pattern, sizes and fabric preparation for garment manufacturing.

UNIT-III :
Types of fabric packages, spreading, marker preparation and its planning, types and functions of cutting machine, preparation for sewing processes,
Sewing: feed systems, types of sewing machinery and equipment, parts of needles and their function,

UNIT-IV :
Sewing thread- Properties, ticket number, classification of seams and stitches.
Fusing- Importance, fusing process, fusing machineries, control of fusing quality. Pressing- Importance, types, pressing equipments.

UNIT-V :
Finishing and inspection: Various components used in garments viz: buttons, zips, underlining, hooks, ornamental materials, sewing labels, motif etc. Garment cleaning and inspection- fitting quality, live models, final inspection of garments, quality standards.

UNIT-VI :
Industrial line production methods: Manual systems, making through, section system, progressive bundle system, straight line system, mechanical transport systems, selective conveyor belt system, unit production system, quick response sewing system.
Ware housing- equipments used in garment handling, storage and packing. Application of CAD and CAM in garment production.

Reference Books :
1. Introduction to clothing Manufacture by Gerry Cooklin
2. Technology of clothing manufacture by Harrold carr & Barbara Lathem
3. Garment Technology by Dr. V.Subramaniam, Winter School booklets 1990
4. Apparel Manufacturing Handbook by Jacob Solinger.
5. Clothing construction and wardrobe planning by Dora S. Lewin, Mabel Goode Bowers, Manetta Knttunen , The Macmillan co New York .

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SEMESTER - III (Practicals)

3TX07 TEXTILE FIBRE - I - LAB.

8 to 10 practicals based on the syllabus 3TX01 **TEXTILE FIBRE – I**

3TX08 YARN MANUFACTURING - I - LAB.

8 to 10 practicals based on the syllabus 3TX02 **YARN MANUFACTURING – I**

3TX09 FABRIC MANUFACTURING - I - LAB.

8 to 10 practicals based on the syllabus **3TX03 FABRIC MANUFACTURING – 1**

3TX10 TEXTILE TESTING - I - LAB.

8 to 10 practicals based on the syllabus 3TX04 **TEXTILE TESTING – I**

SEMESTER - IV (Practicals)

4TX07 TEXTILE FIBRE - II - LAB.

8 to 10 practicals based on the syllabus 4TX01 **TEXTILE FIBRE – II**

4TX08 YARN MANUFACTURING - II - LAB..

8 to 10 practicals based on the syllabus 4TX02 **YARN MANUFACTURING – II**

4TX09 FABRIC MANUFACTURING - II - LAB.

8 to 10practicals based on the syllabus 4TX03 **FABRIC MANUFACTURING – II**

4TX 10 TEXTILE "TES'T'ING - II - LAB.

8 to l0 practicals based on the syllabus **4TX04 TEXTILE TESTING —IT**

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SYLLABI PRESCRIBED FOR FOUR YEAR DEGREE COURSE
BACHELOR OF ENGINEERING (CHEMICAL)
SEMESTER PATTERN (CHOICE BASED CREDIT GRADE SYSTEM)

SEMESTER : THIRD

3 CH 01/3 PE 01 APPLIED MATHEMATICS-III / MATHEMATICS-III

1. **Pre-requisite of Subject** : Engineering Mathematics I and Engineering Mathematics II

2 **Course Objectives of Applied mathematics III** :

On Completion of the students are expected
- To understand Fourier transform & Z-transform, Laplace transform & their application to engineering problems.
- To know probability and probability distribution.
- To understand Numerical analysis.
- To know vector Clarks &their application.

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. (7 Hrs.)

UNIT-II: Laplace transforms: Definition, standard forms, properties of Laplace transform, Inverse Laplace transform, Laplace convolution theorem, Laplace transforms and Unit step function, Solution of Linear differential equations. (7 Hrs.)

UNIT-III: Probability & Probability Distribution Probability: definition, axioms of mathematical probability, complementation rule, Theorem of total probability, Theorem of compound probability, Independent Events, subjective probability, Baye's Theorem, Probability Distribution:– Binomial distribution, Poisson and normal Distribution. (7 Hrs.)

SECTION B

UNIT-IV: Complex Analysis :- Functions of complex variables, Analytic function, Cauchy- Reimann conditions, Harmonic conjugate functions, Milne's method, singular points, expansion of function in Taylor's and Laurent's series, Cauchy's integral theorem and formula, Residue theorem. (7Hrs.)

UNIT-V: Numerical Analysis: Solution of algebric and transcendental equations by method& method of false position, Newton-Raphson method Solution of system of linear equations by Gauss Seidal method, Relaxation method. Solution of first order ordinary differential equations by modified Euler's, method Runge - Kutta method. (7Hrs.)

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). (7Hrs.)

Course Outcomes :

Students are expected to expertise in

- Solving numerical methods, Laplace transform, Fourier Transform & Z-transform Probability & Probability Distribution and statistics are very useful to them in future curriculum/student.
- Complex functions and vector calculus are backbone of future academic curriculum and hence should be in touch with contents in syllabus. Design of syllabus is more than sufficient for academic curriculum of student.

Text Books:

1. Higher Engineering. Mathematics by B.S. Grewal, Khanna Publication.
2. A Text Book of Applied Mathematics, Volume-II by P. N. Wartikar and
J.N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune.
3. Applied Mathematics, Vol. III, J.N. Wartikar and P.N. Wartikar, Vidyarthi Griha Prakashan, Pune.

Reference Books:

1. Numerical Analysis- S.S. Sastry.
2. Advancing Engg. Mathematics by E.K.Kreyzig.

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3 CH 02 PROCESS INSTRUMENTAION

Monitoring and control of processes is an important activity of Chemical Engineer. This subject deals with measurement principles of process parameters like temperature, pressure, level flow.

Course Objectives:

The students will be able:

To learn the operating principles, construction and working of temperature, pressure, level and flow measuring devices.

To select the most suitable measuring device based on its performance characteristics for specific measuring task.

To test, Calibrate, Maintain measuring devices elements.

SECTION A

UNIT-I : Basic method of measurements –Errors in measurements – Types of Errors. Transducers – definition – classification – Static characteristics of instruments Dynamic characteristic. Transmitter –definition different types. (8)

UNIT-II : Temperature measurements: Introduction – Temperature scale Conventional methods of temperature sensing. Resistance Thermometer Detector (RTD) – Unbalanced Wheatstone Bridge Direct conversion. Thermistors – Temperature sensing using thermistor – Semiconductor temperature sensor. Thermocouple – Basics of thermocouple – Thermocouple types – Cold junction compensation. Infrared thermometry – Basics of radiation – Emissivity – Methods of sensing –Direct detection – Indirect detection. (8)

UNIT-III: Pressure measurements: Introduction – Units of pressure – Types of pressure measurement- –Bourdon tube and bellows – SG based pressure sensors – Capacitance type pressure transducers. Low pressure measurements – pirani gauge – Thermocouple gauge – Ionization gauge. (8)

SECTION B

UNIT-IV: Basics of fluid flow – Flow meters – Quantum flow measurements, Differential pressure measurement – Principle of the differential pressure flow meter, Orifice plate, Venturimeter, Flow nozzle, Dall tube, Pitot tube. Variable area flow meter,Magnet Flowmeters – DC Magnetic Flow meter, Pulsed Magnetic Flow meter, Permanent Magnet Type Magnetic Flow meter, AC Magnetic Flow meter. Positive displacement Flowmeters – Different type of ultrasonic Flow meter. (7)

UNIT-V : Level Measurements – Level transducer with differential pressure sensing –Capacitance based level sensors – Capacitance sensors for conducting liquids – Capacitance sensors for Non – conducting liquids, other liquid sensors – Displacement type level sensor – Ultrasonic type level sensor, Gamma ray level sensor. (7)

UNIT-VI : pH measurements – Basic ideas of pH value – Measurement of electrode potentials – Glass electrode – Reference electrode – Calomel electrode – Silver- Silver chloride electrode, Humidity Sensing – Basic ideas of humidity sensing – Humidity measurement by dew point sensing – Humidity measurement using Lithium Chloride.
Measurement for Concentration: Obtaining concentration of solution by conductivity and conductivity titration, determination of concentration by density meter, hydrometer, refractometer, measurement of concentration of ion and coloured solution.. (7)

Text Books:

1. Tattamangalam R. Padmanaban “Industrial Instrumentation Principles and Design” Springer, 2000.
2. Donald P. Eckman, “ Industrial Instrumentation”, CBS Publishers, New Delhi,2002.

Reference Books:

1. R.K.Jain, “Mechanical and Industrial Measurements” Khanna Publishers, New Delhi, 1999
2. D.Patranabis, “Principles of Industrial Instrumentation”, Tata McGraw Hill Publishing Ltd, New Delhi, 1999
3. C.D. Johnsons, “Process Control Instrumentation Technology”, Prentice Hall Inc,
4. A.K.Sawhney, “A Course In Electrical and Electronics Measurement and Instrumentation”, Dhanpat Rai and Sons, New Delhi, 1999

3 CH 03 /3CT03 STRENGTH OF MATERIALS

Learning Objectives of Subject:

1. TodeterminetheMechanicalbehaviorofthebodyandconstructionmaterialsbydetermining the stresses, strains produced by the application of loads.
2. To apply the fundamentals of simple stresses and strains.
3. To make one understand the concept of bending and its theoretical analysis.
4. To apply fundamental concepts related to deformation, moment of inertia, load carrying capacity, shear forces, bending moments, torsional moments, principal stresses and strains, slopes and deflection.

Course outcomes:

At the end of the subject the students will be able -

1. To understand the basics of material properties, stress and strain.
2. To apply knowledge of mathematics, science, for engineering applications
3. To identify, formulate, and solve engineering & real life problems
4. To design and conduct experiments, as well as to analyze and interpret action and reaction data.
5. To understand specific requirement from the component to meet desired needs within realistic constraints of safety.

SECTION – A

Unit I: Mechanical properties: Concept of direct 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, Generalized Hook's law, factor of safety. 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: 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 forces, bending moment and loading intensity.

Unit III: 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, impact loads and instantaneous stresses.

SECTION – B

Unit IV: 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. Thin cylinders subjected to internal pressures.

Unit V: Principal stresses: Biaxial stress system, principal stresses, principal planes, Mohr's circle of stresses, principal strains. Combined direct & bending stresses.

Unit VI: Slope & deflection of beams: Slope & deflection in statically determinate beams subjected to point loads, uniformly distributed loads, moments by Macauley's method. Theory of long columns, Euler, Rankin's 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. Ferdinard 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. R. K. Bansal, Strength of materials, Laxmi Publications Pvt Ltd.
6. Junnarkar, S. B., Mechanics of materials.
7. Mubeen, A., Mechanics of solids, Pearson education (Singapore) Pvt. Ltd.
8. Beer and Johston, Mechanics of materials, Mc-Graw Hill.
9. S. Ramamrutham, Strength of Materials, Dhanpat Rai Publishing Co Pvt Ltd.

3 CH 04 : CHEMICAL ENGINEERING THERMODYNAMICS-I

Chemical Engineering Thermodynamics is primarily concerned with the application of thermodynamics to phase equilibria and reaction equilibria. It is concerned with the application of Thermodynamics to heat-to-work and work- to-heat conversion devices. Chemical engineers are seriously concerned with the calculation of work in separation and in mixing processes. Its applications are obvious in the design of Chemical engineering equipments in processes.

Course Objectives:

After studying this subject the student will have:

* The mathematical abilities required for applying thermodynamics to practical problems.
* Its applications in the design of Chemical engineering equipments in processes.

