INSTRUMENT TECHNOLOGY

Group B

SCHEME AND SYLLABI : (With effect from 2022-23 admitted batch)

B.Tech & B.Tech + M.Tech

I Year - I Semester

Course code	Category	Course Title	Hours per week L	T	Internal Marks	External Marks	Total Marks	Credits
1101	BS	Maths – I	4	0	30	70	100	3
1102	BS	Physics	4	0	30	70	100	3
1103	ES	Engg .Graphics	2	3	30	70	100	3
1104	ES	Electronic Devices & Circuits	4	0	30	70	100	3
1105	ES	Material Science	4	0	30	70	100	3
1106	ES	Workshop	0	3	50	50	100	1.5
1107	BS	Physics Lab	0	3	50	50	100	1.5
1108	ES	Electronic Devices & Circuits Lab	0	3	50	50	100	1.5
		Total Credits						19.5

I Year - II Semester

1201	BS	Maths – II	4	0	30	70	100	3
1202	BS	Green Chemistry	4	0	30	70	100	3
1203	HSS	English	4	0	30	70	100	3
1204	ES	CPNM	4	0	30	70	100	3
1205	ES	Industry 4.0	4	0	30	70	100	3
1206	HSS	English Language Lab	0	3	50	50	100	1.5
1207	BS	Green Chemistry Lab	0	3	50	50	100	1.5
1208	ES	CPNM Lab	0	3	50	50	100	1.5
		Total Credits						19.5

II Year - I Semester

2101	BS	Maths III	4	0	30	70	100	3
2102	PC	Analog Electronic Circuits	4	0	30	70	100	3
2103	PC	Electrical Machines	4	0	30	70	100	3
2104	PC	Sensors & Transducers	4	0	30	70	100	3
2105	HSS	Managerial Economics	4	0	30	70	100	3
2106	PC	Analog electronic circuits LAB	0	3	50	50	100	1.5
2107	PC	Transducers LAB	0	3	50	50	100	1.5
2108	PC	Electrical machines LAB	0	3	50	50	100	1.5
2109	SC	Object Oriented Programming through C++	1	2	50	50	100	2
2110	MC	Professional Ethics & Universal Human values	0	0	-	100	100	0

2111	MC	NCC/NSS	0	2	-	-	-	0
		Total Credits						21.5

II Year - II Semester

2201	BS	Maths IV	4	0	30	70	100	3
2202	PC	Electrical Measurements and Measuring Instruments	4	0	30	70	100	3
2203	PC	Signals and Systems	4	0	30	70	100	3
2204	PC	Linear & Digital IC Applications	4	0	30	70	100	3
2205	PC	Python Programming	4	0	30	70	100	3
2206	PC	DLD lab	0	3	50	50	100	1.5
2207	PC	Electrical measurements lab	0	3	50	50	100	1.5
2208	SC	Python Programming lab	1	2	50	50	100	2
2209	MC	Environmental Sciences	0	0	-	100	100	0
		Total Credits						20

Summer Internship(Community Service)

IN-1101 : MATHEMATICS-I

Course Objectives:

* To transmit the knowledge of Partial differentiation.

* To know of getting maxima and minima of function of two variables and finding errors and approximations.

* To evaluate double and triple integrals, volumes of solids and area of curved surfaces.

* To expand a periodical function as Fourier series and half-range Fourier series.

Course Outcomes:

* Find the partial derivatives of functions of two or more variables.

* Evaluate maxima and minima, errors and approximations.

* Evaluate double and triple integrals, volumes of solids and area of curved surfaces.

* To expand a periodical function as Fourier series and half-range Fourier series.

* Have a fundamental understanding of Fourier series and be able to give Fourier expansions of a given function.

SYLLABUS

(Partial Differentiation) : Introduction - Functions of two or more variables - Partial derivatives - Homogeneous functions – Euler's theorem - Total derivative - Change of variables – Jacobins. Mean value Theorems (without proofs) (Applications of Partial Differentiation) : Geometrical interpretation -Tangent plane and Normal to a surface -Taylor's theorem for functions of two variables - Errors and approximations -Total differential. Maxima and Minima of functions of two variables - Lagrange's method of undetermined multipliers - Differentiation under the integral Sign - Leibnitz's rule.

(Multiple Integrals) : Introduction - Double Integrals - Change of Order of Integration - Double Integrals in Polar Coordinates - Triple Integrals - Change of Variables.

(Multiple Integrals-Applications) : Area enclosed by plane curves - Volumes of solids - Area of a curved surface - Calculation of Mass - Center of gravity - Moment of inertia - product of inertia – principal axes- Beta Function - Gamma Function - Relation between Beta and Gamma Functions. Error Function or Probability Integral.

(Fourier Series) : Introduction - Euler's Formulae - Conditions for a Fourier Expansion - Functions having points of discontinuity - Change of Interval - Odd and Even Functions - Expansions of Odd or Even Periodic Functions, Half-Range Series - Parseval's Formula. Practical Harmonic analysis.

TEXT BOOK:

Scope and Treatment as in "Higher Engineering Mathematics", by Dr. B.S. Grewal, 43rd Edition, Khanna publishers.

REFERENCE BOOKS:

1. Graduate Engineering Mathematics by V B Kumar Vatti., I.K.International publishing house Pvt. Ltd.

2. Advanced Engineering Mathematics by Erwin Kreyszig.

3. A text book of Engineering Mathematics, by N.P. Bali and Dr. Manish Goyal, Lakshmi Publications.

4. Advanced Engineering Mathematics by H.K. Dass. S. Chand Company.

5. Higher Engineering Mathematics by B.V. Ramana, Tata Mc Graw Hill Company.

6. Higher Engineering Mathematics by Dr. M.K.Venkataraman.

IN-1102 : PHYSICS

Course Objectives:

* To impart knowledge in basic concept of physics of Thermodynamics relevant to engineering applications.

* To grasp the concepts of physics for electromagnetism and its application to engineering. Learn production of Ultrasonics and their applications in engineering.

* To Develop understanding of interference, diffraction and polarization: connect it to a few engineering applications.

* To Learn basics of lasers and optical fibers and their use in some applications.

* To Understand concepts and principles in quantum mechanics and Nanopahse Materials. Relate them to some applications.

Course Outcomes:

* Understand the fundamentals of Thermodynamics and Laws of thermodynamics. Understand the working of Carnot cycle and concept of entropy.

* Gain Knowledge on the basic concepts of electric and magnetic fields. Understand the concept of the nature of magnetic materials. Gain knowledge on electromagnetic induction and its applications .

* Understand the Theory of Superposition of waves. Understand the formation of Newton's rings and the working of Michelson's interferometer. Remember the basics of diffraction, Evaluate the path difference. Analysis of Fraunhofer Diffraction due to a single slit

* Understand the interaction of matter with radiation, Characteristics of Lasers, Principle, working schemes of Laser and Principle of Optical Fiber. Realize their role in optical fiber communication.

* Understand the intuitive ideas of the Quantum physics and understand dual nature of matter. Compute Eigen values, Eigen functions, momentum of Atomic and subatomic particles using Time independent one Dimensional Schrodinger's wave equation. Understand the fundamentals and synthesis processes of Nanophase materials.

SYLLABUS

THERMODYNAMICS

Introduction, Heat and Work, First law of thermodynamics and applications, Reversible and Irreversible process, Carnot cycle and Efficiency, Second law of thermodynamics, Carnot's Theorem, Entropy, Second law in terms of entropy, Entropy and disorder, Third law of thermodynamics (statement only).

ELECTROMAGNETISM

Concept of electric flux, Gauss's law - some applications, Magnetic field - Magnetic force on current, torque on current loop, The Biot-Savart's Law, B near a long wire, B for a circular Current loop, Ampere's law, B for a solenoid, Hall effect, Faraday's law of induction, Lenz's law, Induced magnetic fields, Displacement current, Maxwell's equations (no derivation), Magnetic materials: Classification of magnetic materials and properties.

Ultrasonics : Introduction, Production of Ultrasonics – Piezoelectric and Magnetostriction methods, acoustic grating, applications of ultrasonics.

OPTICS

Interference: Principles of superposition – Young's Experiment – Coherence - Interference in thin films (reflected light), Newton's Rings, Michelson Interferometer and its applications.

Diffraction: Introduction, Differences between interference and diffraction, Fresnel and Fraunhofer diffraction, Fraunhofer diffraction at a single slit (Qualitative and quantitative treatment).

Polarisation: Polarisation by reflection, refraction and double refraction in uniaxial crystals, Nicol prism, Quarter and Half wave plate, circular and elliptical polarization.

LASERS and FIBRE OPTICS

Introduction, characteristics of a laser beam, spontaneous and stimulated emission of radiation, population inversion, Ruby laser, He-Ne laser, Semiconductor laser, applications of lasers

Introduction to optical fibers, principle of propagation of light in optical fibers, Acceptance Angle and cone of a fibre, Numerical aperture, Modes of propagations, classification of fibers, Fibre optics in communications, Application of optical fibers.

MODERN PHYSICS

Introduction, De Broglie concept of matter waves, Heisenberg uncertainty principle, Schrodinger time independent wave equation, application to a particle in a box. Free electron theory of metals, Kronig - Penney model (qualitative treatment), Origin of energy band formation in solids, Classification of materials into conductors, semi conductors and insulators.

Nanophase Materials

Introduction, properties, Top-down and bottom up approaches, Synthesis - Ball milling, Chemical vapour deposition method , sol-gel methods, Applications of nano materials.

TEXT BOOKS :

1. Physics by David Halliday and Robert Resnick – Part I and Part II - Wiley.

2. A textbook of Engineering Physics, Dr. M. N. Avadhanulu, Dr. P.G. Kshirsagar - S. Chand

3. Engineering Physics by R.K. Gaur and S.L. Gupta –Dhanpat Rai

Reference Books:

1. Modern Engineering Physics by A.S. Vadudeva

2. University Physics by Young and Freedman

IN-1103 : ENGINEERING GRAPHICS

Course Objectives:

* Understand the basics of Engineering Graphics and BIS conventions.

* Develop the graphical skills for communication of concepts, ideas and design of engineering products through technical drawings

* Demonstrate and practice the various profiles/curves used in engineering practice through standard procedures.

* Demonstrate and practice the orthographic projections of points, lines, planes, solids and section of solids

* Demonstrate and practice the development of surfaces of simple solids

* Familiarize the basic concept of isometric views clearly.

Course Outcomes:

* Develop simple engineering drawings by considering BIS standards.

* Able to draw different engineering curves with standard Procedures

* Comprehend the basics of orthographic projections and deduce orthographic projections of points, lines, planes and solids at different orientations in real life environment.

* Visualize clearly the sections of solids.

* Apply the concepts of development of surfaces while designing/analyzing any product.

* Recognize the significance of isometric drawing to relate 2D environment with 3D environment.

SYLLABUS

Introduction: Lines, Lettering and Dimensioning, Geometrical Constructions, and Scales.

Curves: Conic sections: General construction of ellipse, parabola and hyperbola. Construction of involutes of circle and polygons only. Normal and tangent to curves.

Projections of Points: Principal or Reference Planes, Projections of a point situated in any one of the four quadrants.

Projections of Straight Lines: Projections of straight lines parallel to both reference planes, perpendicular to one reference plane and parallel to other reference plane, inclined to one reference plane and parallel to the other reference plane.