SECTION A

UNIT-I:BASIC CONCEPTS: The terminologies of thermodynamics, the variables and quantities of thermodynamics, categorization of systems and processes. Energy classifications, point and path properties, energy in transition, heat and work, reversible and irreversible processes, phase rule. (8)

UNIT-II: FIRST LAW OF THERMODYNAMICS: First law of thermodynamics – heat and energy changes, enthalpy and heat capacity limitations of the first law, application of first law to different processes. (8)

UNIT-III: SECOND LAW THERMODYNAMICS: Second law of thermodynamics and its applications - Entropy, reversible and irreversible processes, Carnot cycle, T-S diagrams, enthalpy of mixing and disorder, refrigeration and liquefaction. (8)

SECTION B

UNIT-IV: REFRIGERATION AND LIQUEFACTION: The carnot refrigerator, the vapour- compression cycle, comparison of refrigeration cycles, liquefaction processes, heat pump. Rankine power cycle. (7)

UNIT-V: THERMODYNAMIC PROPERTIES OF FLUIDS: Property relations for homogeneous phases, thermodynamic diagram, generalized property correlation for gases. (7)

UNIT-VI: THERMODYNAMICS OF FLOW PROCESSES: flow of compressible fluids through ducts, compression processes, steam turbines and nozzles, condensers. (7)

Text Books:

1. J.M. Smith and H.C. Van Ness, “Introduction to Chemical Engineering Thermodynamics”, McGraw Hill, 1998.

2. K.V.Narayanan, .”A textbook of Chemical Engineering Thermodynamics”, Prentice Hall of India Ltd., 2001.

Reference Books:

1. Sadler S. I., J, “Chemical and Engineering Thermodynamics” John Wiley and Sons, Inc. New York, 3rd Ed., 1999.

2. Elliot J. R. and Lira C.T., “Introductory Chemical Engineering Thermodynamics”, Prentice Hall, 1999.

3. Eastop T. D. and McConkey A.,” Applied Thermodynamics for Engineering Technologists’, Addison Wesley Longman Ltd., England, 5th Ed., 1999.

3 CH 05 PROCESS CALCULATION

Course objectiveS :

1. Students will learn the basic and fundamentals of chemical engineering operations and processes.
2. Students will understand the material balance and energy balance of various unit operations and unit processes.
3. Students will learn how to formulate and solve the problems related to material and energy balance with or without chemical reaction.

Course Outcomes:

After successful completion of this course student will be able to :

1. Understand the concept of basic chemical calculations
2. Understand the concept and application of theory of proportions
3. Determine the humidity with/without using a psychrometric chart.
4. Make the material balance over unit operations and processes.
5. Make the energy balance over unit operations and processes.
6. Solve the problem of fuels and combustion.

Course Contents :

Unit I. Introduction to unit operations and unit processes, Units and dimensions, Atoms, moles and molecular weight, mole and mass fraction, Composition of solids, liquids and gases, Concept of Normality, Molarity and Molality, PPM (Parts Per Million), Ideal Gas Law, Dalton’s Law, Partial Pressure, Amagat’s Law, Average Molecular Weight,Density of Gas Mixture, Raoult’s Law, Henry’s Law, Vapour Pressure, Clausius Clapeyron equation, Cox Chart,.Humidity and saturation, Humidity Chart, and their application.

Unit II. Material balance without chemical reaction stoichiometry and unit operations Distillation, Absorption, Extraction, Crystallization, Drying, Mixing, Evaporation. Recycle, purge and Bypass calculations.

Unit III.: Material balance involves chemical reaction, Principle of stoichiometry, simple oxidation reaction, multiple chemical reaction, percentage Conversion, percentage Yield, and selectivity, calculation involving combustion of gases, liquid and solid fuel. Recycle, purge and bypass calculations.
Introduction to unsteady state material balance

Unit IV.: Energy balance: open and closed system, heat capacity, calculations of enthalpy changes, enthalpy changes for phases transitions, evaporation, Solution and mixing, clausius clapeyron equation.

Unit V.: Energy balance with chemical reaction, calculation of standard heat of reaction, heat of formation, heat of combustion, Hess law, Effect of temperature on heat of reaction; adiabatic flame temperature calculations.

Unit VI.: Heating value of fuels, calculations involving theoretical and excess air, heat and material balance of combustion processes.

References :

1. Bhatt, B. I., Vora, S. M., "Stoichiometry", Fourth Edition, Tata McGraw Hill Publishing Company Ltd, 2004.
2. Narayanan K V and Lakshmikutty B, Stoichiometry and Process Calculations, Prentice Hall of India Pvt Ltd, New Delhi 2006.
3. Sikdar, D. C., "Chemical Process Calculations", Prentice Hall of India.
4. Himmelblau, D. M., Riggs, J. B. "Basic Principles and Calculations in Chemical Engineering", Eighth Ed., Pearson India Education Services, 2015.
5. Hougen. O. A, Watson K.M. and Ragatz R.A. "Chemical Process Principles, Part -I, Material and Energy Balance".

3CH07 PROCESS INSTRUMENTATION - LAB

List of experiments:

1. Measurement of temperature using thermocouple or RTD or Thermistor and to find their characteristics.
2. Measurement of high temperature using radiation or Optical pyrometer.
3. Measurement of pressure using LVDT or Strain gauge transducer.
4. Calibration of pressure gauge using Dead Weight Tester.
5. Measurement of level using air purge or capacitance type level detector.
6. Measurement of flow using magnetic flow meter or Ultrasonic flow meter.
7. Calibration of thermocouple/Bimetallic thermocouple/Resistance thermocouple.
8. Calibration of Pressure gauge/ Pnuematic pressure recorder/ Differential pressure recorder.
9. Calibration of Orificemeter/ Venturimeter / Rotameter/ Gas flow meter.
10. Estimation of viscosity by Redwood/ Saybolt/ Ostwald viscometer.
11. Calibration of pH meter.
12. Calibration of Conductivity meter.

All above experiments are to be arranged in the laboratory. Minimum 8 experiments are required to be performed by the student to complete the term work.

3CH08 / 3CE06 – STRENGTH OF MATERIALS – LAB

List of Practical's in Strength of Material Lab (Minimum any eight practical from the list should be performed)

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.

3CH09 CHEMICAL ENGINEERING THERMODYNAMICS-I–LAB

List of Study Experiments:

- Study 1st law of Thermodynamics

- Study of low temperature refrigeration system.

- Study of ranking power cycle.

- Study of steam nozzles

- Study of steam turbine
- Study of boiler

- Study of mounting accessories of boiler.

- Study of condensers.

- Study of economizer and super-heater.

- Visit to thermal power station.

All above experiments are to be arranged in the laboratory. Minimum 8 experiments are required to be studied by the student to complete the term work.

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SEMESTER: FOURTH

4 CH01 APPLIED PHYSICAL CHEMISTRY

Teaching Scheme:
Lecture: 03 Hours / week
Tutorial: 01 Hour /week
(Total credit: 04)

Examination Scheme:
Theory
T (E) : 80 Marks T (I) : 20 Marks
Duration of University Exam : 03 Hours

Learning Objectives:

- To understand the transport phenomenon, internal forces and molecular speed in gases.
- To understand the electrical properties of fluid.
- To know the rate, order, energy of activation of chemical reactions and their determination.
- To know the use of kinetics and thermodynamics to elucidate mechanisms of reactions.
- To understand the basic concepts, the Ist and IInd Laws of Thermodynamics, Thermodynamic functions and their applications.
- To predict the high and low quantum yield photochemical reactions and to know about advanced spectroscopic analysis techniques.
- To know the basic concepts and industrial examples of catalysis and adsorption on surface.

Contents:

Unit-I : Advanced Gas Concepts : Equation of state for real and ideal gases, Van-der-waal‘s equation, critical phenomenon, calculation of critical constants, Principle of corresponding states, compressibility factor, Principle of equipartition of energy, Maxwell-Boltzmann‘s law of distribution of molecular speed, Root mean square speed, Average speed and Most probable speed. Numerical. (6 Hrs)

Unit- II : Kinetics & Reaction mechanism: Introduction, Rate of reaction, concept of molecularity and order in elementary and complex reactions, differential and integral methods to formulate rate equations of zero, first and second order reactions. experimental methods in kinetic studies, effect of temperature on reaction rate, energy of activation and its determination, steady state approximation and rate determining step, Mechanism of complex reactions, photochemical chain reactions, polymerization reactions. Fast reactions – experimental techniques. Numerical (10 Hrs.)

Unit-III : Surface, interfacial chemistry and catalysis: Adsorption , types of adsorption, Adsorption isotherms , Langmuir theory of adsorption, BET adsorption isotherm and it's application for determination of surface area of fine powder. Homogeneous and Heterogeneous catalysis, Criteria of catalyst, Theory of heterogeneous catalysis, Homogeneous, Lewis acid-base catalysts, organometallic catalysts and industrially examples, Auto and enzyme catalysis. kinetics of reactions on surfaces. (8 Hrs.)

Unit – IV : Ion transport and electrical phenomenon at interface: Specific, Equivalent and Molar conductivity, Kohlraush's law and its applications ,Transport number and their determination ,Relation between electrical work done and free energy, Nernst equation for electrode potential ,Electrolytic concentration cell with and without transference, Debye- Huckel's theory of strong electrolyte, Determination of pH, solubility and solubility product of sparingly soluble salts, dissociation constant by emf measurement, Numerical. (8 Hrs.)

Unit – V : **Thermodynamics and Equilibrium :** Statements of the second law; Heat engines, Carnot's theorem, and Carnot cycle, Mathematical statement of the second law, Introduction of Entropy under the IInd Law to define spontaneity of a process, Temperature- entropy diagram, Introduction of the state functions A & G to determine conditions of Material Equilibrium. Condition of reversibility, Transformation at constant temperature and pressure, Gibbs- Helmholtz equation, pressure – volume and volume – Temperature relationship under isothermal condition for ideal gas. Partialmolar properties, chemical potential, Numerical (8 Hrs.)

Unit VI: **Spectroscopic techniques and applications :** Principles of spectroscopy and selection rules. Electronic spectroscopy. Vibrational and rotational spectroscopy of diatomic molecules. Principle and Applications of Nuclear magnetic resonance and magnetic resonance imaging.

Photochemistry and Modern Analytical techniques: Lows of photochemistry, quantum efficiency and its determination, low & high quantum yield reactions, Mass spectrometry. Chromatography. (8 Hrs.)

Course Outcomes :

The course will enable the student to:

- Evaluate the properties of non-ideal gases, Intermolecular forces in gas, critical phenomenon & probability consideration of molecular speed.
- Solve problems involving root mean square, average and most probable speeds & critical constants.
- Evaluate the specific rate, order and energy of activation of chemical reactions.
- Know the fundamental concepts related to homogeneous and heterogeneous catalysis, mechanisms of industrially important reactions, surface phenomenon and adsorption isotherms.
- Apply mass and energy balances to closed and open systems ,Rationalize bulk properties and processes using thermodynamic considerations
- Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques and spectroscopic methods for identification of compounds.
- Know the ion transport & electrical properties of solutions, solve problems involving transport no, electrode potential and emf of different types of cell.

Books Recommended :

1. Physical Chemistry , P.W. Atkins and J.D. Paula, Oxford University Press.
2. Physical Chemistry , K.J. Laidler and J.M. Meiser, CBS Publisher
3. Chemical kinetics and catalysis , R. J. Masel, John Wiley publications
4. Handbook of conducting polymers, Skotheim, Elsenbaumer and Reynolds, Marce Dekker.
5. Fundamentals of spectroscopy ,Banwell, Tata McGraw-Hill
6. Physical chemistry of surfaces, Arthur W. Adamsons, Alice P. Gast, John Wiley publications
7. Principle of Heterogeneous catalysis, J.M.Thomas, W.J. Thomas, John Wiley publications
8. Thermodynamics for students of chemistry, Dr. J. Rajaram & Dr. J. C. Kuriacose, Chand & comp.

4 CH02 MACHINE DESIGN & DRAWING

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 31 32 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 cylin-der, 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, cclamps

(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).

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4CH03 FLUID FLOW OPERATIONS

Course Objectives:

This basic course introduces concepts of momentum transfer to students. Various concepts such as pressure, momentum, energy are introduced. Laws related to conservation of momentum, energy are taught. Applications of these laws to various engineering situations and process equipment is explained with the help of several problems

SECTION A

Unit I: Properties of fluids and their classification. Fluid statics: Forces on fluids, pressure depth relationship for compressible and incompressible fluids. Forces on submerged bodies. Rigid body motion, pressure measurements, Euler's equation. (8)

Unit II: Kinematics of flow, Description of velocity field, Stream functions, Angular velocity, Fluids in circulation, Fluid flow: Laminar and turbulent flows, Equations of Continuity and Motion in laminar flows and its applications for the calculation of velocity profiles, shear stresses, power, etc. in various engineering applications. Dimensional analysis; Buckingham's Pi Theorem ; Dimensionless numbers and their physical significance; Vortex flow (8)

Unit III Dynamics of flow , Bernoulli's Equation and engineering applications, Conservation of mass, momentum and energy; Mechanical energy balance ,Basics of Turbulent flows, equations of continuity and motion for turbulent flows: Prandtl mixing length theory,. Turbulent pipe flow, basis of Universal velocity profile and its use. Von-Karman integral equations . Pressure drop in pipes and Fittings, Piping systems. (10)

SECTION B

Unit IV: Flow measuring devices for chemical plants: Orifice meter, Venturi meters, Rotameter, Pitot tube and Notches.

(7)

Unit V : Fluid moving machinery such as pumps like reciprocating pumps, rotary pumps, Centrifugal pumps, blowers, compressors, vacuum systems, etc. . (8)

Unit VI: Flow past immersed bodies, Particle Dynamics, flow through packed bed and fluidized Bed. Introductory concepts of two-phase flow. (6)

Books Recommended:

1. Unit Operations in Chemical Engineering, McCabe Smith: McGraw Hill.
2. Chemical Engineering, Vol. 1, Coulson J. M. and Richardson J. F. Butterworth Heinemann.
3. Fluid Mechanics, F. W. White.
4. A Text book of Fluid Mechanics and Hydraulic Machines ; Dr. R.K.Bansal
5. Fluid Mechanics , R. P. Vyas.

Subject Outcomes :

1 Students should be able to calculate velocity profiles by simplification of equations of motion in simple 1-D flows
2 Students should be able to calculate friction factor, losses in pipe fittings
3 Students will be able to calculate pressure drop, power requirements for single phase flow in pipes
4 Students should be able to calculate two phase gas/liquid pressure drop
5 Students should be able to calculate power requirements, NPSH requirements of pumps
6 Students should be able to calculate drag force and terminal settling velocity for single particles
7 Students will be able to calculate pressure drop in fixed and fluidized beds.

4CH04 CHEMICAL ENGINEERING THERMODYNAMICS-II

Chemical Engineering Thermodynamics is primarily concerned with the application of thermodynamics to phase equilibria and reaction equilibria. It is concerned with the application of Thermodynamics to heat-to-work and work- to-heat conversion devices. Chemical engineers are seriously concerned with the calculation of work in separation and in mixing processes. Its applications are obvious in the design of Chemical engineering equipments in processes.

Course Objectives:
After studying this subject the student will have:

- The mathematical abilities required for applying thermodynamics to practical problems.
- Its applications in the design of Chemical engineering equipments in processes.

SECTION A

UNIT-I: First law of thermodynamics, equation of state, critical properties, Vander Wall's constants, Virial expansions, Redlich-Kwong equation, Beattle-Bridgeman equation.
First law applied to thermodynamic processes and calculations of work, free energy and heat changes. Maxwell relation equation, second law and third law of thermodynamics. Thermodynamics relations based on second law. Relation between Cp and Cv, compressibility factor and coefficient of thermal expansion, concept of residual entropy and entropy of equilibrium. (8)

UNIT-II: Partial molar and apparent molar properties, Gibbs Duhem equation, chemical potential, effect of temperature and pressure fugacity, excess thermodynamic properties of mixing. Gibbs-Duhem-Morgules equation, Konovalov laws.

UNIT-III: Colligative properties, Ebulliometric constant. Determination of molecular weight of unknown chemical substances. Solubility law. Vapour liquid equilibrium, T-X-Y diagrams and X-Y diagram for ideal and non ideal system . Raoult's law and Henry's law, Deviations from Raoult's law. Comparison of ideal and non- ideal systems. (8)

SECTION B

UNIT-IV: Phase equilibria in non reacting multi-components, binary and ternary systems. Graphical representation of L/L, L/S and G/S systems. Right angled triangular diagrams. Equilateral triangular diagrams, Janecke diagram, Phenol-water systems, Aniline-water-chlorobenzene systems. (7)

UNIT-V: Statistical thermodynamics, thermodynamics probability, its relation with entropy, partition function and its relation with thermodynamic functions, the Boltzman distribution law, Distribution law for chemically reactive system Thermodynamics charts and their uses. Searching of thermodynamics data. (7)

UNIT-VI: Chemical equilibrium, feasibility of chemical reaction, free energy change, Reaction co-ordinate, equilibrium constant, effect of temperature and pressure, Relation between Kp, Kc and Kv, Le-Chatelier's principle. Endo-exothermic reactions. Heterogeneous equilibria, various methods of calculating free enegy charge, equilibrium conversions, case study of feasibility report for manufacture of industrial chemicals. (7)

Text Books:

1. An Introduction of Chemical Thermodynamics: R.P.Rastogi and R.R. Mishra
2. Chemical Engineering Process: Houghen and Watson

Reference Books:

1. Introduction to Chemical Engineering Thermodynamics: J. M. Smith and H. C. Vauhess.
2. Thermodynamics for Chemical Engineering: H. C. Weber and J. P. Meissner.
3. Engineering Thermodynamics: P.K. Nag.

4CH05 CHEMICAL ENGINEERING OPERATIONS–I (MECH. OPERATIONS)

This subject intends to equip the students with concepts and principles as well as construction of equipments used for handling Mechanical Operations in a chemical plant. This subject gives idea about principles of handling mixtures of solids, liquid and gases. This subject will help students for understanding principles for separation and purification techniques of solid, liquids and gases mixtures.

Course Objective: After studying this subject's student will be able to:

- Explain methods of size reduction and equipments working on those principles.

- Describe various equipments used for size separation.

- Identify various other physical properties used for purification solid-solid mixtures and equipments working on this principle.
- Describe various method of purification of heterogeneous mixture of solid liquid, & equipments like filters, settlers, used for separation of solid liquid mixtures.
- Identify various types of agitators used for mixing solids-liquids mixtures, power calculation of a mixer.

SECTION - A

UNIT-I: Size reduction, stages of reduction, equipment operating variables, laws of energies, energy requirements. Screening: Screen analysis, particle size distribution. (7)

UNIT-II: Classification: Equal falling particles, equipment, jigging, tabling. Gravity settling, drag force, terminal settling velocity Sedimentation: Continuous thickners. (8)

UNIT-III: 1. Storage and handling of solids, transportation.

2. Mixing, mixers, agitation, type of equipments. (7)

SECTION - B

UNIT-IV: Filtration: Theory, operation, types, flotation agents, flotation cells Filter calculations, filtration equation for compressible and non- compressible cakes , specific cake resistance. Filtration- constant pressure and constant rate and their equipments. (8)

UNIT-V: Centrifuges: Theory, equipments, types and calculations.

Cyclones: Hydro cyclones, liquid scrubbers and electronic precipitators (7)

UNIT-VI: Adsorption, theory, type and application, Langmuir's Freund Lich;s equation nature of adsorbents, industrial adsorbents. Adsorption on fixed bed, fluidized beds Recent developments in mechanical operations. **(8)**

Text Books:

1. Bedger and Bencharo, "Introduction to Chemical Engineering". Tata McGraw Hill.
2. Narayanan C.M. & Bhattacharya B.C. "Mechanical operations for chemical engineers", Khanna Publishers, 3 rd Ed.1999.

Reference Books:

1. Coulson and Richardson: Chemical Engineering, Vol. 2

2. Brown,G.G. and Associates "Unit operations" Wiley , New York

4CH07 APPLIED PHYSICAL CHEMISTRY- LAB

Total credits: 2 Examination Scheme: (I): 25 (Ext): 25 Marks

Objectives: To provide the practical knowledge of analysis techniques by classical and instrumental methods for developing experimental skill to built technical competence.

List of Experiments:

1. Determination of critical temperature of phenol-water system
2. Determination of order of reaction and specific rate constant of hydrolysis of methyl acetate.
3. Study of kinetics of second order reaction.
4. Determination of relative strength of two acids by kinetic study of reaction
5. Determination of energy of activation of reaction
6. Determination of equivalent conductivity of strong electrolytes at infinite dilution.
7. Determination of transport number
8. Determination of equivalence point of titration by conductance measurement.
9. Potentiometric titration between strong acid and strong base.
10. Verification of Beer- Lambert's law and determination of concentration of unknown solution.
11. Verification of Freundlich and Langmuir isotherm.
12. Determination of refractive index.
13. Determination of solubility of sparingly soluble salts by EMF measurement.
14. Determination of heat of neutralization & ionization of acetic acid
15. Determination of ΔH and ΔS of monobasic acid by measuring its solubility at different temperatures.
16. Determination of specific rotation of cane sugar by polarimetry.

Course outcomes: After completion of this course the students shall be able to ;

1. Understand the objectives of their experiments.
2. Follow the proper and safe procedure to get the accurate results.
3. Record and analyze the results.
4. Interpret the results through proper writing in laboratory journal

Books Recommended :

1. Experiments in Physical Chemistry, David P. Shoemaker, Carl W. Garland, Jeffrey I. Steinfeld
2. Experiments in Chemistry, Dr. D. V. Jahagirdar, Himalaya Publishing House, New Delhi
3. A Text Book of on experiments and calculations- Engg. Chemistry, S.S. Dara, S. Chand & Comp. ltd.

All above experiments are to be arranged in the laboratory. Minimum 08 experiments are required to be performed by the student to complete the term work.

4CH08 FLUID FLOW OPERATION-LAB

Experiments:

- To obtain the coefficient of discharge for the given Venturimeter and obtain its relationship with Reynolds' no.
- To calibrate the given Rotameter.

- To obtain the coefficient of discharge for the given orifice meter and obtain its relationship with Reynolds' no.
- To study the flow and determine critical Reynolds no.

- To determine the discharge co-efficient of the given v-notch.

- To verify the Bernoulli's theorem.

- To determine the viscosity of the given liquids using Stoke's law.

- To determine the viscosity of a given liquid by measuring efflux time of a given tank. Also determine the diameter of a given capillary and compare.

- To determine relation between friction factor and Reynolds number for the given flowing fluid through circular pipe.
- To obtain relation between friction factor and Reynolds number for flow of water through annulus.
- To determine the resistance offered by various pipe fittings and express them in terms of equipment straight pipe length.
- To study characteristics curves for a centrifugal pump.

All above experiments are to be arranged in the laboratory. Minimum 8 experiments are required to be performed by the student to complete the term work.

4CH09 CHEMICAL ENGINEERING THERMODYNAMICS –II -LAB

List of experiments:

- Critical solution temperature of phenol water system.

- Critical solution temperature of phenol water system in presence of impurity like NaCl.

- Critical solution temperature of phenol water system in presence of impurity like succnic acid.

- Determination of boiling point elevation in presence of impurity.

- Determination of freezing point depression in presence of impurity.

- Study of T-X-Y Diagram.

- Lowering of vapour pressure.

- Study of boiling point diagram.

- Study of ternary diagram.

All above experiments are to be arranged in the laboratory. Minimum 8 experiments are required to be performed by the student to complete the term work.

4CH10 CHEMICAL ENGINEERING OPERATIONS-I LAB (MECH. OPERATIONS) -LAB

- To study the performance of Ball Mill and find out it's crushing efficiency.
- To study the performance of Jaw Crusher and find out it's crushing efficiency.
- To study the performance of Crushing Rolls and find out it's crushing efficiency.
- To study the settling characteristics (Free & Hindered settling) of a given suspension of particles.
- To study the filtration characteristics of rotary vacuum filter.
- To study the filtration characteristics of Plate and frame filter press.
- To study the filtration characteristics of Leaf and sparkle filter.
- To carry out differential and cumulative screen analysis of given sample of solid particles.
- To determine energy consumption and crushing law constants for jaw crusher.
- To determine Critical speed of Ball mill & Average particle size of the product obtained in ball mill, **OR** Average particle size of product obtained in Bhrustone mill.
- To determine area of batch thickener by conducting batch sedimentation test.
- To determine efficiency of Cyclone separator.
- To Determine Variation of size reduction in ball Mill by changing the residence time, size of grinding medium and material of grinding medium.