Projections of Straight Line Inclined to Both the Reference Planes: Projections of Planes: Projection of Perpendicular planes: Perpendicular to both reference planes, perpendicular to one reference plane and parallel to other reference plane and perpendicular to one reference plane and inclined to other reference plane. Projection of Oblique planes. Introduction to Auxiliary Planes.

Projections of Solids: Types of solids: Polyhedra and Solids of revolution. Projections of solids in simple positions: Axis perpendicular to horizontal plane, Axis perpendicular to vertical plane and Axis parallel to both the reference planes, Projection of Solids with axis inclined to one reference plane and parallel to other and axes inclined to both the reference planes.

Sections of Solids: Perpendicular and inclined section planes, Sectional views and True shape of section, Sections of solids (Prism, Pyramid, Cylinder and Cone) in simple position only.

Development of Surfaces: Methods of Development: Parallel line development and radial line development. Development of a cube, prism, cylinder, pyramid and cone.

Isometric Views: Isometric projection, Isometric scale and Isometric view. Isometric view of Prisms, Pyramids, cylinder, cone, and their combinations.

Text Book:

Elementary Engineering Drawing by N.D.Bhatt, Charotar Publishing House.

Reference:

Engineering Graphics by K.L. Narayana and P. Kannaiah, Tata Mc-Graw Hill

IN 1104 : ELECTRONIC DEVICES AND CIRCUITS

Course Objectives:

* This course gives an overview of carrier transport phenomena in semiconductors, characteristics and applications of semiconductor devices like P-N junction diode,

* Bipolar Junction transistor (BJT), Field Effect Transistors (FET), Metal oxide Semiconductor Field Effect Transistor (MOSFET) and various special devices.

* Emphasis is placed on analysis, selection and proper biasing of transistors like BJT and FET.

Course Outcomes:

* At the end of the course, the student will be able to Remember the transport phenomena of charge carriers in semiconductors.

* Understand the operation of Diode, BJT and FET.

* Apply different types of filters in AC and DC conversion.

* Analyze the different types of diodes, operation and its characteristics.

* Evaluate the different biasing techniques used in BJT and FET.

SYLLABUS

Semiconductor Physics: Energy band theory of crystals, conductors, insulators, semiconductors, mobility and conductivity, energy distribution of electrons, electrons and holes in a Intrinsic semiconductors, conductivity of semiconductor, carrier concentration in Intrinsic semiconductors, donor and acceptor impurities, mass action law, charge densities in a semiconductor with impurities, Fermi level in semiconductor with impurities, diffusion, carrier life time, continuity equation, hall effect.

Semiconductor Diode Characteristics: Qualitative theory of p-n junction, p-n junction as a diode, band structure of an open circuited p-n junction, current components in a diode, qualitative theory of diode currents, Volt-Ampere characteristics , temperature dependence of a diode characteristics, diode resistance, diode capacitance, transition and diffusion capacitances.

Rectifiers: Half wave rectifier, Full wave rectifier with center tap transformer and Bridge circuit –Derivation of DC, RMS currents and voltages, Ripple factor, Efficiency, Peak inverse voltage , Transformer utilization factor and percentage regulation. Rectifiers using filters: Inductive filter, capacitive filter, L-section filter, Pi filter.

Bipolar Junction Transistor (BJT) : Introduction to three terminal devices, BJT construction, types and different regions of operations, Transistor as an amplifier. Transistor current components-Emitter efficiency, Transport factor, Large Signal current gain, input and output characteristics of transistor in common base, common emitter and common collector configurations, relation between alpha, beta and gamma, base width modulation, Ebers-Moll Model.

Field Effect Transistors (FET): Comparison between FET and BJT, Classification of FET, Construction, operation, Drain and Transfer characterstics of JFET and MOSFET.

TEXT BOOKS

1. Jacob Milliman Christos C Halkias, “Electriionic Devices and Circuits,” Tata Mcgraw Hill Publishers, New Delhi.

2. Bes Streetman and Sanjay Banerjee,” Solid State Electronic Devices,” Prentice Hall

IN-1105 : MATERIAL SCIENCE

Course Objectives:

* An introduction to the mechanical properties of metals and physical properties is explained.

* Gives the beginning student an appreciation of recent developments in materials science & engineering within the framework of this class. To review physics and chemistry in the context of materials science & engineering. To describe the different types of bonding in solids.

* The meaning of phases, and the different types of phase transformations. How to interpret a binary phase diagram, especially the compositions and fractions of equilibrium phases according to the lever rule.

* The meaning and use of time-temperature-transformation diagrams. The crystal structures for common metals and semiconductors. To give knowledge about semiconductor physics, charge carriers and energy band diagrams. It discusses working and applications of basic devices, including p-n junctions.

* Magnetic Materials and Dielectric materials, their applications which discusses the principles and concepts behind magnetic materials and dielectric materials. It explains their applications in the fields of physics and engineering.

* The powder metallurgy process provides a host of advantages over competing metalworking technologies.

Course Outcomes:

* An ability to apply knowledge of mathematics, science and engineering, to understand different materials and their properties.

* Given a type of material, be able to qualitatively describe the bonding scheme and its general physical properties, strength as well as possible applications.

* Given a binary phase diagram microstructures obtained by suitable thermal treatments. An ability to identify the phases and their interrelationship in different alloy systems.

* An ability to design a system, component or process to meet desired needs within, realistic constraints such as economic, safety, manufacturability and sustainability etc.., while selecting a material to manufacture the designed components.

* Powder metallurgy processes add up to part-to-part uniformity for improved product quality, shape and material flexibility, application versatility, and cost effectiveness, types and manufacturing of composite materials. An ability to use modern techniques, skills, and engineering tools appropriate to materials research and engineering.

SYLLABUS

MECHANICAL PROPERTIES: Definitions of mechanical properties, Tensile Testing, Impact Testing, Hardness Tests- Brinell, Vickers and Rockwell tests, Plastic deformation.

EQUILIBRIUM DIAGRAMS: Phase rule-binary Alloy systems-Solid Solutions-Eutectic-Peritectic-Meritect-Entectoid systems-The Lever Rule, IRON-CARBON Diagram.

MAGNETIC MATERIALS : Types of magnetic materials, Ferromagnetism and related Phenomena- Domain structure-Hysteresis Loop- Soft and Hard magnetic materials.

DIELECTRIC MATERIALS : Dielectric materials, Polarization, Types of Polarization, Temperature and Frequency effects on polarization, Dielectric loss, Dielectric Breakdown- Ferro Electric materials.

SEMICONDUCTORS: Intrinsic and Extrinsic semiconductors-different types of extrinsic semi conducting ma-Energy band diagrams- Fermi energy level and P-N junction diode, Homojunction and Heterojunction

POWDER METALLURGY: Steps in Powder Metallurgy Processes- Powder production, Compaction, Sintering, & Secondary operations

TEXTBOOKS:

1. Material Science and Engineering by V.Raghavan-prentice Hall of India, New Delhi.

2. Testing of Metallic Materials by A.V.K.SuryaNarayana, Prentice Hall of India.

REFERENCE BOOKS:

1. Introduction to Material science for Engineers by J.F.Shackelford, Macmillan publishing Co., New York

2. Semiconductor and Electronic devices, Adir Bar-Lev, Prentice Hall of India, New Delhi.

3. Practical Experimental Metallurgy by D.Eurof Davies, Elsevier Publishing Co. Ltd. London

IN-1106 : WORKSHOP LAB

Course Objectives:

* Get hands on experience with the working skills in Carpentry trade.
* Know how to work with Sheet Metal tools.
* Get familiar with the working skills of Metal Fitting operations.
* Get hands on experience with house hold electrical wiring.

Course Outcomes:

* Can be able to work with Wood Materials in real time applications.
* Can be able to build various parts with Sheet Metal in day-to-day life.
* Can be able to apply Metal Fitting skills in various applications.
* Can be able to apply this knowledge to basic house electrical wiring and repairs.

SYLLABUS

Carpentry: Any three jobs from – Half lap joint, Mortise and Tenon joint, Half – lap Dovetail joint, Corner Dovetail joint, Central Bridle joint.

Sheet Metal: Any three jobs from – Square tray, Taper tray(sides), Funnel, Elbow pipe joint.

Fitting: Any three jobs from – Square, Hexagon, Rectangular fit, Circular fit and Triangular fit.

House wiring: Any three jobs from – Tube light wiring, Ceiling fan wiring, Stair-case wiring, Corridor wiring.

References:

1. Elements of workshop technology, Vol.1 by S. K. and H. K. Choudary.
2. Work shop Manual / P.Kannaiah/ K.L.Narayana/ SciTech Publishers.
3. Engineering Practices Lab Manual, Jeyapoovan, Saravana Pandian, 4/e Vikas.

IN-1107 : PHYSICS LAB

Course Objectives:

* To enable the students to acquire skill, technique and utilization of the Instruments
* Draw the relevance between the theoretical knowledge and to imply it in a practical manner with respect to analyze various electronic circuits and its components.
* To impart the practical knowledge in basic concepts of Wave optics, Lasers and Fiber optics.
* To familiarize the handling of basic physical apparatus like Vernier callipers, screw gauge, spectrometers, travelling microscope, laser device, optical fibre, etc.

Course Outcomes:

* Ability to design and conduct experiments as well as to analyze and interpret
* Ability to apply experimental skills to determine the physical quantities related to Heat, Electromagnetism and Optics
* The student will learn to draw the relevance between theoretical knowledge and the means to imply it in a practical manner by performing various relative experiments.

SYLLABUS

1. Determination of Radius of Curvature of a given Convex Lens By forming Newton's Rings.

2. Determination of Wavelength of Spectral Lines in the Mercury Spectrum by Normal Incidence method.

3. Study the Intensity Variation of the Magnetic Field along axis of Current Carrying Circular Coil.

4. Determination of Cauchy's Constants of a Given Material of the Prism using Spectrometer.

5. Determination of Refractive Index of Ordinary ray m--- and Extraordinary m---$_e$ ray. $_o$

6. Determination of Thickness Given Paper Strip by Wedge Method.

7. Calibration of Low Range Voltmeter.

8. Calibration of Low Range Ammeter.

9. Determination of Magnetic Moment and Horizontal Component of Earth's Magnetic Field.

10. Lees Method - Coefficient of thermal Conductivity of a Bad Conductor.

11. Carey Foster's Bridge – Verification of laws of Resistance and Determination Of Specific Resistance.

12. Melde's Apparatus – Frequency of electrically maintained Tuning Fork.

13. Photoelectric cell-Characteristics.

14. Planks Constants.

15. Laser- Diffraction.

IN-1108 : Electronic Devices and Circuits Laboratory

Course Objective:

* The course gives an overview of basic lab equipments like CRO, Function generators, calculation of basic semiconductor device parameters from their VI characteristics and application of P-N junction diodes in rectifier circuits.

Course Outcomes:

* At the end of the curse, the student will be able to

* Understand the operation of regulated power supplies, Function generators and CRO.

* Analyze the characteristics of different electronic devices such as diodes and transistors.

* Design the rectifier circuits.