All above experiments are to be arranged in the laboratory. Minimum 8 experiments are required to be performed by the student to complete the term work.

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SYLLABI PRESCRIBED FOR FOUR YEAR DEGREE COURSE

BACHELOR OF TECHNOLOGY CHEMICAL TECHNOLOGY

SEMESTER PATTERN (CHOICE BASED CREDIT GRADE SYSTEM)

SEMESTER : THIRD

3CT01 APPLIED ORGANIC CHEMISTRY

Course Objectives:

1. Students will get introduced to aromatic compounds, heterocyclic chemistry and natural products, properties and applications of phenols, ethers, epoxides, amines and their derivatives.
2. Student will get the knowledge about the chemistry of unit process, kinetics and mechanism of Nitration, sulphonation and sulphation.
3. Students will get introduces to polymer chemistry and technical preparation of some polymers.

Course Outcomes:

Students will be able to -

1. Analyzed aromaticity and list properties of aromatic compounds.
2. Write simple mechanisms of aromatic reactions.
3. List some of the heterocyclic chemistry and chemistry of natural products.
4. List some properties of amines and their derivatives.
5. Know the unit process like halogenation, sulfonation and nitration.
6. Synthesized some simple organic compounds, polymers and understand the kinetics and mechanism of unit processes.

SECTION-A

Unit I : 1. Aromatic hydrocarbons : Preparation, properties and applications of Benzene, and Naphthalene

2. Heterocyclic compounds: Classification of heterocyclic compounds, preparation, Properties and applications of pyrrole, thiophene, & furan (8 Hrs.)

Unit II : 1.Phenols : Basic concepts, classification, preparation, properties and applications of Phenol, resorcinols, cresols, catechol.

2. Ethers, epoxides and sulphur acids: Methods of preparation, General reaction, ethylene and propyleneoxides – their reactions and applications (8 Hrs.)

Unit III : Amines and their derivatives : Basic concepts, classification of amines, preparation, properties and applications of aniline and Benzene diazonium chloride.

Natural products: Terpenes, alkaloids, plant pigments, their applications (8 Hrs.)

SECTION-B

Unit IV : 1) Study of Chemistry of Unit Process : Nitration, nitrating agents, kinetics and mechanism of aromatic nitration. Technical preparation of nitrobenzene and nitronaphthalene.

2) Study of Chemistry of Unit Process : Sulphonation and Sulphation : Sulphonating & Sulphating agents, kinetics of mechanism of sulphonation. Technical preparation of Sulphonation of Benzene (8 Hrs.)

Unit V : 1) Study of Chemistry of Unit Process : Halogenation : Halogenating agents, thermodynamics, kinetics Technical preparation of DDT and Vinyl chlorides.

2) Principles of polymer chemistry and practices: Classification of polymerization. Types of polymers. Technical preparation of Polyvinylchloride, Bakelite. (10 Hrs.)

Unit VI: 1) Carbohydrates: Basic concepts, classification, industrial applications of glucose, sucrose and starch.

2) Chemicals in food products: Study of preservatives, sweetening agents and antioxidants. (6 Hrs.)

Books Recommended :

1) Organic Chemistry (Vol. I & II): I.L.Finar, Longman Group Ltd. And the English Language Book Society, London, 6th edition.
2) Advance Organic Chemistry: Fieser and Fieser, Asia Pub. House, Mumbai, 1961.
3) Unit Process in Organic Synthesis: P.H.Groggins, McGraw Hill, 5th edition.

3CT02 APPLIED PHYSICAL CHEMISTRY

Teaching Scheme:
(Th)Lecture: 03 Hours / week
Tutorial: 01 Hour /week
Total credit: 04

Examination Scheme:

T (U) : 80 Marks T (I) : 20 Marks
Duration of Univ. Exam : 03 Hours

Learning Objectives:

- To understand the effect of structure on properties of polymer, concept of weight average and number average molecular weight of macromolecules.
- To understand the electrical properties of fluid.
- To know the rate, order, energy of activation of chemical reactions and their determination.
- To know the use of kinetics and thermodynamics to elucidate mechanisms of reactions.
- To understand the basic concepts, the Ist and IInd Laws of Thermodynamics, Thermodynamic functions and their applications.
- To predict the high and low quantum yield photochemical reactions and to know about advanced spectroscopic analysis techniques.
- To know the basic concepts and industrial examples of catalysis and adsorption on surface.

Course outcomes :

The course will enable the student to:

- Evaluate the structural properties of macromolecules, average molecular weight determination of polymers by various methods.
- Evaluate the specific rate, order and energy of activation of chemical reactions.
- Know the fundamental concepts related to homogeneous and heterogeneous catalysis, mechanisms of industrially important reactions, surface phenomenon and adsorption isotherms.
- Apply mass and energy balances to closed and open systems ,Rationalize bulk properties and processes using thermodynamic considerations
- Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques and spectroscopic methods for identification of compounds.
- Know the ion transport & electrical properties of solutions, solve problems involving transport no, electrode potential and emf of different types of cell.

Contents:

Unit- I : Ion transport and electrical phenomenon at interface: Specific, Equivalent and Molar conductivity, Kohlraush's law and its applications ,Transport number and their determination ,Reversible and reference electrode , Thermodynamics of reversible electrode, Relation between electrical work done and free energy, Nernst equation for electrode potential , Standard electrode potential , Electrolytic concentration cell with and without transference, Determination of pH, solubility and solubility product of sparingly soluble salts, dissociation constant by EMF measurement, Numerical. (8 Hrs.)

Unit-II : Polymer science: Number average and weight average molecular weight of macromolecule, Methods of molecular weight determination of macromolecules, Membrane osmometry, Light scattering, sedimentation and ultracentrifuge methods, Effect of polymer structure on properties of polymers. Numerical on molecular weight determination. (6 Hrs)

Unit- III : Kinetics & Reaction mechanism: Introduction, Rate of reaction, concept of molecularity and order in elementary and complex reactions, differential and integral methods to formulate rate equations of zero, first and second order reactions. experimental methods in kinetic studies, effect of temperature on reaction rate, energy of activation and its determination, steady state approximation and rate determining step, Mechanism of complex reactions, photochemical chain reactions, polymerization reactions. Fast reactions – experimental techniques. Numerical (10 Hrs.)

Unit-IV : Surface, interfacial chemistry and catalysis: Adsorption , types of adsorption, Adsorption isotherms , Langmuir theory of adsorption, BET adsorption isotherm and it's application for determination of surface area of fine powder. Homogeneous and Heterogeneous catalysis, Criteria of catalyst, Theory of heterogeneous catalysis, Homogeneous, Lewis acid-base catalysts, organometallic catalysts and industrially examples, Auto and enzyme catalysis. kinetics of reactions on surfaces. (8 Hrs.)

Unit – V : **Thermodynamics and Equilibrium :** Statements of the second law; Heat engines, Carnot's theorem, and Carnot cycle, Mathematical statement of the second law, Introduction of Entropy under the IInd Law to define spontaneity of a process, Temperature- entropy diagram, Introduction of the state functions A & G to determine conditions of Material Equilibrium. Condition of reversibility, Transformation at constant temperature and pressure, Gibbs- Helmholtz equation, pressure – volume and volume – Temperature relationship under isothermal condition for ideal gas. Partialmolar properties, chemical potential, Numerical. (8 Hrs.)

Unit VI: Spectroscopic techniques and applications : Principles of spectroscopy and selection rules. Electronic spectroscopy. Vibrational and rotational spectroscopy of diatomic molecules. Principle, Instrumentation and Applications of IR, UV & NMR spectroscopy

Photochemistry and Modern Analytical techniques: Lows of photochemistry, quantum efficiency and its determination, low & high quantum yield reactions, Atomic absorption spectroscopy, chromatography. (8 Hrs.)

Books Recommended :

1. Physical Chemistry , P.W. Atkins and J.D. Paula, Oxford University Press.
2. Physical Chemistry , K.J. Laidler and J.M. Meiser, CBS Publisher
3. Chemical kinetics and catalysis , R. J. Masel, John Wiley publications
4. Handbook of conducting polymers, Skotheim, Elsenbaumer and Reynolds, Marce Dekker.
5. Fundamentals of spectroscopy ,Banwell, Tata McGraw-Hill
6. Physical chemistry of surfaces, Arthur W. Adamsons, Alice P. Gast, John Wiley publications
7. Principle of Heterogeneous catalysis, J.M.Thomas, W.J. Thomas, John Wiley publications
8. Thermodynamics for students of chemistry, Dr. J. Rajaram & Dr. J. C. Kuriacose, Chand & comp.

3 CH 03 /3CT03 STRENGTH OF MATERIALS

Learning Objectives of Subject:

1. TodeterminetheMechanicalbehaviorofthebodyandconstructionmaterialsbydetermining the stresses, strains produced by the application of loads.
2. To apply the fundamentals of simple stresses and strains.
3. To make one understand the concept of bending and its theoretical analysis.
4. To apply fundamental concepts related to deformation, moment of inertia, load carrying capacity, shear forces, bending moments, torsional moments, principal stresses and strains, slopes and deflection.

Course outcomes:

At the end of the subject the students will be able -

1. To understand the basics of material properties, stress and strain.
2. To apply knowledge of mathematics, science, for engineering applications
3. To identify, formulate, and solve engineering & real life problems
4. To design and conduct experiments, as well as to analyze and interpret action and reaction data.
5. To understand specific requirement from the component to meet desired needs within realistic constraints of safety.

SECTION – A

Unit I: Mechanical properties: Concept of direct 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, Generalized Hook's law, factor of safety. 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: 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 forces, bending moment and loading intensity.

Unit III: 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, impact loads and instantaneous stresses.

SECTION – B

Unit IV: 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. Thin cylinders subjected to internal pressures.

Unit V: Principal stresses: Biaxial stress system, principal stresses, principal planes, Mohr's circle of stresses, principal strains. Combined direct & bending stresses.

Unit VI: Slope & deflection of beams: Slope & deflection in statically determinate beams subjected to point loads, uniformly distributed loads, moments by Macauley's method. Theory of long columns, Euler, Rankin's 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. Ferdinard 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. R. K. Bansal, Strength of materials, Laxmi Publications Pvt Ltd.
6. Junnarkar, S. B., Mechanics of materials.
7. Mubeen, A., Mechanics of solids, Pearson education (Singapore) Pvt. Ltd.
8. Beer and Johston, Mechanics of materials, Mc-Graw Hill.
9. S. Ramamrutham, Strength of Materials, Dhanpat Rai Publishing Co Pvt Ltd.

3CT04 APPLIED THERMODYANICS

Course Learning Objectives :

1. To study the basic concepts of thermodynamics, thermodynamic systems, work and heat
2. To study the laws of thermodynamics and their applications
3. To study the properties of steam, work done and concept of heat transfer
4. To study the air standard cycles

Course Outcomes :

Students will be able to

1. Understand the basic concepts of thermodynamics, thermodynamic systems, work and heat
2. Apply first law of thermodynamics and application of first law to flow and non-flow processes
3. Apply second law of thermodynamics and understand concept of entropy
4. Understand the properties of steam, work done and heat transfer during various thermodynamics processes with steam as working fluid
5. Understand the concept of air standard cycles

SECTION – A

Unit-I: Introduction to basic concepts of thermodynamics, Macroscopic and microscopic approaches, properties of system, state, processes and cycle, thermodynamic equilibrium, types of thermodynamic systems, Temperatures and Zeroth law of thermodynamics, Quasi-static process, Gas Laws and Ideal gas equation of states, gas constant and universal gas constant.
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 (10 hrs)

Unit-II: First law of thermodynamics: Energy of a system, classification of energy, law of conservation of energy law, Joules experiment. Energy a property of system, internal energy-a function of temperature, Enthalpy, specific heat at constant volume and constant pressure. Application of first law to non-flow processes, Change in internal energy, work done and Heat transfer during various non-flow processes. (7 hrs)

Unit-III: First Law applied to flow processes: Steady state, steady flow process, equation for work done in steady flow process and its representation on P-V diagram, 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. (9 hrs)

SECTION – B

Unit-IV: Second Law of thermodynamics: Limitations of First law, Thermal energy reservoir, heat engines refrigerator and heat pumps, COP and tonne of refrigeration, COP for heat pump and refrigerator, Kelvin-Plank and Clausious statements, their equivalence, reversible and irreversible processes, Carnot cycle, Carnot theorem and its corollary, The thermodynamic temperature scale, Reverse Carnot cycle, Inequality of Clausius.
Introduction to Entropy, availability and irreversibility. Principle of increase of entropy. (8Hrs)

Unit-V: 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, internal latent hear, 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 VI : Air Standard Cycles: Ottto, diesel, semidiesel, Brayton, Sterling and joule cycles etc., their efficiencies and mean effective pressure, comparison of auto, diesel and duel cycles.
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) (numerical on air standard cycle) (8 Hrs)

BOOKS RECOMMENDED:

Text Books :

1. Engineering Thermodynamic - by P. K. Nag.
2. Fundamentals of Engineering Thermodynamics; R. Yadav;
3. Thermodynamics Basics and Applied: by V. Ganeshan
4. Thermal Engineerirng: by Mahesh M. Rathore.

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.

3CT05 PROCESS CALCULATION

Course objectives :

1. Students will learn the basic and fundamentals of chemical engineering operations and processes.
2. Students will understand the material balance and energy balance of various unit operations and unit processes.
3. Students will learn how to formulate and solve the problems related to material and energy balance with or without chemical reaction.

Course Outcomes:

After successful completion of this course student will be able to

1. Understand the concept of basic chemical calculations
2. Understand the concept and application of theory of proportions
3. Determine the humidity with/without using a psychrometric chart.
4. Make the material balance over unit operations and processes.
5. Make the energy balance over unit operations and processes.
6. Solve the problem of fuels and combustion.

SECTION A

Unit I: Introduction to unit operations and unit processes, Units and dimensions, Atoms, moles and molecular weight, mole and mass fraction, Composition of solids, liquids and gases, Concept of Normality, Molarity and Molality, PPM (Parts Per Million), Ideal Gas Law, Dalton's Law, Partial Pressure, Amagat's Law, Average Molecular Weight,Density of Gas Mixture, Raoult's Law, Henry's Law, Vapour Pressure, Clausius Clapeyron equation, Cox Chart,.Humidity and saturation, Humidity Chart, and their application.

Unit II : Material balance without chemical reaction stoichiometry and unit operations Distillation, Absorption, Extraction, Crystallization, Drying, Mixing, Evaporation. Recycle, purge and Bypass calculations.

Unit III : Material balance involves chemical reaction, Principle of stoichiometry, simple oxidation reaction, multiple chemical reaction, percentage Conversion, percentage Yield, and selectivity, calculation involving combustion of gases, liquid and solid fuel. Recycle, purge and bypass calculations.
Introduction to unsteady state material balance

SECTION B

Unit IV : Energy balance: open and closed system, heat capacity, calculations of enthalpy changes, enthalpy changes for phases transitions, evaporation, Solution and mixing, clausius clapeyron equation.

Unit V: Energy balance with chemical reaction, calculation of standard heat of reaction, heat of formation, heat of combustion, Hess law, Effect of temperature on heat of reaction; adiabatic flame temperature calculations.

Unit VI : Heating value of fuels, calculations involving theoretical and excess air, heat and material balance of combustion processes.

References :

1. Bhatt, B. I., Vora, S. M., "Stoichiometry", Fourth Edition, Tata McGraw Hill Publishing Company Ltd, 2004.
2. Narayanan K V and Lakshmikutty B, Stoichiometry and Process Calculations, Prentice Hall of India Pvt Ltd, New Delhi 2006.
3. Sikdar, D. C., "Chemical Process Calculations", Prentice Hall of India.
4. Himmelblau, D. M., Riggs, J. B. "Basic Principles and Calculations in Chemical Engineering", Eighth Ed., Pearson India Education Services, 2015.
5. Hougen. O. A, Watson K.M. and Ragatz R.A. "Chemical Process Principles, Part -I, Material and Energy Balance".

3CT06 APPLIED ORGANIC CHEMISTRY- LAB

Course objectives:

1. Students should be familiar with common organic compounds, should identify them and should know simple organic preparation and separationmethods.
2. Students will get introduced to aromatic compounds, heterocyclic chemistry and natural Products.

Course outcomes:

1. Students will be able to list steps for identifying simple organic compounds
2. Students will be able to list some methods of separation of organic compounds
3. Student will be able to synthesize simple organic compounds.

Content:

1. Identification of an organic compound through elemental analysis, group detection, physical constants (m.p and b.p) and derivatisation.
2. Separation and purification of binary mixtures of the type: water soluble-water insoluble, both watersoluble, liquid-liquid by distillation, dissociation - extraction , crystallization, etc.
3. Simple organic preparations:
   i) Acetanilide
   ii) Nitro Acetanilide
   iii) Aspirin

Books Recommended:

1. Practical Organic Chemistry, by I.L. Finar
2. Laboratory hand book of organic qualitative analysis and separation, by Kulkarni V. S. D. Ramchandra & co. Pune.

3CT07 APPLIED PHYSICAL CHEMISTRY- II - LAB

Total hours / week : 2 Examination Scheme: (I): 25, (Ext): 25 Marks
Total credit: 1

Course Objectives: To provide the practical knowledge of analysis techniques by classical and instrumental methods for developing experimental skill to built technical competence.

List of Experiments:

1. Determination of viscosity average molecular weight of polymer.
2. Determination of order of reaction and specific rate constant of hydrolysis of methyl acetate.
3. Study of kinetics of second order reaction.(Saponification of ethyl acetate & reaction between potassium per sulphate & potassium iodide)
4. Determination of relative strength of two acids by kinetic study of reaction
5. Determination of energy of activation of reaction
6. Determination of equivalent conductivity of strong electrolytes at infinite dilution.
7. Determination of transport number by EMF measurement.
8. Determination of equivalence point of titration by conductance measurement.
9. Potentiometric titration between strong acid and strong base.
10. Verification of Beer- Lambert's law and determination of concentration of unknown solution.
11. Verification of Freundlich and Langmuir isotherm.
12. Determination of refractive index.
13. Determination of solubility of sparingly soluble salts by EMF measurement.
14. Determination of heat of neutralization & ionization of acetic acid
15. Determination of ΔH and ΔS of monobasic acid by measuring its solubility at different temperatures.
16. Determination of specific rotation of cane sugar by polarimetry.

All above experiments are to be arranged in the laboratory. Minimum 08 experiments are required to be performed by the student to complete the term work.

Course outcomes: After completion of this course the students shall be able to :

1. Understand the objectives of their experiments.
2. Follow the proper and safe procedure to get the accurate results.
3. Record and analyze the results.
4. Interpret the results through proper writing in laboratory journal

Books Recommended :

1. Experiments in Physical Chemistry, David P. Shoemaker, Carl W. Garland, Jeffrey I. Steinfeld
2. Experiments in Chemistry, Dr. D. V. Gahagirdar, Himalaya Publishing House
3. A Text Book of on experiments and calculations- Engg. Chemistry, S.S. Dara, S. Chand & Comp. ltd.

3CT08 / 3CH08 – STRENGTH OF MATERIALS – LAB

List of Practical's in Strength of Material Lab (Minimum any eight practical from the list should be performed)

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.

3CT09 APPLIED THERMODYNAMICS – lab.

Minimum 8 10 10 Practicals based on the Syllabus 3CT09 APPLIED THERMODYNAMICS**.**

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SEMESTER - IV

4CT01 MATHEMATICS - II

Course Outcomes:

After successfully completing the course, the students will be able to

1. Demonstrate the knowledge of partial differential equations, applied to Computer technology.
2. Find roots of complex numbers, separate the complex quantity in real & imaginary parts, and find logarithms of negative numbers and complex quantities.
3. Compute different Numerical Methods
4. Analyze the Knowledge of Optimization.
5. Analyze the concept of Linear Programming Problems and Simplex Method
6. Demonstrate the basic concepts of probability and statistics

Students are expected to be aware of the statements of the relevant theorem without mastering their proofs.

Unit I :Partial Differential Equations : Basic concepts (@J 1.1), Vibrating string (@11.2), separation of variables (@11.3), one dimensional heat flow(@11.5), 11.6) (07 periods)

Unit II: Complex Numbers and Analytic functions : Complex numbers(@12.1), polar fonn(@12.2),Complex function limit, derivative analytic function (@12.4), Cauchy Riemann Equations, Laplace's Equation(@12.5), rational functions(@12.6), Exponential function (@12.7), Trigonometricand hyperbolic functions (@12.8), logarithm (@12.9) (07 periods)

Unit III : Numerical Analysis : Errors in computation (@19.1), Solution of Equations by iteration, Newton - Raphson method (@19.2) Finite differences{@19.3}, Interpolation (@19.4), Numerical integration using rectangular, trapezoidal and Simpson's rule (07 periods)

Unit IV : Optimization : Basic concepts (@22.1), Linear programming{@22.2), Simplex method{@22.3),(@~2.4) (07 periods)

Unit V : Probability and Statistics : Sample mean and variance (@23.3), probability (@23.S),Permutations and combinations (@23.6), discrete and continuous distributions (@23.7), mean and variance of adistribution (@23.8), Binomial, Poisson distributions (@23.9),Normal distribution (@23.10) (07 periods)

Unit VI : Probability and Statistics (continued) : Random sampling (@23.12), Estimation of parameters (@23.13),confidence intervals (@23.14), Testing of hypothesis (@23.15) (07 periods)

Note : Numbers in bracket refer to section number; T1 "AdvancedEngineering Maths" by Erwin Kreyszig (Finn jdn), WileyEastern.

Books Recommended :

1) Elements of Applied Mathematics: P.N. Wartikar& J.N. Wartikar,
2) A text book of Applied Mathematics: P. N. Wartikar& J. N. Wartikar,
3) Advanced Engg. Mathematics - Erwin Kreyszig, Wiley Eastern (5thEdition),
4) Higher Engg. Mathemetics . B.S.Grewal.
5) Numerical Method for Mathematics Science and Engineering, John H. Mathew, PHI
6) 4. Numerical Methods - Principles, Analysis & Algorithms Pal, Oxford.

4FT02 FOOD TECHNOLOGY-I:

CHEMISTRY OF FOODS :

Development of Food Chemistry : History of Food Chemistry. Nature and Origin of life. Basic activities of animals and plants and their relations. Water and Ice: Importance of water in foods. Structure of water and ice. Concept of bound and free water and their implications.

Carbohydtrates :- Nomenclature, Classification and structure of Carbohydrates. Chemical reactions of carbohydrates. Physical and Chemical properties of sugars, starch, pectic substances, gums and other polysacchrides, Functional properties of carbohydrates in foods.

Lipids: Definition and classification of lipids, Chemistry of fatty acids and glycerides, Physical and chemical characteristics. Chemistry of processing of fats and oils, hydrogenated fats, shortening agents and confectionery fat etc. Rancidity of fats and oils, its prevention and antioxidants. Functional properties of lipids in foods.

Protein: Importance of proteins. Nomenclature, classification, structure and chemistry of amino acids, peptides and proteins Sources and distribution of proteins. Isolation identification and purity of proteins, Denatruation Functional properties of proteins in food.

Fruits and Vegetables: Plant Cells and tissues, their structure, functions and physiology, Chemical Composition of edible plant tissue. Texture of fruits and vegetables. Effects of cooking on texture and composition of fruits and vegetables.

Meat. Fish and Poultry : Animal Proteins, Structure and chemical composition of muscles, **Myoglobin and hemoglobin** - Post - Mortem charges regor mortis. Methods of cooking and processing and their influence on texture. Physical and chemical changes during cooking Palatability characters; texture and tenderness. Structure and composition of eggs. Chemistry and functional properties of eggs.