Lab Experiments

1. Study of functionality of basic devices and lab equipment.
2. Measurement of signal characteristics using CRO.
3. P-N Junction diode Volt- Ampere characteristics
4. Zener diode Volt – Ampere characteristics
5. Half wave rectifier with out filters
6. Half wave rectifier with capacitor and inductor filters
7. Full wave rectifier with out filters
8. Full wave rectifier with capacitor and inductor filters
9. Bridge rectifier with out and with filters.
10. Transistor characteristics under CB configuration
11. Transistor characteristics under CE configuration
12. Transistor characteristics under CC configuration
13. Drain and Transfer characteristics of Field effect Transistor
14. Study of Low pass filter
15. Study of high pass filter

IN-1201 : Mathematics – II

Course Objectives:

* The way of obtaining rank, eigen values and eigen vectors of a matrix.

* To know the importance of Cayley-Hamilton theorem and getting canonical form from a given quadratic form.

* To solve the system of equations by using direct and indirect methods.

* To solve first order and higher order differential equations by various methods.

* To obtain the Laplace transforms and inverse Laplace transforms for a given functions and their applications.

Course Outcomes:

* Find rank, eigen values and eigen vectors of a matrix and understand the importance of Cayley-Hamilton theorem.

* Reduce quadratic form to canonical forms and solving linear systems by direct and indirect methods.

* Demonstrate solutions to first order differential equations by various methods and solve basic applications problems related to electrical circuits, orthogonal trajectories and Newton's law of cooling

* Discriminate among the structure and procedure of solving higher order differential equations with constant and variable coefficients.

* Understand Laplace transforms and its properties and finding the solution of ordinary differential equations.

SYLLABUS

(Linear Algebra) : Rank of a matrix- Echelon form, Normal Form - Solution of Linear System of Equations - Consistency of Linear System of Equations - Direct & Indirect Methods: Gauss elimination method, LU Factorization method, Gauss Seidal Method. Complex Matrices: Hermitian, Skew-Hermitian and Unitary Matrices and their Properties.

(Eigen Values and Eigen Vectors) : Eigen Values and Eigen Vectors of a Matrix - Cayley-Hamilton theorem - Inverse and Powers of a Matrix using Cayley-Hamilton's theorem and its applications. Diagonalization of a Matrix - Quadratic Forms - Reduction of Quadratic Form to Canonical Form - Nature of a Quadratic Form.

(Ordinary Differential Equations of First Order and its Applications) : Formation of ordinary differential equations (ODEs) - Solution of an ordinary differential equation - Equations of the first order and first degree - Linear differential equation - Bernoulli's equation - Exact differential equations - Equations reducible to exact equations - Orthogonal Trajectories - Simple Electric (LR & CR) Circuits - Newton's Law of Cooling - Law of Natural growth and decay.

(Differential Equations of Higher Order) : Solutions of Linear Ordinary Differential Equations with Constant Coefficients - Rules for finding the complimentary function - Rules for finding the particular integral - Method of variation of parameters - Cauchy's linear equation - Legendre's linear equation - Simultaneous linear differential equations.

(Laplace Transforms) : Introduction - Existence Conditions - Transforms of Elementary Functions - Properties of Laplace Transforms - Transforms of Derivatives - Transforms of Integrals - Multiplication by t^n - Division by t – Evaluation of integrals by Laplace Transforms - Inverse Laplace Transform - Applications of Laplace Transforms to Ordinary Differential Equations - Simultaneous Linear Differential Equations with Constant Coefficients - Second Shifting Theorem - Laplace Transforms of Unit Step Function, Unit Impulse Function and Laplace Transforms of Periodic Functions.

TEXT BOOK:

Scope and Treatment as in "Higher Engineering Mathematics", by Dr. B.S. Grewal, 43r^d edition, Khanna publishers.

REFERENCE BOOKS:

7. Graduate Engineering Mathematics by V B Kumar Vatti., I.K. International publishing house Pvt. Ltd.

1. Advanced Engineering Mathematics by Erwin Kreyszig.

2. A text book of Engineering Mathematics, by N.P. Bali and Dr. Manish Goyal. Lakshmi Publications.

3. Advanced Engineering Mathematics by H.K. Dass. S. Chand Company.

4. Higher Engineering Mathematics by B.V. Ramana, Tata Mc Graw Hill Company.

IN1202 : GREEN CHEMISTRY SYLLABUS

Course Objectives:

CO 1:To apply the basic knowledge of Chemistry to the Engineering Discipline.
CO 2:To develop knowledge about water and its treatment for industrial and potable purposes.
CO 3:To develop understanding in the areas of Batteries, Fuels Mechanism of Corrosion of Metals and Corrosion Control Methods, Green Chemistry andTechnology and Processes involving Green Chemistry and apply the knowledge for solving existing challenges faced in various engineering and societal areas.

Learning outcome:

LO 1: The students are able to apply the basic concepts and principles studied in Chemistry to the field of Engineering.
LO 2: The students are able to apply chemistry to different branches of engineering
LO 3: The students are able to acquire the knowledge in the areas of Water Chemistry, Mechanism of Corrosion of Metals and Corrosion Control Methods, Batteries, Fuel Cells, Green Chemistry and Technology and Processes involving Green Chemistry and suggest innovative solutions for existing challenges in these areas.

Unit 1: Water Technology : Sources of Water – Impurities and their influence of living systems – WHO Limits – Hardness and its Determination – Boiler Troubles and their removal – Water Softening Methods – Lime-Soda, Zeolite and Ion Exchange - Municipal Water Treatment-Break Point Chlorination – Desalination of Sea Water – Reverse Osmosis Method, Electro-dialysis.

Unit 2: Batteries : Primary batteries: The chemistry - Types: Zinc-carbon (Leclanche type), zinc alkaline (Duracell), zinc/air batteries; Lithium primary cells – liquid cathode, solid cathode and lithium-ferrous sulphide cells. Secondary batteries: Lead acid and VRLA (valve regulated (sealed) lead acid), nickel-cadmium, nickel-zinc, nickel-metal hydride batteries, lithium ion batteries, ultrathin lithium polymer cells. Advanced Batteries for electric vehicles, requirements of the battery – sodium-beta and redox batteries.

Unit 3: Fuel Cells : Fuel Cells: Description, working principle, anodic, cathodic and cell reactions, fabrication of electrodes and other components, applications, advantages, disadvantages and environmental aspects of the following types of fuel cells: Proton Exchange Membrane Fuel Cells, alkaline fuel cells, phosphoric acid, solid oxide, molten carbonate, direct methanol fuel cells- Membranes and Fuels

Unit 4: Corrosion : Corrosion: Origin and Theory – Types of Corrosion: Chemical and Electrochemical; Pitting, Inter granular, Waterline, Stress – Galvanic Series – Factors Effecting Corrosion. Corrosion Controlling Methods, Protective Coatings, Metallic Coatings, Electroplating and Electroless Plating.

Unit 5: Green Chemistry and Technology : Introduction and significance of green chemistry, Goals of green chemistry, 12 principles of green chemistry, toxicity of chemicals, material safety data sheet (MSDS), concept of zero pollution technologies, atom economy, functional toxicity vs non-functional toxicity, functional group approaches to green chemistry, Elimination of toxic functional group, optimization of frameworks for the design of greener synthetic pathways, Applications of green chemistry - Green solvents, green fuels and propellants, biocatalysis.

Text Books

1. Engineering Chemistry – PC Jain and M. Jain – Dhanpath Rai and Sons, New Delhi.

2. A Text book of Engineering Chemistry – S. S. Dara – S. Chand & Co. New Delhi.

3. Hand Book of Green Chemistry and Technology; by James Clarke and Duncan Macquarrie; Blakwell Publishing.

IN-1203 : ENGLISH

Course Objectives:

* To make students understand the explicit and implicit meanings of a text/topic;

* To give exposure to new words and phrases, and aid to use them in different contexts;

* To apply relevant writing formats to draft essays, letters, emails and presentations; and

* To adapt oneself to a given situation and develop a functional approach to finding solutions: adaptability and problem solving.

Course Outcomes:

* Students will be able to analyse a given text and discover the various aspects related to language and literature;

* Learn the various language structures, parts of speech and figures of speech;

* Develop one's reading and writing abilities for enhanced communication; and

* Learn to apply the topics in real-life situations for creative and critical use.

SYLLABUS

On the conduct of life: William Hazlitt

Life skills: Values and Ethics

If: Rudyard Kipling

The Brook: Alfred Tennyson

Life skills: Self-Improvement

How I Became a Public Speaker: George Bernard Shaw

The Death Trap: Saki

Life skills: Time Management

On saving Time: Seneca

Chindu Yellama

Life skills: Innovation

Muhammad Yunus

Politics and the English Language: George Orwell

Life skills: Motivation

Dancer with a White Parasol: Ranjana Dave

Grammar: Prepositions – Articles – Noun-Pronoun Agreement, Subject-Verb Agreement – Misplaced Modifiers – Clichés, Redundancies.

Vocabulary: Introduction to Word Formation – Root Words from other Languages – Prefixes and Suffixes – Synonyms, Antonyms – Common Abbreviations

Writing: Clauses and Sentences – Punctuation – Principals of Good Writing – Essay Writing – Writing a Summary

Writing: Essay Writing

Life skills: Innovation

Muhammad Yunus

Textbook:

Language and Life: A Skills Approach Board of Editors, Orient Blackswan Publishers, India. 2018.

References :

1. *Practical English Usage*, Michael Swan. OUP. 1995.

2. *Remedial English Grammar*, F.T. Wood. Macmillan.2007

3. *On Writing Well*, William Zinsser. Harper Resource Book. 2001

4. *Study Writing*, Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.

5. *Communication Skills*, Sanjay Kumar and PushpLata. Oxford University Press. 2011.

6. *Exercises in Spoken English*, Parts. I-III. CIEFL, Hyderabad. Oxford University Press.

IN-1204 : CPNM

Course Objectives:

* The course is designed to provide complete knowledge of C language.

* To provide students with understanding of code organization and functional hierarchical decomposition with using complex data types.

* To provide knowledge to the Students to develop logics which will help them to create programs, applications in C.

* This course aims to identify tasks in which the numerical techniques learned are applicable and apply them to write programs, and hence use computers effectively to solve the task.

* This course provides the fundamental knowledge which is useful in understanding the other programming languages.

Course Outcomes:

* **Identify** basic elements of C programming structures like data types, expressions, control statements, various simple functions and **Apply** them in problem solving.

* **Apply** various operations on derived data types like arrays and strings in problem **solving**.

* **Design** and Implement of modular Programming and memory management using Functions, pointers.

* **Apply** Structure, Unions and File handling techniques to **Design** and **Solve** different engineering programs with minimal complexity.

* **Apply** Numerical methods to **Solve** the complex Engineering problems.

SYLLABUS

1. Introduction to C: Basic structure of C program, Constants, Variables and data types, Operators and Expressions, Arithmetic Precedence and associativity, Type Conversions. Managing Input and Output Operations Formatted Input, Formatted Output.

2. Decision Making, Branching, Looping, Arrays & Strings: Decision making with if statement, Simple if statement, The if…else statement, Nesting of if…else statement, the else..if ladder, switch statement, the (?:) operator, the GOTO statement., The while statement, the do statement, The for statement, Jumps in Loops ,One, Two-dimensional Arrays, Character Arrays. Declaration and initialization of Strings, reading and writing of strings, String handling functions, Table of strings.

3. Functions: Definition of Functions, Return Values and their Types, Function Calls, Function Declaration, Category of Functions: No Arguments and no Return Values, Arguments but no Return Values, Arguments with Return Values, No Argument but Returns a Value, Functions that Return Multiple Values. Nesting of functions, recursion, passing arrays to functions, passing strings to functions, the scope, visibility and lifetime of variables.

4. Pointers: Accessing the address of a variable, declaring pointer variables, initializing of pointer variables, accessing variables using pointers, chain of pointers, pointer expressions, pointers and arrays, pointers and character strings, array of pointes, pointers as function arguments, functions returning pointers, pointers to functions, pointers to structures-Program Applications

5. Structure and Unions: Defining a structure, declaring structure variables, accessing structure members, structure initialization, copying and comparing structure variables, arrays of structures, arrays within structures, structures within structures, structures and functions and unions, size of structures and bit-fields- Program applications.

6. File handling: Defining and opening a file, closing a file, Input/ Output operations on files, Error handling during I/O operations, random access to files and Command Line Arguments- Program Applications

7. Numerical Methods: Solutions of Algebraic and Transcendental Equations, Bisection Method, Newton Raphson Method. Newton's forward and backward Interpolation, Lagrange's Interpolation in unequal intervals. Numerical Integration: Trapezoidal rule, Simpson's 1/3 rules. Solutions of Ordinary First Order Differential Equations: Euler's Method, Modified Euler's Method and Runge-Kutta Method.

Text Book:

1. Programming in ANSI C, E Balagurusamy, 6th Edition. McGraw Hill Education (India) Private Limited.

2. Introduction to Numerical Methods, SS Sastry, Prentice Hall

Reference Books:

1. Let Us C ,YashwantKanetkar, BPB Publications, 5th Edition.

2. Computer Science, A structured programming approach using C", B.A.Forouzan and R.F.Gilberg, " 3rd Edition, Thomson, 2007.

3. The C –Programming Language' B.W. Kernighan, Dennis M. Ritchie, PHI.

4. Scientific Programming: C-Language, Algorithms and Models in Science, Luciano M. Barone (Author), Enzo Marinari (Author), Giovanni Organtini, World Scientific.

IN 1205 : INDUSTRY 4.0

SYLLABUS

Unit-1: Introduction to Industry 4.0 : Introduction, Idea of Industry 4.0, Various Industrial Revolutions, Origin concept of Industry 4.0,Industry 4.0 Production system, How is India preparing for Industry 4.0, Comparison of Industry 4.0 Factory and Today's Factory.

Unit-2: Trends in Industry 4.0 : Introduction, Main Concepts and Components of Industry 4.0, State of Art Technologies, Proposed Framework for Industry 4.0, Trends of Industrial Big Data and Smart Business Transformation.

Unit-3: Roadmap for Industry 4.0 : Introduction, Proposed Framework for Technology Roadmap: Strategy Phase, Development Phase, Smart Manufacturing, Types of Smart Devices, Smart Logistics, Smart Cities, Predictive Analytics.

Unit-4: Advances in the Era of Industry 4.0 : Introduction, Recent Technological Components of Robots- Advanced Sensor Technologies, Internet of Things, Industrial Robotic Applications- Manufacturing, Maintenance and Assembly, IIoT- Industrial IoT.

Unit-5: The Role of Industry 4.0 and Future Aspects : Introduction, Challenges & Future of Works and Skills for Workers in the Industry 4.0 Era, Strategies for competing in an Industry 4.0 world.

(MATERIAL IS READILY AVAILABLE ON INTERNET)

IN-1206 : ENGLISH LANGUAGE LAB

Course Objectives:

* To make students recognize the sounds of English through Audio-Visual aids;

* To help students build their confidence and help them to overcome their inhibitions and self- consciousness while speaking in English;

* To familiarize the students with stress and intonation and enable them to speak English effectively; and

* To give learners exposure to and practice in speaking in both formal and informal contexts.

Course Outcomes:

* Students will be sensitized towards recognition of English sound patterns and the fluency in their speech will be enhanced;

* A study of the communicative items in the laboratory will help students become successful in the competitive world;

* Students will be able to participate in group activities like roleplays, group discussions and debates; and

* Students will be able to express themselves fluently and accurately in social as well professional context.

SYLLABUS

Introduction to Phonetics: The Sounds of English (Speech sound – vowels and consonants) - Stress and Intonation - Accent and Rhythm.

Listening Skills: Listening for gist and specific information - listening for Note taking, summarizing and for opinions - Listening to the speeches of eminent personalities.

Speaking Skills: Self-introduction - Conversation Skills (Introducing and taking leave) - Giving and asking for information - Role Play - Just A Minute (JAM) session - Telephone etiquette.

Reading and Writing skills: Reading Comprehension – Précis Writing - E-Mail writing - Punctuation.

Presentation skills: Verbal and non-verbal communication - Body Language - Making a Presentation.

Reference Books:

1. Ashraf Rizvi. *Effective Technical Communication*. Tata McGraw Hill Education Private Limited, New Delhi.
2. *Speak Well*. Orient Blackswan Publishers, Hyderabad.
3. Allan Pease. *Body Language*. Manjul Publishing House, New Delhi.

IN 1207 : GREEN CHEMISTRY LAB

Course Objectives:

CO 1:To develop the fine skills of quantitative determination of various chemical components through titrimetric analysis
CO 2:To prepare ion exchange/ zeolite column for removal of hardness
CO 3:To develop the skill of green synthesis through the preparation of a polymer/ drug

Learning Outcomes:

LO 1: The students are able to determine the amount of various chemical species in solutions by titrations quantitatively with accuracy
LO 2: The students are able to develop novel materials to be used as zeolite and prepare columns for removal of hardness of water
LO 3: The students develop skills to synthesise a polymer or a drug

SYLLABUS

1. Determination of Sodium Hydroxide with HCl (Na_2CO_3 Primary Standard)
2. Determination of Alkalinity (Carbonate and Hydroxide) of water sample

3. Determination of percentage of Iron in the given rust solution by external indicator method

4. Determination of total Hardness of Water sample by EDTA method

5. Preparation and analysis of Ionexchange/ Zeolite column for removal of hardness of water

6. Green Synthesis of Polymer/ drug

Reference Books:

1. Vogel's Quantitative Chemical Analysis – V – Edition – Longman.

2. Experiments in Applied Chemistry (For Engineering Students) – Sinita Rattan – S. K. Kataria & Sons, New Delhi

IN-1208 : CPNM LAB

Course Objectives:

* To impart writing skill of C programming to the students and solving problems.

* To write and execute programs in C to solve problems such as Modularize the problems into small modules and then convert them into programs.,

* To write and execute programs in C to solve problems such as arrays, files, strings, structures and different numerical methods.

* This reference has been prepared for the beginners to help them understand the basic to advanced concepts related to Objective-C Programming languages.

Course Outcomes:

* Understand various computer components, Installation of software. C programming development environment, compiling, debugging, and linking and executing a program using the development environment.

* Analyzing the complexity of problems, Modularize the problems into small modules and then convert them into programs.

* Construct programs that demonstrate effective use of C features including arrays, strings, structures, pointers and files.

* Apply and practice logical ability to solve the real world problems.

* Apply Numerical methods to Solve the complex Engineering problems.

SYLLABUS

1. Write a program to read x, y coordinates of 3 points and then calculate the area of a triangle formed by them and print the coordinates of the three points and the area of the triangle. What will be the output from your program if the three given points are in a straight line?

2. Write a program, which generates 100 random integers in the range of 1 to 100. Store them in an array and then print the arrays. Write 3 versions of the program using different loop constructs. (e.g. for, while, and do while).

3. Write a set of string manipulation functions e.g. for getting a substring from a given position, Copying one string to another, Reversing a string, adding one string to another.

4. Write a program which determines the largest and the smallest number that can be stored in different data types like short, int, long, float, and double. What happens when you add 1 to the largest possible integer number that can be stored?

5. Write a program, which generates 100 random real numbers in the range of 10.0 to 20.0, and sort them in descending order.

6. Write a function for transposing a square matrix in place (in place means that you are not allowed to have full temporary matrix).

7. First use an editor to create a file with some integer numbers. Now write a program, which reads these numbers and determines their mean and standard deviation.

8. Given two points on the surface of the sphere, write a program to determine the smallest arc length between them.

9. Implement bisection method to find the square root of a given number to a given accuracy.

10. Implement Newton Raphson method to det. a root of polynomial equation.

11. Given table of x and corresponding f(x) values, Write a program which will determine f(x) value at an intermediate x value by using Lagrange's interpolation/

12. Write a function which will invert a matrix.

13. Implement Simpson's rule for numerical integration.

14. Write a program to solve a set of linear algebraic equations.

B.Tech II year - I Semester

IN 2101: MATHS - III

OBJECTIVES:

In general, the students are introduced with a knowledge on the topics: Vector Calculus, Partial differential equations, their applications and Integral Transforms (Fourier transforms, FST, FCT) so as to facilitate them to use these concepts in core subjects.

The objectives, in particular are to learn:

* the basic knowledge and applications of Vector Calculus used in Engineering problems.

* About the gradient, divergence and curl under the differentiation of scalar and vector point functions, also on Line-, Surface- and Volume integrals under the integration of point functions along with their applications in Engineering issues.

* Transformation theorems such as **Green's** theorem in the plane, **Stoke's** theorem, **Gauss Divergence** theorem and their applications.

* How to formulate the Partial Differential Equations from the relation between the dependent and independent variables, the methods of solving first order first degree linear, non-linear P**artial Differential Equations**, Homogeneous and Non homogeneous linear partial differential equations with constant coefficients .

* The procedure to find out the solutions of Partial Differential Equations by using the method of separation of variables (product method) about the formulation of one dimensional wave (string equation), one-and two-dimensional **Heat flow equations**, **Laplace's equation** in Cartesian and polar coordinates, and how to solve these equations using the method of separation of variables.

* The concept of integral transforms, namely, **Fourier transforms**, **Fourier Sine, Cosine and related inverse transforms, and** their applications in solving several Physical and Engineering problems.

OUTCOMES:

After going through this course , the students would be able to:

* operate the differential operator 'del' to the scalar and vector point functions, Calculate the Gradient, Divergence and Curl, Vector normal to a surface, maximum rate of change of a scalar field, test whether two surfaces are to cut orthogonally or not .

* find the rate per unit volume at which the physical quantity is issuing from a point, the rate of inflow minus out flow using the Divergence and the angular velocity of rotation at any point of the vector field using the Curl.

* **test** whether the given motion is irrotational or rotational, whether a vector force acting on a particle is conservative or not

* find out the potential function from a given vector field.

* obtain the well known Laplace and poisson equations from an irrotational field

* understand to determine the work done by a force field and circulation using a Line integral

* find out the Line, Surface and Volume integrals, find flux using surface integral and volumes using the volume integral.

* apply the vector integral theorems (Green's theorem in the plane, Stoke's and Divergence theorems) for evaluating the double and triple integrals as these are used to find areas and volumes.

* know the methods of solving Linear and Non linear first order and first degree partial differential equations.

* solve the Linear Partial Differential Equations with constant coefficients (homogeneous and non homogeneous) and know the procedure for finding the complementary function and particular integrals

* apply the method of separation of variables to obtain solutions to the boundary value problems involving Linear partial differential equations occurred in engineering studies

* solve wave equation, heat flow equation and the Laplace's equations in Cartesian and polar coordinates using the method of separation of variables.