Milk and Milk Products : Composition of milk, Physical and chemical properties of milk protein and effects of processing on these. Chemistry of milk product like cheese, cream, butter, ghee etc

Miscellaneous: Sensory perception of tests and flavors. .Browing reactions, Nutritive and non-nutritive sweeteners. Food dispersions and their implications on foods.

Books Recommended :

1. Food Chemistry by L.H. Meyer, Publishers, Van Nostrand Reinhold Co.New York, Latest Edition.
2. Principles of Food Science- Edited by Owen R. Fennema, Part I Food Chemistry, Publishers Marce Dekker, Inc. New York.
3. The Chemical Analysis of Foods and Food Products : Morries, B.Jacobs 3rd Edition, Publishers Van. Nostrand Company, INC. Princeton, New.
4. Introduction to the Biochemistry of Foods by J..B.S. Braverman, Publishers Elsevier Publishing Co. Amsterdam, Latest Edition.
5. The Spice Hand Book by J. W.Patty, Publishers Chemical Publishing Co. Inc.New York, Latest Edition.
6. Food Theory andApplication by Paul, Pauline and Palmer, Helen H., Publishers, John Wiley and Sons. NewYork,. Latest Edition.

4PT02 PULP AND PAPER TECHNOLOGY-I

CHEMISTRY OF WOOD AND PULP OF PAPER MATERIALS:

Species, anatomy and physical properties of Wood:-

Classification of woods, plants used in pulp and paper, gross structure of trunk, structure elements of wood, fiber dimensions water conducting system, food conducting system, reactions of wood, bark and its structural elements, dec of wood, physical properties of wood. Fiber morphology: Cell formation and growth, fiber structure, chemical composition of wood, non-wood fibers used in pulping bast, fruits, grass, leaf, animal, mineral and synthe: icfibers

Cellulose: Chemistry and location in the cell, isolation molecular constitution, microfibrils, crystalline and amorphoupus Pulp of Paper biogenesis of the cell wall, Polysacchrides, sorption, swelling and solution of cellulose, degradation reactions of pulp of paper.

Hemicelluloses : Structure and properties of hemicelluloses.

Lignin: Lignification in wood, biological and biochemical aspects of lignin information, structure and properties of lignin, separation of lignin from woodytissues and Fiber laboratory separation, commercial separation, analysis of'lignin and utilization of Lignin.

Books Recommended :

1. "The Chemistry of Cellulose" by Emil Hauser, John Wiley & Sons, New York.
2. "The Methods of Cellulose Chern. " by Charles Dorce, Chapman & Hall, L.
3. High Polymers Vol V (Part-I to V) edited by Emil Ott& Others, Interscience Publishers.
4. Publishing Processes by S.A.Rydholm, John Wiley & Sons, Inc.,New York.
5. Pulp &Paper : Chemistry & Chemical Technology by James P. Cascy.

4OT02 OIL & PAINT TECHNOLOGY-I

(CHEMISTRY OF OIL AND FATS & INTRODUCTION OF PAINTS)

Natural Fats : Their Sources, classification and composition Constituents of natural fats : Glycerides, Phospholipids, Fatty acids, non-glycerides constituents, toxic constituents and detoxication, Nutritional functions of Fats. **Glycerides and fatty acids :** Nomenclature, Structure, occurrence in fats. Physical properties of fats and fatty acids. Elementary ideas on their liquid properties, solution properties and spectral properties.

Chemical reaction of fats and their fatty acids. Chemistry of hydrogenation, hydrogenolysis, autoxidation, polymerisation dehydration, pyrolysis, halogenation, sulpation and sulphonation , esterification , interesterification and hydrolysis. Chemical Oxidation of fatty acids, Significance and importance of these reactions. Rancidity Of Oils & Fats, . Oils Antioxidant and Synergists.

Physical and Chemical characteristics : Indian standards for oils and fats - ISI Specifications of Oilseeds, Oils, DOC, Vegetable Ghee . Identification of fats. Detection of adulteration in fats and Indian standards for oils and fats. **Introduction of Paints**, Types Of Paints, Basic Ingredients of Paint System, Industrial Applications of Paints , Recent development in the field of Oils & Paints.

Books Recommended :

1. Industrial Oil and Fat Products Ed. : A.E.Bailey. Interscience & Sons New York, London, Sydney 5th Edn.
2. An Introduction of the Chemistry and Biochemistry of Fatty Acids : Gumstone.
3. Progress in the Chemistry of Fats and other liquids (Vols. 1 to 11) T.R.Holmann, Pergamon Press.
4. Fatty Acids : K.S.Markley, Inter Sc.Publishers, 2nd edition, New York.
5. Industrial Chemistry of Fats and Waxes : T.Hilditch Balliere Tindall and Cox, London 2nd Edition.
6. Rancidity of Edible Fats : C.H.Lea, His Majesty's Stationary Office, London, Latest Edition.
7. Analysis of Fats and Oils : V.V.Mellen Bacher, Garrard Press Publishers, Illinois, Latest Edition.
8. Outline of Paint Tech. - H.Hea
9. Introduction of paints by Morgan.

4PC02 PETROCHEMICAL TECHNOLOGY - I

Course Objectives: Basic Concepts of Chemistry of Hydrocarbons, Introduction to Basic Refinery Processes. Formation Theories of Petroleum. Exploration and prospecting for petroleum and gas field, Drilling. Transportation, Storage of Petroleum & Products and future Energy Sources.

Course Outcomes:

1) Students will be able to understand the chemistry and composition of petroleum.
2) Students will be able to understand the importance petroleum as a source of energy and petrochemicals
3) Students will be able to understand the technology involved in exploration and prospecting for petroleum and gas field, as well as drilling for petroleum.

Unit-I: Origin, Occurrence, and Formation of crude petroleum. History of Indian Petroleum and Refining Industry and future trends. Hydrocarbon resources in India, history. World Petroleum Scenario, world Petroleum Reserves and Deposits. Crude Oil and Natural Gas Production and Consumption in India. Petroleum refineries in India, their location, year of commissioning, and organizations, Refining Capacity& throughput, Production& Consumption of Petroleum Products. Advantages and disadvantages of petroleum.

Unit-II: Composition, Chemistry, Classification of Petroleum Hydrocarbon composition of petroleum and petroleum products (liquid and gas).Non-hydrocarbon compounds in petroleum. Properties of hydrocarbons and non-hydrocarbons. Classification and description of crude oils and petroleum gases.

Unit-III: Refining Processes and Operations Various refining processes, operations and chemistry involved. Principle involved in dehydration, desalting and conditioning of crude oil. Thermodynamics, kinetics and reaction mechanism, principle involved in thermal and catalytic processes such as thermal and catalytic cracking, hydro cracking, reforming, isomerisation, polymerization, alkylation.

Unit-IV: Exploration and prospecting for petroleum and gas field Structure of earth and of the earth crust, formation of Sedimentary rocks, Exploration and prospecting for petroleum and gas field, Geological, Geophysical, Geochemical prospecting methods, geophysical borehole logging methods. Migration of petroleum and gas deposits and commercial petroleum accumulations. Petroleum traps and their classifications. Development of an oil or gas field.

Unit-V: Drilling for Petroleum Drilling operation, Cable tool method, Rotary drilling, Turbo drilling, types of drill bits, mud fluids, casing off formations, Deviation of holes, Directional drilling, Offshore drilling rigs, Well control systems.

Unit-VI : Other Sources of Hydrocarbons, Transportation& Storage of Petroleum Sources of hydrocarbons other than crude oil, future automotive fuel resources, new and future energy sources. Transportation and storage of crude oil, petroleum gases, and petroleum products. Shipping tankers, Pipelines: Materials and Corrosion, Onshore and offshore pipeline construction. Pipeline network in India.

Books Recommended :

1) Modern Petroleum Refining Processes by B. K. BhaskaraRao, Latest Edition.
2) Chemistry of Petrochemical Processes by Sami Matar, Lewis F. Hatch
3) The Chemistry and Technology of Petroleum by James G. Speight
4) Fundamentals of Petroleum and Petrochemical Engineering by Uttam Ray Chaudhuri
5) Modern Petroleum Technology Volume-I Upstream Edited by Richard A. Dawe

4 CT03 / 4CH02 MACHINE DESIGN & DRAWING

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 31 32 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 cylin-der, 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, cclamps

(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).

4CT04 MATERIAL SCIENCE & ENGINEERING

SECTION-A

Unit I : Crystalline and non crystalline structure sensitive and insensitive properties and defects in crystals. Co-relation of mechanical properties with reference to structure.

Unit II: Effect of temperature on mechanical properties various rnethods of improving the strength failure under service conditions

Unit III : Solid solutions phase diagrams and their relation to meta properties with reference to steels and cast irons.

SECTION-B

Unit IV : Heat treatment of steels and common on ferrous alloyes.

Unit V: Elastomers and plasiomers, molecular structure and properties of polymers, ceramic materials and refractoriness, High ternperature oxide ceramics glasses and their properties, composite materials.

Unit VI : Corrosion: Electrode potentials e.m.f and galavanic series, polarization forms of corrosion, rate factors, inhibition, prevention, control and testing, Corrosion behaviour of metals and alloys chemical resistance of polymers, Forming processes and corrosion. Non destructive methods of testing, Metallic, Plastic and other protective coatings.

Books Recommended :

1. Nature and properties of Engineering Materials by D.Jastrebski.

2. Introduction to Materials science by Guy.

3. Materia! Science and Processes by SK.Hajra Chaudhry

4. Material Science for Engineers by Van Valack.

4CT05 FLUID FLOW OPERATION

Course Objectives:

1. Students will understand the basic concept of fluid flow, types of flow, and application of fluid mechanics.
2. Students will get the knowledge of flow and pressure measurement using different flow meters, and pressure measuring devices.
3. Students will get the knowledge of various pumps used in chemical industries.
4. Students will get the knowledge of various agitators and mixing equipments and power consumption for mixing.

Course Outcomes:

After successful completion of this course student will be able to

1. Understand the knowledge of fluid flow, fluid properties and type of fluid
2. Understand the concept of dimensional analysis
3. Select the agitators for mixing operations and able to calculate the power required for mixing.
4. Understand the concept and applications of Bernoulli's theorem,
5. Understand the principle, working and application of different flow meter
6. Understand the principle, working and application of various pumps and able to calculate the power requirement and NPSH of centrifugal pump.
7. Calculate the pressure drop across packed bed and minimum fluidization velocity in fluidized bed; understand the concept of two phase flow.

Course Contents:

Unit I :Properties of fluid and their classification : Fluid statics: Forces on fluids, pressure depth relationship for compressible and incompressible fluids, forces on submerged bodies. rigid body motion, pressure measurement, Euler's equation.

Unit II :Kinetics of flow, Description of velocity field, Stream functions, angular velocity, Fluids in circulation, Irrational flow. Dimensional analysis: Buckingham Pi theorem, dimensionless number and their physical significance, simulated criteria. Mixing and agitation of fluid, types of mixers and their selection, power requirement.

Unit III :Fluid flow: Laminar and turbulent flows, pressure drop in pipes and tubes, pipe fitting and pipe network and friction factor, conversion of mass Momentum and energy, Navier-Stokes equation, mechanical energy balance and Bernoulli's theorem.

Unit IV :Flow measuring devices for chemical plants: Orifice metre, Nozzle Venturimeter, Rotameter and pitot tube.

Unit V :Pumping and compressing of chemicals and gases, reciprocating pump, rotary pump, centrifugal pump and blowers. NPSH and calibrations. Mixing and agitation fluids. Compressible fluid flow and Aerodynamics.

Unit VI :Flow past immersed bodies, flow through packed bed and fluidized bed, Introductory concept of two phase flow.