* apply and extend the knowledge of Fourier transform techniques in solving several Initial and Boundary value problems of Engineering, such as in Conduction of heat **/** Thermodynamics, Hydraulics transverse vibrations of a string, oscillations of an elastic beam, bending of beams, electrical circuits, free and forced vibrations of a membrane and transmission lines , etc.

(VECTOR CALCULUS-DIFFERENTIATION)

Differentiation of vectors, curves in space, velocity and acceleration, relative velocity and relative acceleration, scalar and vector point functions, vector operator ? applied to scalar point functions- gradient, ? applied to vector point functions-divergence and curl. Physical interpretation of gradient, divergence and culrl (i.e.,*?f* , ?.*F*,?? *F*), Irrotational and Solenoidal fields, the relations obtained after ? applied twice to point functions, ? applied to products of two functions.

(VECTOR INTEGRATION)

Integration of vectors, line integral, circulation, work done, surface integral-flux, Green's theorem in the plane, Stoke's theorem, volume integral, Gauss Divergence theorem. (All theorems without proofs) Introduction of orthogonal curvilinear coordinates, cylindrical and spherical polar coordinates

(PARTIAL DIFFERENTIAL EQUATIONS)

Formation of partial differential equations, solutions of partial differential equations- equations solvable by direct integration, linear equations of first order: Lagrange's Linear equation, non-linear equations of first order, Charpit's method. Homogeneous linear equations with constant coefficients- rules for finding the complementary function, rules for finding the particular integral (working procedure), non- homogeneous linear equations.

(APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS)

Method of separation of variables, One dimensional wave equation-vibrations of a stretched string, one dimensional Heat flow equation, Two dimensional heat flow in steady state - solution of Laplace's equation in Cartesian and polar coordinates (two dimensional).

(INTEGRAL TRANSFORMS (Fourier Transform)

Introduction, definition, Fourier integral, Sine and Cosine integrals, Complex form of Fourier integral, Fourier transform, Fourier Sine and Cosine transforms, Finite Fourier Sine and Cosine transforms, properties of Fourier transforms.

Convolution theorem for Fourier transforms, Parseval's identity for Fourier transforms, Fourier transforms of the derivatives of a function, simple applications to Boundary value problems.

TEXT BOOKS:

Scope and treatment as in "Higher Engineering Mathematics", by Dr. B.S.Grewal, 43rd Edition, Khanna Publishers.

REFERENCE BOOKS:

1. Graduate Engineering Mathematics by V B Kumar Vatti, I.K.International publications

2. Advanced Engineering Mathematics by Erwin Kreyszig.

3. A text book of Engineering Mathematics by N.P. Bali and Dr. Manish Goyal, Lakshmi Publications.

4. Mathematical Methods of Science & Engineering aided with MATLAB by Kanti B.Dutta, Cengage Learning India Pvt. Ltd.

5. Higher Engineering Mathematics by B. V. Ramana, Tata McGraw Hill Company.

6. Advanced Engineering Mathematics by H.K.Dass. S.Chand Company.

IN 2102 : ANALOG ELECTRONIC CIRCUITS

Course Objectives:

In this course student will learn about

* Analysis of single and multi stage amplifiers.
* Frequency response of single and multi stage amplifiers.
* Different power amplifiers.
* Concept of negative feedback in amplifiers.
* Operation, types and stability of oscillators.

Course Outcomes:

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

* Design different single and multi stage amplifiers.
* Understand the effect of capacitance on frequency response.
* Understand the application of power amplifiers.
* Know the importance of negative feedback in amplifiers.
* Design sinusoidal oscillators for different frequencies.

Small Signal Frequency Transistor Amplifiers: Hybrid parameter model of a Two Port network, h parameter model for transistor in CE, CB and CC configurations. Typical h-parameter values, h parameter conversion from one configuration to another configuration. Analysis of CE, CB and CC Amplifiers using h parameter model. CE Amplifier with emitter resistance.

Multistage Amplifiers: Cascade Amplifier (RC Coupled Amplifier), Cascade Amplifier, Darlington Pair and Analysis.

Transistor at High Frequencies: The hybrid common Emitter Transistor model, Hybrid **ð** conductance in terms of low frequency h parameters-Transconductance, input impedance, Feedback conductance. Base spreading resistance, output conductance and hybrid capacitance. The CE short circuit current gain obtained with the hybrid **ð** model- Bandwidth f_p and parameter f_T, current gain with resistive load, Transistor amplifier response with source resistance-Gain Bandwidth product.

Power Amplifiers: Classification of large signal amplifiers, Distortion in Amplifiers- Second harmonic Distortion and higher order harmonic distortion, Class A power amplifiers, Direct coupled and Transformer coupled Class B power amplifiers- push pull and complementary symmetry class AB power amplifiers, Class C power amplifiers, Class D and S power amplifiers.

Feedback Amplifiers: Open loop amplifiers, voltage amplifiers, current amplifier, Transresistance Amplifier and Transconductance Amplifiers, Closed loop amplifiers- Block diagram, concept of negative feedback, concept of positive feedback, characteristics of negative feedback amplifiers, classification of negative feedback amplifiers-Voltage series negative feedback amplifiers, voltage shun feedback amplifiers, current series feedback amplifiers, current shunt feedback amplifiers and their analysis.

Sinusoidal Oscillators: Barkhausen Criterion, classification of oscillators, Hartly oscillators, Colpitts oscillators, RC phase shift oscillators using BJT and JFET, Wein Bridge oscillators, crystal oscillators, Frequency and amplitude stability of Oscillators.

TEXT BOOKS

Jacob Milliman and Christos C Halkias, " Electronic Devices and Circuits," Tata Mcgra Hill Publishers, New Delhi, Fourth REprint, 2011.

IN2103 : ELECTRICAL MACHINES

Course Objectives:

The subject aims to provide the student with:

* Understanding of the basics of electrical machines and their construction
* Knowledge of testing and performance of electrical machines.
* Knowledge for learning advanced machines and their control.

* In-depth understanding of application based knowledge in the field of electrical drives

Course Outcome:

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

* Analyse and apply the energy conversion principles to rotating machines.

* Evaluate the steady state parameters, basic operating characteristics and performance of DC Machine and its application.

* Evaluate the steady state parameters, basic operating characteristics and performance of transformers

POLYPHASE CIRCUITS

Star and why connections, vector diagrams, phase sequence, voltage, current relations in two phase and three phase circuits. Analysis of balanced three phase circuits. Measurements of power in three phase circuits.

TRANSFORMERS

Single phase transformer-construction-voltage equation, transformer on no-load and full-load. Equivalent circuit – losses- efficiency-auto transformer, use of transformers with instruments-testing of transformer – Short circuit test and open circuit test.

D.C.Machines

DC Generator – construction - armature windings – principle - e.m.f equation-armature reaction (in brief) and commutation- losses - efficiency - Generator characteristics D.C.motor – construction- back e.m.f- - losses – efficiency- speed torque characteristics-starters-speed control testing.

Synchronous machines- Alternators- principle and working - synchronous impedance-armature reaction (in brief) -e.m.f.equation-synchronous motor, nature of torque, vector diagram-characteristics of a synchronous motors-starting methods.

Induction motor-construction-theory of induction motor –efficiency-equivalent circuit and speed control.

TEXT BOOKS:

1. Electrical technology by B.L.Theraja.

2. Electrical technology by H.Cotton.

3. Electrical machinery by Fitzgerald/kingsley/umans.

4. Electrical machinery by Irving L.Kosow.

IN2104 : SENSORS AND TRANSDUCERS

Course Objectives:

* To understand about measurement systems and their classification

* To understand about errors in measurement systems and calibration of measurement systems

* To enable the students to select and design suitable instruments to meet the requirements of industrial applications and various transducers used for the measurement of various physical quantities

* To understand about Various types of Sensors & Transducers and their working principle Resistive, Capacitive and Inductive, Piezo electric and Some of the miscellaneous transducers Characteristics of transducers

Course Outcomes:

* Upon completion of this course the student shall be able to understand the working of basic sensors and transducers used in process and manufacturing industries.

* The student will be able to select particular type of sensor/transducer in a typical application in a process Industry.

Measurements and Measurement systems- functional elements of measurement system- classification of measuring instruments- specifications of measuring instruments-

Standards of measurement-calibrations of measuring instruments- static and dynamic characteristics of measurement systems-errors in measurement systems.

Mathematical modeling of measurement systems- Modeling of mechanical systems-electrical system-thermal systems and fluidic systems- order of measurement systems –zero order,1st order, 2nd order and higher order systems – transfer function of measurement systems – system response to standard test signals – response of 1st order and second order systems for standard test signals.

Primary sensing elements-mechanical sensors springs-cantilever- torsion bars, load cells elastic sensors- diaphragms, capsules-Bellous and bourden tube gauges- flapper-nozzle sensors – Thermal sensors - filled in systems- Bimetal sensors – Level sensors- floats and displacers – flow sensors- Head flow sensors (Orifice, venture and pitot tubes) Area flow sensors (Rota meter and piston meters)

Transducers-Active and passive transducers – Transducers- characteristics- basic requirements hesistive transducers- strain gaues- potentiometers RTD's and thermistors – Inductive transducers- self inductance and variable inductance transducers _LVDT and its applications – capacitive transducers- variable distance and variable area and dielective type Piezo electric transducers and their applications- magnetic strictive- thermo electric and hall effect transducers- photo electric transducers- photo emissive and photo voltaic types and their applications- advanced sensors smart transducers- intelligent transducers and MEMS sensors.

IN 2105 : MANAGERIAL ECONOMICS

Course Objectives:

* To bring about an awareness about the nature of Managerial Economics and its linkages with other disciplines.

* To understand the Micro and Macro Environment of Business.

* To familiarize the prospective engineers with the concepts and tools of Managerial Economics with an objective to understand the real world of business.

Course Outcomes:

After completion of the course, student will be able to:

* Understand the various economic activities in business and industry.

* Analyse the real world business problems.

* Make optimal business decisions for the effective and efficient management of Organisations. Significance of Economics and Managerial Economics:

Economics: Definitions of Economics- Wealth, Welfare and Scarcity definitions Classification of Economics- Micro and Micro Economics.

Managerial Economics: Definition, Nature and Scope of Managerial Economics, Differences between Economics and Managerial Economics, Main areas of Managerial Economics, Managerial Economics with other disciplines.

Demand and Utility Analysis: Demand - Definition, Meaning, Nature and types of demand, Demand function, Law of demand - Assumptions and limitations. Exceptional demand curve.

Elasticity of demand - Definition, Measurement of elasticity, Types of Elasticity (Price, Income, Cross and Advertisement), Practical importance of Price elasticity of demand, Role of income elasticity in business decisions, Factors governing Price Elasticity of demand.

Utility Analysis: Utility- Meaning, Types of Economic Utilities, Cardinal and Ordinal Utility, Total Utility, Marginal Utility, The law of Diminishing Marginal Utility and its Limitations**.**

Theory of Production and Cost analysis: Production **-** Meaning, Production function and its assumptions, use of production function in decision making;

Cost analysis - Nature of cost, Classification of costs - Fixed vs. Variable costs, Marginal cost, Controllable vs. Non - Controllable costs, Opportunity cost, Incremental vs. Sunk costs, Explicit vs. Implicit costs, Replacement costs, Historical costs, Urgent vs. Postponable costs, Escapable vs. Unavoidable costs, Economies and Diseconomies of scale.

Market Structures : Definition of Market, Classification of markets; Salient features or conditions of different markets - Perfect Competition, Monopoly, Duopoly , Oligopoly, Importance of kinked demand curve ;Monopolistic Competition.

Pricing and Business Cycles: Pricing Analysis : Pricing – Significance; Different Pricing methods- Cost plus pricing, Target pricing, Marginal cost pricing, Going -rate pricing, Average cost pricing, Peak load pricing , Pricing of joint Products, Pricing over the life cycle of a Product, Skimming pricing Penetration pricing, Mark- up and Mark- down pricing of retailers.

Business cycles - Definition, Characteristics, Phases, Causes and Consequences; Measures to solve problems arising from Business cycles.

Text Books:

1. Sankaran,S., Managerial Economics, Marghan Publications, 2015, Chennai.

2. Aryasri, A.R., Managerial Economics and Financial Analysis, MC Graw Hill Education, New Delhi,2015.

Reference Books:

1. Dwivedi, D.N., Managerial Economics, Vikhas Publishing House Pvt. Ltd. 6th Edition, New Delhi,2004.

2. Dewett, K.K., Modern Economic Theory, S.Chand & Company Ltd., New Delhi, 2005.

IN 2106 : Analog Electronics Circuits Lab

Course Educational Objective: This course gives an overview of amplifiers, power amplifiers, Feedback Amplifiers and Oscillators.

Course Outcomes:

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

CO1 :Understand the operation of different types of amplifiers and oscillators.
CO2: Analyze the characteristics of different types of amplifiers.
CO3: Design an amplifier.

List of Experiments

1. Common Emitter Amplifier
2. Common Source Amplifier
3. Two Stage RC coupled CE amplifier
4. Two Stage RC coupled CS FET amplifier
5. Class A power amplifiers
6. Class B power amplifiers
7. Class C power amplifiers
8. Voltage –current series feedback amplifier

9. RC phase shift Oscillator using Transistor

10. Wein Bridge oscilator

IN 2107 : Transducers Lab

Course Objective:

1. This Lab explores the Calibration of Various kinds of Transducers & Industrial Instruments

2. To make the students familiarize with several Industrial parameters.

To obtain the practical knowledge on working principle of several transducers & Sensors what they have studied intheory.

Course Outcomes:

The purpose of inclusion of this lab into the curriculum is to illustrate the Working principle, Calibration and characteristics of various types of transducers

At the completion of this lab, the student will be able to:

1. Calibrate & plot Characteristics of different kinds of transducers such as Strain Gauge, LVDT, Dead weight tester etc….

2. Visualize the working principle of various types of sensors Like RTD, Thermo couple, Orifice meter etc… which they have studied in theory.

3. Control the Industrial parameters like Pressure, Level, Flow, Temperature etc.…

4. Obtain the knowledge about practical applications of several transducers, Sensors & Industrial Instruments.

IN2108: ELECTRICAL MACHINES LAB

Course Objective:

1. This Lab explores all the possible design connections of a DC machine and it also experimentallyobtains the characteristics and thus observes the performance of different DC motors andgenerators and performs tests on DC machines to derive their efficiency.

2. To make the students familiarize the students with all necessary AC electrical machines likeSingle phase and three phase induction motors all of which help to enhance the technical skills ofstudents.

3. The working of a transformer, wattmeter and dc, ac motors are apparent to the students. Theycould practically visualize & can correlate with what they have studied in theory and grasp theconcepts well.

Course Outcomes:

The purpose of inclusion of this lab into the curriculum is to illustrate the working andcharacteristics of transformers & various types of dc & ac motors and generators under no-load,loaded conditions.

At the completion of this lab, the student will be able to:

1. Obtain the operating characteristics of dc machines, transformers and Induction motors.

2. Examine the relationship between torque, speed, voltage and Current for various types ofmotor & generator connections in no-load and loaded configurations.

3. Predict, by calculation, the performance of dc machines Motor & Generator.

4. Analyze and select appropriate dc machines & ac machines for given applications.

5. The working of a transformer, wattmeter and DC Motors, ACMotors are apparent to the students. Theycould practically visualize & can correlate with what they have studied in theory and grasp theconcepts well.

List of Experiments:

IN2109: Object Oriented Programming through C++

Course Objectives:

* Exposure to basics of object oriented mode, C++ programming and I/O in C++

* Acquaintance with classes, objects and member functions.

* Concentration on inheritance, types of inheritance, polymorphism, virtual functions

* Focus on constructors , destructors, variants in them

Course Outcome:

* Expertise in object oriented principles and their implementation in C++

INTRODUCTION: Differences Between C And C++, Disadvantage of Conventional Programming, Concepts of Object Oriented Programming, Advantages of OOP. Structure of a C++ Program, Header Files And Libraries.

INPUT AND OUTPUT IN C++: Introduction ,Formatted And Unformatted I/O Operations, Bit Fields, Manipulators.

FUNCTIONS IN C++: Introduction ,Inline Functions, Function Overloading, Recursion.

CLASSES AND OBJECTS: Introduction, Access Specifiers And Their Scope, , Data Hiding or Encapsulation, Classes, Objects and Memory, Array Of Objects, Friend Functions, Recursive Member Function.

CONSTRUCTORS AND DESTRUCTORS :Introduction, Characteristic Of Constructors & Destructors, Applications With Constructors, Parameterized Constructor, Overloading Constructors (Multiple Constructors), Destructors, Private Constructors And Destructors ,Local Vs. Global Object.

INHERITANCE: Introduction, Access Specifiers And Simple Inheritance, Protected Data With Private Inheritance, Types Of Inheritances(Single Inheritance, Multilevel Inheritance, Multiple Inheritance, Hierarchical Inheritance, Hybrid Inheritance, Multipath Inheritance), ,Advantages Of Inheritance, Disadvantages Of Inheritance.POLYMORPHISM: Virtual Functions, Pure Virtual Functions.

TEXT BOOKS

* Object Oriented Programming with C++, E. Balaguruswamy, TMH
* Programming In C++ , Ashok N Kamthane. Pearson 2nd Edition.
* Object Oriented Programming C++ , Joyce Farrell, Cengage
* Mastering C ++, Venugopal, Rajkumar, Ravi kumar TMH

REFERENCE BOOKS

* The Complete Reference, C++, 4ed, Herbert Schildt, TMH

LIST OF PROGRAMS:

Program No	Topic	Program Title
1	INPUT &OUTPUT IN C++	Program to print a string
2		Program to accept a string and display using cin & cout statements.
3		Simple c++ program for Addition of two numbers
4		Simple c++ program for Division of two numbers
5		Simple c++ program for Multiplication of two numbers
6		Simple c++ program for Subtraction of two numbers
7		Simple c++ program for Average of two numbers
8		Program to display data using typecasting
9	UNFORMATTED I/O FUNCTIONS	Program to read and display string using get() & put()functions
10		Program to demonstrate the use of gcount()function
11	FORMATTED I/O FUNCTIONS	Program to set number of precision points. Display the result of 22/7 in different precision settings
12	BITFIELDS	Program to convert decimal number to hexa decimal and octal format
13	MANIPULATORS	Program to display message using Manipulators.
14	FUNCTIONS IN C++ : INLINE FUNCTIONS	Write a program to find the cube of a number using inline function
15	RECURSION	Write a program to calculate Factorial of a Number Program
16	FUNCTION OVERLOADING	Write a program to compute the area of a square , rectangle and circle
17	CLASSES & OBJECTS:ACCESS SPECIFIERS:PUBLIC,PRIVATE, PROTECTED	Write a program using class to declare member variable and functions Private, Public, and Protected section and make an attempt to access them using object
18	DATA HIDING OR ENCAPSULATION	Write a program to calculate simple interest. Hide the data elements of the class using Private Keyword
19	ARRAY OF OBJECTS	Write a program to declare the array of objects. Initialize and display the contents of array. Eg: Read and display the information of the players on the screen.
20	FRIEND FUNCTIONS	Write a program to access private data using non-member function .Use friend function
21	RECURSIVE MEMBER FUNCTION	Write a program to find the sum of n Fibonacci number by using recursion.
22	CONSTRUCTORS AND DESTRUCTORS:CONSTRUCTORS	Write a Program to define a constructor and initialize the class data member variables with constant
23	OVERLOADING CONSTRUCTORS (MULTIPLE CONSTRUCTORS)	Write a program to overload constructor and display date and time
	DESTRUCTORS	Write a program to demonstrate execution of constructor and destructor
25	PRIVATE CONSTRUCTOR AND DESTRUCTOR	Write aprogram to declareconstructorand destructor as private and call them explicitly
26	LOCAL VS GLOBAL OBJECT	Write a program to show the difference between local and global object
27	INHERITANCE :PROTECTED DATA WITH PRIVATE INHERITANCE:	Write a program to declare protected data in base class .Access data of base class declared under protected section using member function of derived class
28	SINGLE INHERITANCE	Write a program to demonstrate single inheritance.
29	MULTILEVEL INHERITANCE	Write a program to explain multilevel inheritance with member functions
30	POLYMORPHISM: PURE VIRTUAL FUNCTIONS	Write a program to declare pure Virtual Functions

INE 2110 : SYLLABUS

PROFESSIONAL ETHICS AND UNIVERSAL HUMAN VALUES

Common for all B.Tech and B.Tech+M.Tech Integrated Courses

(w.e.f. 2022-2023)

Course Objectives:

* To recognize the moral values that should guide the Engineering profession.

* To resolve moral issues concerning one's profession.

* To develop and exhibit a set of moral beliefs and attitudes that engineers should inculcate.

* To inculcate social values and morality in one's life.

* To develop awareness about Professional/Engineering Ethics and Human Values.

Learning Outcomes:

Students will be able to:

* Apply the conceptual understanding of ethics and values into everyday practice.

* Understand the importance of moral awareness and reasoning in life.

* Acquire professional and moral etiquette that an engineer requires.

* Develop the acumen for self-awareness and self-development.

* Develop cultural tolerance and integrity.

* Tackle real-life challenges with empathy.

CONTENTS

Unit - I: HUMAN VALUES : Values - Respect - Caring - Sharing - Honesty- Courage - Self confidence - Communal Harmony Morals - Virtues

Unit –II PROFESSIONAL VALUES : Integrity - Discipline - Valuing time - Cooperation - Commitment - Code of conduct - Challenges in the workplace

Unit – III PROFESSIONAL ETHICS : Overview - Engineering ethics - Moral issues - Profession - Models of professional roles - Responsibility

Unit – IV RESPONSIBILITIES AND RIGHTS : Safety and risk - Collegiality and loyalty - Confidentiality - Occupational crime - Human rights - Employee rights - Intellectual property rights

Unit – V GLOBAL ISSUES : Globalization - Environmental ethics - Computer ethics - Code of ethics - Multinational corporations - Engineers as advisors in Planning and Policy making

Suggested Textbook:

R.S. Nagarazan. *A Textbook on Professional Ethics and Human Values.* New Age International Publishers. 2006.

Reference Books:

Premvir Kapoor. Professional Ethics and Human Values. Khanna Publishing House. 2019.

B.S. Raghavan. Human Values and Professional Ethics. S.Chand Publications. 2012.