Text Books/ Reference Books :

1. R. P. Vyas, Fluid Mechanics, Central Techno Publications, Nagpur.
2. W. L. McCabe, J. C. Smith and P. Harriot, Unit Operations of Chemical Engineering, 7th Edition, McGraw-Hill International Edition 2005.
3. Chemical Engineering volume 1 coulson J. M. and Richardson J. F. Butterworth Heinemann, Oxford
4. M. White, Fluid Mechanics, 8th Edition, Tata-McGraw Hill, 2016.
5. O. Wilkes, Fluid Mechanics for Chemical Engineers, Prentice Hall of India, 2005.
6. R. W. Fox, P. J. Pritchard & A. T. McDonald, Introduction to Fluid Mechanics, 7th Edn, Wiley-India 2010.

4 FT 06 FOOD TECHNOLOGY - I –LAB

General methods of proximate analysis of food materials. Analysis of Oils and Fats, Chemical Analysis of carbohydrates and proteins, taniles vitamanies etc. colorimetric methods for starch. and qualitative detection of carbohydrates and proteins, taniles, vitamins etc. Colorimetric methods for starch, polyphenols, carotenes Xanthophylls etc. Paper chromatography and qualitative detection of carbohydrates, proteins and, tats oils, Colour. test for oil. Qualitative and quantitative analysis of acided and antioxidates. Chemical Preservations like benzoic acid and sulfur dioxide, Non-Nutritive Sweetness and emulsifying agents.

Books Recommended :

1. The Chemical Analysis of Foods, Sixth Edition by David Perason, J.O.A. Churbcill, 104 Gloucester place London. 70

2. Manual of Analysis of Fruits and Vegetable Products: S.Ranganna, Ph.D. Central Food Technological. Research Institute, Mysore, Publisher, Tata McGraw Hill Publishing Company Ltd., New Delhi.

3. Food Analysis by A.G. Woodman, 4th Edition, Publishers, Mc.Graw Hill Book Company, INC, New York and London, Latest Edition.

4. Modem Food Analysis by F.Leslie Hart A.N. and Hary John Stone Fishes. Ph.D. Publishers, Springer - Verlag. Berlin Heidelberg, New York, Latest Edition.

5. Food Analysis by RLees, Published by Leonard Hill Books, London.

6. Official Methods of Analysis of Association of Official Analytical Chemists, Pub.Associ. Office, Anal, Chemist, Washington D.C. Latest Edition.

7. Approved Methods of the American Association of Cereal Chemist, Vols. I & II, Latest Edition. Published by American Association of Cereal Chemist inc. Paul, Minnesota U.S.A.

4 PT 06 PULP & PAPER TECHNOLOGY-I - LAB

Determination of various components of wood such as moisture content.ash content, Water Solubility, alkali, solubility extractives, lignin Cellulose; hemicellulose, holo cellulosepentosans etc. Microscopic observations of fibrous materials.

4 OT 06 OIL AND PAINT TECHNOLOGY-I – LAB

Preparations & Standardization Of Solutions, Determination of various Physical and Chemical characteristics of oils, fats and waxes, colour, solubility and thermal test for purity. Analysis of oilseeds and cakes, estimation of rancidity. Analysis of nickel catalysts and acid oils determination, Physical and Chemical, characteristics of vanaspati, margarine and ghee. Detection of adulteration in oils & fats Testing of readymade Paints & Raw materials of paints systems like pigments, Solvents, additives, Resins .

4 PC06 PETROCHEMICAL TECHNOLOGY- I –LAB

Course Objectives:

Petrochemical Technology lab provides students first handexperience of conducting preliminary tests for various petroleum products and verifying various standard tests and test methods setfor petroleum products and comparing and studying the standard specifications set for petroleum products.

Contents:

Experiments for Petrochemical Technology-I (Chemistry of Petroleum Hydrocarbons) such as Flash Point by Abel's Method, Flash Point by Pensky Martien's Method, Flash and Fire Point by Clevland Open Cup Method, Smoke Point, Aniline Point, Cloud and Pour Point, API Gravity, Viscosity (by Redwood Viscometer/Saybolt Viscometer/Engler Viscometer), Copper Strip Corrosion, Drop Melting Point of Wax, Melting Point of Wax by Cooling Curve Method, Congealing Point of Wax etc.

Lab. Outcomes :

Students will be able to:

- Learn how to experimentally verify various theoretical concepts.
- Visualize practical testing of petroleum products under standard test conditions.
- Develop experimental skills.

4 CT07 MACHINE DESIGN & DRAWING –LAB

Minimum 8 to 10 practicals based on the Syllabus 4 CT04 MACHINE DESIGN & DRAWING

4 CT08 MATERIAL SCIENCE & ENGINEERING – LAB

Ten experiments based on the above syllabus evenly distribute shall be performed and a report/journal there of submitted by each student. The practical Examination shall consist of practicals and viva voce based on the syllabus and practicals.

4 CT09 FLUID FLOW OPERATIONS – LAB

List of Practicals :

1. Calibration of Venturi metre
2. To obtain the coefficient of discharge for the given orifice meter
3. To study the types of flow and determine critical Reynolds number.
4. To verify Bernoulli's theorem.
5. To study the centrifugal pump
6. To study the reciprocating pump
7. To study the loss of head due to Pipe Friction
8. To study the Loss of head due to Pipe Fittings

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NOTIFICATION

No. 91 /2020 Date :26/10/2020

Subject : Equivalence & Absorption Schemes / Chances for Old Course failures of B.E. Sem. I / II (Group A & B) and B.E./ B.Text.E./ B.Tech. (Chem.Tech.) Sem. III & IV in the Faculty of Science & Technology …

It is notified for general information of all concerned that the authorities of the University have accepted the Equivalence & Absorption Schemes / Chances for Old Course failures of Sem. I/II (Group A/ B) and Sem. III & IV of B.E./ B.Text. E./ B. Tech. (Chem. Tech.) (Food, Pulp & Paper, Oil & Paint and Petrochemical Tech.) in the Faculty of Science & Technology to be implemented from the academic session 2020-21 & onwards as per "**Appendix – A**" as given below:

Sd/-
(Dr.T.R.Deshmukh)
Registrar

"**Appendix – A**"

(A) SCHEMES OF EQUIVALENCE & ABSORPTION / CHANCES FOR B.E. SEM.I/II [Grp. A & B]
[W.E.F. SUMMER – 2021]

Sr No	Old Course Subj. Code	Old Course Subject	Chances to be given, if any	Equivalent new Subj. code	Equivalent New Subject after exhausting chances
1	1A1	**B.E. Semester I / II (Gp A)** Engineering Maths - I	(2) Summer- 2021 & Winter-2021	----	-----
2	1A2	Engineering Physics	(2) Summer- 2021 & Winter-2021	----	-----
3	1A3	Engineering Mechanics	(2) Summer- 2021 & Winter-2021	----	-----
4	1A4	Engineering Drawing	(2) Summer- 2021 & Winter-2021	----	-----
5	1B1	**B.E. Semester I / II (Gp B)** Engineering Maths - II	(2) Summer- 2021 & Winter-2021	----	-----
6	1B2	Engineering Chemistry	(2) Summer- 2021 & Winter-2021	----	-----
7	1B3	Computer Programming	(2) Summer- 2021 & Winter-2021	----	-----
8	1B4	Electrical Engineering	(2) Summer- 2021 & Winter-2021	----	-----

(B) SCHEMES OF EQUIVALENCE & ABSORPTION / CHANCES FOR OLD COURSE FAILURES OF B.E. III & IV

(I) Civil Engineering :

Sr No	Old Course Subj. Code	Old Course Subject	Chances to be given, if any	Equivalent new Subj. code	Equivalent New Sub. after exhausting chances
1	3CE01	[**w.e.f. Winter – 2020]** Mathematics – III	(2) Winter-2020 & Summer- 2021	3CE01	Mathematics – III
2	3CE02	Strength of Materials	Four (4) chances till Summer – 2022	3CE02	Strength of Materials
3	3CE03	Transportation Engg. - I	Four (4) chances till Summer – 2022	3CE04	Transportation Engg.
4	3CE04	Building Construction and Materials	Four (4) chances till Summer – 2022	3CE03	Building Construction and Engg. Geology
5	3CE05	Engineering Geology	Four (4) chances till Summer – 2022	----	-----
6	4CE01	**[w.e.f. Summer – 2021]** Geotechnical Engg. - I	Four (4) chances till Winter - 2022	4CE04	Geotechnical Engg. - I
7	4CE02	Fluid Mechanics – I	Four (4) chances till Winter - 2022	4CE02	Hydrology & Water Resource Engineering
8	4CE03	Theory of Structures – I	Four (4) chances till Winter - 2022	4CE05	Structural Analysis – I
9	4CE04	Surveying – I	Four (4) chances till Winter - 2022	4CE03	Surveying
10	4CE05	Reinforced Cement Concrete - I	Four (4) chances till Winter - 2022	3CE05	Concrete Technology & R.C.C.

(II) Mechanical Engineering :

Sr No	Old Course Subj. Code	Old Course Subject	Chances to be given, if any	Equivalent new Subj. code	Equivalent New Sub. after exhausting chances
1	3ME01	[**w.e.f. Winter – 2020]** Mathematics – III	(2) Winter-2020 & Summer- 2021	3ME01	Mathematics – III
1	3ME02	Mechanics of Materials	(2) Winter-2020 & Summer- 2021	3ME03	Mechanics of Materials
2	3ME03	Fluid Power – I	(2) Winter-2020 & Summer- 2021	3ME05	Fluid Mechanics
3	3ME04	Engineering Thermodynamics	(2) Winter-2020 & Summer- 2021	3ME04	Engineering Thermodynamics
4	3ME05	Manufacturing Process - I	(2) Winter-2020 & Summer- 2021	3ME02	Manufacturing Processes
5	4ME01	**[w.e.f. Summer – 2021]** Basic Electrical Drives & Control	(2) Summer- 2021 & Winter-2021	4ME04	Basic Electrical Drives & Control
6	4ME02	Engineering Metallurgy	(2) Summer- 2021 & Winter-2021	4ME01	Material Science
7	4ME03	Energy Conversion – I	Three (3) chances up to Summer - 2022	4ME02	Energy Conversion – I
8	4ME04	Manufacturing Process - II	(2) Summer- 2021 & Winter-2021	4ME03	Manufacturing Technology
9	4ME05	Machine Design & Drawing -I	(4) Chances up to Winter-2022	6ME01	Design of Machine Elements

(III) Electronics & Telecommunication Engineering :

Sr No	Old Course Subj. Code	Old Course Subject	Chances to be given, if any	Equivalent new Subj. code	Equivalent New Sub. after exhausting chances
1	3ET01	[**w.e.f. Winter – 2020]** Mathematics – III	(2) Winter-2020 & Summer- 2021	3ETC01	Mathematics – III
2	3ET02	Object Oriented Programming	(2) Winter-2020 & Summer- 2021	3ETC05	Object Oriented Programming
3	3ET03	Electronic Devices & Circuits	(2) Winter-2020 & Summer- 2021	3ETC02	Electronic Devices & Circuits
4	3ET04	Instrumentation & Sensors	(4) chances up to Summer- 2022	---	----
5	3ET05	Electromagnetic Fields	(2) Winter-2020 & Summer- 2021	3ETC04	Electromagnetic Waves
6	4ET01	**[w.e.f. Summer – 2021]** Signals & Systems	(2) Summer- 2021 & Winter-2021	4ETC04	Signals & Systems
7	4ET02	Network Analysis	(2) Summer- 2021 & Winter-2021	4ETC03	Network Theory
8	4ET03	Analog Electronics –I	(4) chances up to Summer- 2022	4ETC02	Analog Circuits
9	4ET04	Digital Electronics	(4) chances up to Summer – 2022	---	----
10	4ET05	Communication Engg. - I	(4) chances up to Summer - 2022	4ETC01	Analog & Digital Communication

(IV) Computer Science & Engineering / Computer Engineering :

Sr No	Old Course Subj. Code	Old Course Subject	Chances to be given, if any	Equivalent new Subj. code	Equivalent New Sub. after exhausting chances
1	3KS01/3KE01	[**w.e.f. Winter – 2020]** Mathematics – III	(2) Winter-2020 & Summer-2021	3KS01/3KE01	Mathematics – III
2	3KS02/3KE02	Programming Methodology	(2) Winter-2020 & Summer-2021	3KE03	Programming Methodology