R.R. Gaur & Others. *A Foundation Course in Human Values and Proff. Ethics*. Excel Books. 2009.

A. N. Tripathi. *Human Values*. New Age International (P) Limited. 2009

R. Subramanian. *Professional Ethics*. OUP India. 2013.

IN 2201 : MATHS IV

Objectives: The student should be able to use the concepts of difference equations, 5ØMÜ -transforms, Numerical differentiation and Sampling theory. The student should know the applications of the difference equations in the deflection of a loaded string. The student should be able to estimate unknown parameters of population and apply the tests of hypothesis. They should be able to evaluate 5ØMÜ-transform, inverse 5ØMÜ-transforms and apply these transforms to solve difference equations. The student should be able to know the techniques in the evaluation of numerical solution of ordinary differential equations.

(Functions of Complex Variables) : Introduction-Limit and continuity of f(z)- Derivative of f(z), Cauchy-Reimann Equations, Analytic Functions, Harmonic functions, Orthogonal systems, Applications to flow problems, Geometrical representation of f(z). Integration of complex functions, Cauchy's theorem, Cauchy's integral formula and their applications.

(Conformal Mappings and Contour Integration) Introduction to Conformal transformation, Bilinear transformation w ? *az* ? *b c z* ? *d* , Series of complex terms -Taylor's and Laurent's series (without proofs), Zero's and Singularities of analytic functions.

Residues and Calculations of residues, Cauchy's Residue Theorem (without proofs), Evaluation of real definite integrals: Integration around unit circle, semi circle.

(Difference Equations & Z-transforms) Introduction - Formation of difference equations - Linear difference equations - Rules for finding complementary function - Rules for finding particular integral - simultaneous difference equations with constant coefficients - Applications to deflection of a loaded string.

Introduction to Z-Transforms - Some standard Z-transforms - Linear Property - Damping Rule - Shifting Un to the right and to the left-multiplication by 5Ø[Ü-Two basic theorems - Some useful Z-transforms - Inverse Z-transformation - Convolution theorem - Convergence of Z- transform - Two sided Z-transform - Evaluation of inverse Z-transform - Application to Difference equations.

(Correlation, Regression and Distributions) : Introduction - correlation - coefficient of correlation -Lines of regression. Introduction to Discrete and Continuous Random Variables - Distributions: binomial distribution, Poisson distribution, exponential distribution, normal distribution.

(Sampling Theory) : Introduction - Testing of hypothesis - Level of significance - Confidence limits - Test of significance of large samples - comparison of large samples- Test of significance for means of two large samples. Student t-distribution - Significance test of sample mean - Significance test of difference between sample means - Chi-square test - Goodness of fit - F-distribution.

TEXT BOOK:

Scope and treatment as in "Higher Engineering Mathematics", by Dr.B.S.Grewal,43rd Edition, Khanna Publications.

REFERENCE BOOKS:

1. Graduate Engineering Mathematics by V B Kumar Vatti, I.K.International publications

2. Advanced Engineering Mathematics by Erwin Kreyszig.

3. A text book of Engineering Mathematics by N.P. Bali and Dr.Manish Goyal; Lakshmi publications.

4. Advanced Engineering Mathematics by H.K. Dass. S. Chand Company.

5. Higher Engineering Mathematics by B.V. Ramana, Tata Mc Graw Hill Company.

6. Engineering Mathematics series by Chandrica Prasad.

2202 - ELECTRICAL MEASUREMENTS AND MEASURING INSTRUMENTS

Course Objectives:

* This course provides adequate knowledge of various instruments for measuring electrical quantities.

* understand basic laws governing the operation and working of instruments and their equivalent circuits used for the measurement of voltage, current, power, energy.

Course Outcomes:

The student will be able to:

* differentiate PMMC and MI instruments.

* determine R, L and C of the given impedances using different bridges.

* understand the functioning and errors present different type of instruments

MEASUREMENT OF RESITANCE, CAPACITANCE AND INDUCTANCE: D.C bridges, potentiometers, A.C bridges, measurement of inductance and capacitance, errors in bridge measurements, Wagner's earthing device.

CLASSIFICATION OF INSTRUMENTS: Electrical analog instruments, classification and constructional details, galvanometers, operating principle dynamic response, measurement of galvanometer constants

MEASUREMENT OF VOLTAGE AND CURRENT: moving-iron, PMMC, Electro dynamic, electro static and inductive type instruments, range extension

MEASUREMENT OF POWER: Watt meters, dynamometer induction electrostatic watt meters, poly phase watt meters.

MEASUREMNT OF ENERGY: induction watt-hour meter-errors and compensation, polyphase induction watt-hour meter, measurement of frequency, phase angle, power factor, special purpose instruments.

TEXT BOOKS:

1. Electrical measurement and measuring Instruments by Golding and Widdis.

2. Electrical and Electronic measurements and Instruments By A.K.Sawhney.

3. Electrical measurements and Measuring instruments By Rajendra Prasad.

2203 : SIGNALS AND SYSTEMS

Course Educational Objectives: This course describe signals mathematically and how to perform mathematical operations on signals, represents the signals in both time and frequency domains, provides the concepts of signal approximation using orthogonal functions and Fourier Series, the Fourier Transform and its properties, Laplace Transform and their properties, analysis of systems using Laplace Transforms.

Course Outcomes (COs):

At the end of this course, student will be able to

CO1 Remember the classification and properties of the signals & systems, properties of Fourier and Laplace Transforms.

CO2 Understand the fundamental characteristics of the signals , systems and their classifications

CO3 Apply mathematical tools to model and examine signals and systems in both time and frequency domains.

CO4 Analyze the concept of Fourier Series, Region of convergence and convolution in time and frequency domains

CO5 Evaluate system for linearity, causality, time variance, stability, memorability and reliability.

SIGNAL ANALYSIS: Approximation of a function by a set of mutually orthogonal functions, evaluation of mean square error. Orthogonality in complex functions. Trigonometric and exponential Fourier series. Representation of a periodic function by Fourier series. Fourier transform, properties of Fourier transform. Fourier transform of simple functions.

Convolution integral. Convolution in time domain and frequency domain. Graphical representation. Sampling theorem – statement and proof, aliasing.

CORRELATION: Cross correlation and auto correlation functions, properties of correlation function, correlation and convolution, energy and power spectral density functions. Parseval's theorem.

SIGNAL TRANSMISSION THROUGH LINEAR NETWORKS: Linear time invariant system. Transfer function. Filter characteristics of linear systems. Conditions for distortionless transmission. Causality and physical realizability. Bandwidth and rise time.

LAPLACE TRANSFORMS: Review of Laplace transforms, partial fraction expansion, inverse Laplace transforms, concept of region of convergence (ROC) for Laplace transforms. Constraints on ROC for various classes of signals, properties of Laplace transforms, relation between Lapalce transform and Fourier transform of a signal. Laplace transform of a certain signals using wave form synthesis.

Z-TRANSFORMS : Fundamental difference between continuous and discrete time signals, discrete time complex exponential and sinusoidal signals, periodicity of discrete time complex exponential signals. Concept of Z – transform of a discrete sequence. Distinction between Laplace, Fourier & Z –transforms. Region of convergence in Z-transforms, constraints on ROC for various classes of signals, inverse Z – transforms, properties of Z-transforms.

TEXT BOOKS:

1. Signals, systems and communications – by B.P Lathi, BS publications.

2. Signals and systems – by A.V Oppenheim , AS Willesky & SH Nawab, PHI

REFERENCE:

1. Signals and systems – by Simon Haykins, Wiley Student Ed.

2204 : LINEAR AND DIGITAL IC APPLICATIONS

Course Objectives:

Students undergoing this course are expected to:

1. Understand thefundamentals of Operational Amplifier, it's analysis and design of electronic circuitsusing op-amp with feedback.

2. Get anexposure to Linear Applications of operational amplifier

3. Design various active filleters using opamp and Mulltivibrator using 555 timers and analyzing PLL and its applications

4. Understand digital logic design and Boolean algebra

5. Design of various combinational and sequential logic circuits

Course Outcomes:

After undergoing the course, students will be able to

1. Acquaint with a wide variety of op-amp negative feedback circuits and able to find impedances and bandwidths of circuits.

2. Implement integrator, differentiator, Instrumentation amplifier using Opamp

3. Design Pulse generator circuits of required frequency and PLL circuits.

4. Simplify Boolean functions with Boolean Laws and Karnaugh Maps

5. Design and implement combinational and sequential Ciurcuits

AN OPERATIONAL AMPLIFIER WITH NEGATIVE FEEDBACK:

Block diagram of typical op-amp, Electrical characteristics of an op-amp, Ideal op-amp characteristics, Equivalent circuit of an op-amp, Ideal voltage transfer curve. Block diagram representation of feedback configurations: voltage-series feedback, voltage shunt feedback, Current-series feedback, Current-shunt feedback amplifier

Voltage-series and Voltage shunt feedback amplifier analysis: closed loop voltage gain, difference input voltage ideally zero, input resistance with feedback, output resistance with feedback, Bandwidth with feedback, total output offset voltage with feedback, Voltage follower

GENERAL LINEAR APPLICATIONS OF OPERATIONAL AMPLIFIER:

Summing, Scaling and Averaging Amplifiers, A Subtractor, Differential Amplifier, Instrumentation Amplifier, Instrumentation amplifier using Transducer bridge, the Differentiator,Integrator.

ACTIVE FILTERSAND 555TIMERS:

Filter definition, Classification of Filters, First order low pass filter butter worth filter, Filter design, Frequency scaling, First order high pass filter butter

worth filter, Filter design, Frequency scaling. Basic Comparator, 555 Timer and its applications,PLL.

DIGITAL LOGIC AND BOOLEAN ALGEBRA:

Number systems and codes, Basic gates: OR, AND, NOT, universal gates:NAND, NOR, Boolean laws& theorems, representation of switching functions, Karnaugh map representation, minimization using Karnaugh map, SOP and POS methods.