3	3KS03/3KE03	Electronic Devices & Circuits	(2) Winter-2020 & Summer-2021	---	----
4	3KS04/3KE04	Discrete Structures	4 chances up to Summer-2022	3KS02	Discrete Structures & Graph Theory
5	3KS05/3KE05	Computer Organization	4 chances up to Summer-2022	4IT01	Computer Organization & Architecture
6	4KS01/4KE01	**[w.e.f. Summer – 2021]** Data Structures	(2) Summer-2021 & Winter-2021	3KS04	Data Structures
7	4KS02/4KE02	Analog & Digital ICs	(2) Summer-2021 & Winter-2021	3KS05	Analog & Digital Electronics
8	4KS03/4KE03	Object Oriented Programming	4 chances up to Winter - 2022	---	---
9	4KS04/4KE04	Assembly Language Programming	(2) Summer-2021 & Winter-2021	4KS04	Microprocessors & Assembly Language Programming
10	4KS05/4KE05	Theory of Computation	(2) Summer-2021 & Winter-2021	4KS05	Theory of Computation

(VI) Information Technology :

Sr No	Old Course Subj. Code	Old Course Subject	Chances to be given, if any	Equivalent new Subj. code	Equivalent New Sub. after exhausting chances
1	3IT01	[**w.e.f. Winter – 2020]** Mathematics – III	(2) Winter-2020 & Summer-2021	3IT01	Mathematics – III
2	3IT02	Programming Methodology	(2) Winter-2020 & Summer-2021	3IT03	Object Oriented Programming
3	3IT03	Discrete Structures	(2) Winter-2020 & Summer-2021	3IT02	Discrete Structures & Graph Theory
4	3IT04	Electronic Devices & Circuits	4 chances up to Summer-2022	---	----
5	3IT05	Assembly Language Programming	(2) Winter-2020 & Summer-2021	3IT04	Assembly Language Programming
6	4IT01	**[w.e.f. Summer – 2021]** Data Structures	(2) Summer-2021 & Winter-2021	4IT04	Data Structures
7	4IT02	Communication Engineering	4 chances up to Winter-2022	---	----
8	4IT03	Object Oriented Technology	4 chances up to Winter-2022	---	----
9	4IT04	Social Science & Engineering Economics	(2) Summer-2021 & Winter-2021	4IT05	Social Science & Engineering Economics
10	4IT05	Numerical Methods & Operation Research Technology	4 chances up to Winter-2022	---	----

(VII) Electrical (Electronics & Power) and Electrical & Electronics Engg. / Electrical Engineering :

Sr No	Old Course Subj. Code	Old Course Subject	Chances to be given, if any	Equivalent new Subj. code	Equivalent New Sub. after exhausting chances
1	3EP01/3EX01/ 3EL01/3EE01	[**w.e.f. Winter – 2020]** Mathematics – III	(2) Winter-2020 & Summer-2021	3EP01/3EX01/ 3EE01	Mathematics – III
2	3EP02/3EX02/ 3EL02/3EE02	Network Analysis	(2) Winter-2020 & Summer-2021	3EP02/3EX02/ 3EE02	Electrical Circuit Analysis
3	3EP03/3EX03/ 3EL03/3EE03	Energy Resources & Generation	(2) Winter-2020 & Summer-2021	3EP04/ 3EE04	Energy Resources & Generation
4	3EP04/3EX04/ 3EL04/3EE04	Electronic Devices & Circuits	(2) Winter-2020 & Summer-2021	3EP05/3EE05/ 3EX04	Electronic Devices & Circuits
5	3EP05/3EX05/ 3EL05/3EE05	Electrical Measurements & Instrumentation	(2) Winter-2020 & Summer-2021	4EP02/4EX02/ 4EE02	Electrical Measurements & Instrumentation
6	4EP01/4EX01/ 4EL01/4EE01	**[w.e.f. Summer – 2021]** Electrical Machines – I	(2) Summer-2021 & Winter-2021	3EP03/3EX03/ 3EE03	Electrical Machines – I
7	4EP02/4EX02/ 4EL02/4EE02	Electromagnetic Theory	(2) Summer-2021 & Winter-2021	4EP01/4EX01/ 4EE01	Electromagnetic Fields
8	4EP03/4EX03/ 4EL03/4EE03	Analog & Digital Circuits	(2) Summer-2021 & Winter-2021	4EP05/4EX04/ 4EE04	Analog & Digital Circuits

9	4EP04/4EL04/ 4EE04	Mathematics – IV	4 chances up to Winter-2022	---	----
10	4EP05/4EX05/ 4EL05/4EE05	Numerical Methods & Computer Programming	4 chances up to Winter-2022	4EP04	Numerical Methods & Optimization Techniques
11	4EX03	Linear Integrated Circuits	4 chances up to Winter-2022	---	----
12	4EX04	Signals & Systems	(2) Summer-2021 & Winter-2021	4EX05/ 4EE05	Signals & Systems

(X) Chemical Engineering :

Sr No	Old Course Subj. Code	Old Course Subject	Chances to be given, if any	Equivalent new Subj. code	Equivalent New Sub. after exhausting chances
1	3CH01	[**w.e.f. Winter – 2020]** Applied Mathematics – III	(2) Winter-2020 & Summer-2021	3CH01	Applied Mathematics – III
2	3CH02	Process Instrumentation	(2) Winter-2020 & Summer-2021	3CH02	Process Instrumentation
3	3CH03	Strength of Materials	(2) Winter-2020 & Summer-2021	3CH03	Strength of Materials
4	3CH04	Chemical Engg. Thermodynamics – I	4 chances up to Summer-2022	3CH04	Chemical Engg. Thermodynamics – I
5	3CH05	Process Calculation	(2) Winter-2020 & Summer-2021	3CH05	Process Calculation
6	4CH01	**[w.e.f. Summer – 2021]** Fluid Flow Operations	4 chances up to Winter-2022	4CH03	Fluid Flow Operations
7	4CH02	Chemical Engg. Thermodynamics – II	(2) Summer-2021 & Winter-2021	4CH04	Chemical Engg. Thermodynamics – II
8	4CH03	Machine Design & Drawing	(2) Summer-2021 & Winter-2021	4CH02	Machine Design & Drawing
9	4CH04	Applied Physical Chemistry	(2) Summer-2021 & Winter-2021	4CH01	Applied Physical Chemistry
10	4CH05	Chemical Engg. Operation – I (Mechanical)	(2) Summer-2021 & Winter-2021	4CH05	Chemical Engg. Operation – I (Mechanical)

(XI) Chemical Technology (Food, Pulp &Paper, Oil & Paint and Petrochemical Technology) :

Sr No	Old Course Subj. Code	Old Course Subject	Chances to be given, if any	Equivalent new Subj. code	Equivalent New Sub. after exhausting chances
1	3CT01	[**w.e.f. Winter – 2020]** Applied Organic Chemistry	(2) Winter-2020 & Summer-2021	3CT01	Applied Organic Chemistry
2	3CT02	Applied Physical Chemistry - II	(2) Winter-2020 & Summer-2021	3CT02	Applied Physical Chemistry - II
3	3CT03	Strength of Materials	(2) Winter-2020 & Summer-2021	3CT03	Strength of Materials
4	3CT04	Applied Thermodynamics	4 chances up to Summer-2022	3CT04	Applied Thermodynamics
5	3CT05	Process Calculations	(2) Winter-2020 & Summer-2021	3CT05	Process Calculations
6	4CT01	**[w.e.f. Summer – 2021]** Engg. Mathematics – II	(2) Summer-2021 & Winter-2021	4CT01	Engg. Mathematics – II
7	4FT02	Food Technology -I	(2) Summer-2021 & Winter-2021	4FT02	Food Technology -I
	4PT02	Pulp & paper Technology -I	(2) Summer-2021 & Winter-2021	4PT02	Pulp & paper Technology -I
	4OT02	Oil & Paint Technology -I	(2) Summer-2021 & Winter-2021	4OT02	Oil & Paint Technology -I
	4PC02	Petrochemical Tech. -I	(2) Summer-2021 & Winter-2021	4PC02	Petrochemical Tech. -I
8	4CT03	Machine Design & Drawing	4 chances up to Winter-2022	4CT03	Machine Design & Drawing
9	4CT04	Material Technology	(2) Summer-2021 & Winter-2021	4CT04	Material Science & Engg.
10	4CT05	Fluid Flow Operations	(2) Summer-2021 & Winter-2021	4CT05	Fluid Flow Operations

(IX) Textile Engineering :

Sr No	Old Course Subj. Code	Old Course Subject	Chances to be given, if any	Equivalent new Subj. code	Equivalent New Sub. after exhausting chances
1	3TX01	[**w.e.f. Winter – 2020]** Yarn Manufacturing – I	(2) Winter-2020 & Summer- 2021	3TX02	Yarn Manufacturing – I
2	3TX02	Fabric Manufacturing – I	(2) Winter-2020 & Summer- 2021	3TX03	Fabric Manufacturing – I
3	3TX03	Textile Fibre – I	(2) Winter-2020 & Summer- 2021	3TX01	Textile Fibre – I
4	3TX04	Machine Drawing	(4) chances up to Summer- 2022	----	-------
5	3TX05	Thermal Science & Air Conditioning	(2) Winter-2020 & Summer- 2021	3TX05	Thermal Science & Air Conditioning
6	4TX01	**[w.e.f. Summer – 2021]** Yarn Manufacturing – II	(2) Summer- 2021 & Winter-2021	4TX02	Yarn Manufacturing -II
7	4TX02	Fabric Manufacturing – II	(2) Summer- 2021 & Winter-2021	4TX03	Fabric Manufacturing – II
8	4TX03	Applied Electronics & Control Systems	(4) chances up to Winter – 2022	7TX04	Applied Electronics & Control Systems
9	4TX04	Textile Fibre – II	(2) Summer- 2021 & Winter-2021	4TX01	Textile Fibre – II
10	4TX05	Garment Manufacturing Technology	(2) Summer- 2021 & Winter-2021	4TX05	Garment Manufacturing Technology

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NOTIFICATION

No.92 /2020 Date : 26/10/2020

Subject : Equivalence & Absorption Schemes /Chances for Old Course failure students of B.Tech. (Chem. Tech.) Sem. I & II in the Faculty of Science & Technology …

It is notified for general information of all concerned that the authorities of the University have accepted the Equivalence & Absorption Schemes / Chances for Old Course failures of B.Tech. (Chem Tech.) Sem. I & II (Food, Pulp & Paper, Oil & Paint and Petrochemical Tech.) in the Faculty of Science & Technology to be implemented from the academic session 2020-21 & onwards as per "**Appendix – A**" as given below:

Sd/-
(Dr.T.R.Deshmukh)
Registrar

"**Appendix – A**"

(A) SCHEMES OF EQUIVALENCE & ABSORPTION / CHANCES FOR B.TECH. (CHEM.TECH.) SEM.I & II

[W.E.F. SUMMER – 2021]

Sr No	Old Course Subj. Code	Old Course Subject	Chances to be given, if any	Equivalent new Subj. code	Equivalent New Subject after exhausting chances
1	1SCT1	**B.E. Semester I / II (Gp A)** Engineering Maths - I	(2) Summer- 2021 & Winter-2021	----	-----
2	1SCT2	Engineering Physics	(2) Summer- 2021 & Winter-2021	----	-----
3	1SCT3	Engineering Mechanics	(2) Summer- 2021 & Winter-2021	----	-----
4	1SCT4	Engineering Drawing	(2) Summer- 2021 & Winter-2021	----	-----
5	2SCT1	**B.E. Semester I / II (Gp B)** Engineering Maths - II	(2) Summer- 2021 & Winter-2021	----	-----
6	2SCT2	Engineering Chemistry	(2) Summer- 2021 & Winter-2021	----	-----
7	2SCT3	Computer Programming	(2) Summer- 2021 & Winter-2021	----	-----
8	2SCT4	Electrical Engineering	(2) Summer- 2021 & Winter-2021	----	-----