COMBINATIONAL AND SEQUENTIAL CIRCUITS :

Arithmetic circuits : Half & full adders and subtractors , 4 bit binary adder,Data processing circuits : Multiplexers, demultiplexers, Decoder, seven segment decoders, Encoders.Flip flops :RS flip flops, D flip flop,JK flip flops, master slave flip flop, T flip flopRegisters : serial in – Serial out, Serial in – parallel out, parallel in – Serial out , Parallel in - Parallel out,Design of Asynchronous & Synchronous Counters, mod counter , Decade counter

TEXT BOOKS:

1. Op-amps and linear integrated circuits by RamaKantA.Gayakwad, P.H.I.

2. Linear Integrated Circuits –D. Roy Chowdhury, New Age International (p) Ltd, 2nd Ed., 2003.

3. Digital Logic and Computer Design by M. Morris Mano, P.H.I.

4. Digital Integrated Electronics. Herbert Taub and Donald Schilling, Mcgraw Hill Co.

REFERENCE BOOKS

1. Op-amps and linear integrated circuits by Robert Coughlin.

2. Applications of analog integrated circuits by Sidneysoclof PHI.

3. Design with Operational Amplifiers and Analog Integrated Circuits - Sergi Franco, McGrawHill, 3rdEd., 2002.

4. Digital Principles and Applications. Albert paulMalvino and Donaldp. Leach, T.M.H.

IN 2205 : PYTHON PROGRAMMING

Course Objectives

1. To develop skills on procedural oriented and object oriented programming in Python

2. To understand and apply different data wrangling techniques using Python.

3. To perform data analysis using python libraries like NumPy, Pandas and exploratory data analysis using Matplotlib

Course Outcomes

At the end of the course, a student should be able to:

1. acquire programming knowledge on Basics of Python
2. acquire programming knowledge on Text and File Handling
3. develop Python programs to Mean, Median, Mode, Correlation
4. acquire programming knowledge on NumPy, Pandas Library
5. acquire programming knowledge on Graph Visualizations in Python and Data Analysis using Python

SYLLABUS

1. Introduction to Python: Rapid Introduction to Procedular Programming, Data Types: Identifiers and Keywords, Integral Types, Floating Point Types

Strings: Strings, Comparing Strings, Slicing and Striding Strings, String Operators and Methods, String formatting with str.format

Collections Data Types: Tuples, Lists, Sets, dictionaries, Iterating and copying collections

2. Python Control Structures, Functions and OOP:Control Structures and Functions: Conditional Branching, Looping, Exception Handling, Custom Fuctions

Python Library Modules: random, math, time, os, shutil, sys, glob, re, statistics,creating a custom module

Object Oriented Programming: Object Oriented Concepts and Terminology, Custom Classes, Attributes and Methods, Inheritance and Polymorphism, Using Properties to Control Attribute Access

File Handling: Writing and Reading Binary Data, Writing and Parsing Text Files

3. NumPy Arrays and Vectorized Computation: NumPy arrays, Array creation, Indexing and slicing, Fancy indexing, Numerical operations on arrays, Array functions, Data processing using arrays, Loading and saving data, Saving an array, Loading an array, Linear algebra with NumPy, NumPy random numbers

4. Data Analysis with Pandas: An overview of the Pandas package, The Pandas data structure-Series, The DataFrame, The Essential Basic Functionality: Reindexing and altering labels , Head and tail, Binary operations, Functional statistics , Function application Sorting, Indexing and selecting data, Computational tools, Working with Missing Data, Advanced Uses of Pandas for Data Analysis - Hierarchical indexing, The Panel data

5. Data Analysis Application Examples: Data munging,Cleaning data, Filtering, Merging data, Reshaping data, Data aggregation, Grouping data

6. Data Visualization: The matplotlib API primer-Line properties, Figures and subplots, Exploring plot types-Scatter plots, Bar plots, Histogram plots, Legends and annotations, Plotting functions with Pandas

Text Books

1. Programming in Python 3: A Complete Introduction to Python Language, Mark Summerfield, Second Edition, Addison-Wesley Publications
2. Python: End-to-End Data Analysis Learning Path, Module 1: Getting Started with Python Data Analysis , Phuong VothiHong , Martin Czygan, , Packt Publishing Ltd

Reference Books

1. Learning Python, 5th Edition, Mark Lutz, Orielly Publications
2. Python for Data Analysis, Wes McKinney, Orielly Publications
3. How to Think Like a Computer Scientist: Learning with Python 3 Documentation 3rd Edition, Peter Wentworth, Jeffrey Elkner, Allen B. Downey, Chris Meyers
4. Core Python Programming, Second Edition, Wesley J. Chun, Prentice Hall
5. Python Cookbook – Recipes for Mastering Python 3,3rdEdition, David Beazley, Brian K. Jones, Oreilly

2206 : DIGITAL LOGIC DESIGN Lab

Course Educational Objective: This course gives an overview of logic gates, Adders and Subtractors, Code converters, Decoders and multiplexers.

Course Outcomes: At the end of the course, the student will be able to

CO1 :Understand the operation of different types of Flip Flops and logic circuits
CO2: Analyze the characteristics of logic circuits
CO3: Design an logic circuit

List of Experiments

1. Verification of Logic gates
2. Construction of adders and subtrators
3. Code converters
4. Four bit Adder
5. BCD to 7 Segment display
6. Decoders
7. Multiplexers
8. Verification of Flip Flops using SSI gates.
9. Ripple counters
10. MOD 11 Ripple counters.

2207 : Electrical measurements lab

Course Objectives:

This course provides

* Adequate knowledge of constructing DC and AC bridge circuits and implementing bridge balancing conditions for measurement of resistance, inductance and capacitance.

* Immense knowledge on calibration of ammeters and voltmeters and their range extensions

* Practical capability for handling CRO for measurement of various parameters

* Exposure to measure power in single phase and three phase circuits

Course Outcomes:

The student will be able to

* Design and construction of bridge circuits for measuring various parameters

* Handle CRO

* Calibrate devices like ammeters, voltmeters, watt meters and energy meters

List of Experiments:

1. Measurement of Low Resistance by Kelvin's Double Bridge Method.
2. Measurement of Inductance of low Q coils (1<Q<10) by maxwells bridge
3. Measurement of Inductance of high Q coils (Q>10) by hay bridge
4. Measurement of capacitance by Schering bridge
5. Study of Galvanometer and Determination of Sensitivity and Galvanometer Constants.
6. Calibration of Voltmeters
7. Calibration of Ammeters
8. Extension of ranges of ammeters and voltmeters
9. Testing of Energy meters (Single phase type).
10. Measurement of voltage, current using CRO.
11. Measurement of Phase in CRO using Lissajous figures
12. Measurement of Power in a single phase circuit
13. Measurement of Power and Power Factor in a three phase AC circuit by two-wattmeter method.
14. Measurement of R, L and C using Q meter

IN 2208 : PYTHON PROGRAMMING LAB

Course Objectives

1. familiarize students with key data structures in Python including lists and dictionaries and apply them in context of searching, sorting, text and file handling

2. introduce students to calculation of statistical measures using Python such as measures of central tendency, correlation

3. familiarize students with important Python data related libraries such as Numpy and Pandas and use them to manipulate arrays and dataframes

4. introduce students to data visualization in Python through creation of line plots, histograms, scatter plots, box plots and others

5. implementation of basic machine learning tasks in Python including pre-processing data, dimensionality reduction of data using PCA, clustering, classification and cross-validation.

Course Outcomes

After completion of the course the student should be able to:

1. implement searching, sorting and handle text and files using Python data structures such as lists and dictionaries

2. calculate statistical measures using Python such as measures of central tendency, correlation

3. use Python data related libraries such as Numpy and Pandas and create data visualizations

4. implement basic machine learning tasks pre-processing data, compressing data, clustering, classification and cross-validation.

SYLLABUS

1. Python Programs on lists & Dictionaries

2. Python Programs on Searching and sorting

3. Python Programs on Text Handling

4. Python Programs on File Handling

5. Python Programs for calculating Mean, Mode, Median, Variance, Standard Deviation

6. Python Programs for Karl Pearson Coefficient of Correlation, Rank Correlation

7. Python Programs on NumPy Arrays, Linear algebra with NumPy

8. Python Programs for creation and manipulation of DataFrames using Pandas Library

9. Write a Python program for the following.

* Simple Line Plots,

* Adjusting the Plot: Line Colors and Styles, Axes Limits, Labeling Plots,

* Simple Scatter Plots,

* Histograms,

* Customizing Plot Legends,

* Choosing Elements for the Legend,

* Boxplot

* Multiple Legends,

* Customizing Colorbars,

* Multiple Subplots,

* Text and Annotation,

* Customizing Ticks

10. Python Programs for Data preprocessing: Handling missing values, handling categorical data, bringing features to same scale, selecting meaningful features

11. Python Program for Compressing data via dimensionality reduction: PCA

12. Python Programs for Data Clustering

13. Python Programs for Classification

14. Python Programs for Model Evaluation: K-fold cross validation

Reference Books

1. Core Python Programming, Second Edition, Wesley J. Chun, Prentice Hall

2. Chris Albon, “Machine Learning with Python Cookbook-practical solutions from preprocessing to Deep learning”, O’REILLY Publisher,2018

3. Mark Summerfield, Programming in Python 3—A Complete Introduction to the Python Language, Second Edition, Additson Wesley

4. Phuong Vo.T.H , Martin Czygan, Getting Started with Python Data Analysis, Packt Publishing Ltd

5. Armando Fandango, Python Data Analysis, Packt Publishing Ltd

6. Magnus Vilhelm Persson and Luiz Felipe Martins, Mastering Python Data Analysis, Packt Publishing Ltd

7. Sebastian Raschka& Vahid Mirjalili, “Python Machine Learning”, Packt Publisher, 2017

2209 : ENVIRONMENTAL SCIENCE

(Common for all Branches)

Course Objectives

The objectives of the Environmental Science course are to

* Familiarize the fundamental aspects of environment and the environmental management'

* Provide information of some of the important international conventions which will be useful during the future endeavors after graduation.

* Make realize the importance of natural resources management for the sustenance of the life and the society.

* Apprise the impact of pollution getting generated through the anthropogenic activities on the environment

* Provide the concept of Sustainable Development, energy and environmental management

* Impart knowledge on the new generation waste like e-waste and plastic waste.

Course Outcomes

After completion of the course the students will have

* Knowledge on the fundamental aspects of environment and the environmental management

* The knowledge on the salient features of the important international conventions

* Understanding of the importance of natural resources management for the sustenance of the life and the society.

* Familiarity on various forms of pollution and its impact on the environment.

* Understand the elements of Sustainable Development, energy and environmental management

* Knowledge on the new generation waste like e-waste and plastic waste.

SYLLABUS

Introduction: Structure and functions of Ecosystems-Ecosystems and its Dynamics-Value of Biodiversity-impact of loss of biodiversity, Conservation of bio-diversity. Environmental indicators - Global environmental issues and their impact on the ecosystems.

Salient features of International conventions on Environment: Montreal Protocol, Kyoto protocol, Ramsar Convention on Wetlands, Stockholm Convention on Persistent Organic Pollutants, United Nations Framework Convention on Climate Change (UNFCCC),

Natural Resources Management: Importance of natural resources management-Land as resource, Land degradation, Soil erosion and desertification, Effects of usage of fertilizer, herbicides and pesticide- watershed management.

Forest resources: Use and over-exploitation, Mining and dams – their effects on forest ecosystems and the living beings.

Water resources: Exploitation of surface and groundwater, Floods, droughts, Dams:benefits and costs.

Mineral Resources: Impact of mining on the environment and possible environmental management options in mining and processing of the minerals. Sustainable resource management (land, water, and energy), and resilient design under the changing environment.

Environmental Pollution: Local and Global Issues. Causes, effects and control measures. Engineering aspects of environmental pollution control systems.

Air pollution: impacts of ambient and indoor air pollution on human health. Water pollution: impacts water pollution on human health and loss of fresh water resources. Soil pollution and its impact on environment. Marine pollution and its impact on blue economy. Noise pollution.

Solid waste management: Important elements in solid waste management- Waste to energy concepts. Air (prevention and control of pollution) Act, Water (prevention and control of pollution) Act and their amendments. Salient features of Environmental protection Act, 1986.

Sustainable Development: Fundamentals of Sustainable Development– Sustainability Strategies and Barriers – Industrialization and sustainable development. Circular economy concepts in waste (solid and fluid) management.

Energy and Environment: Environmental Benefits and challenges, Availability and need of conventional energy resources, major environmental problems related to the conventional energy resources, future possibilities of energy need and availability. Solar Energy: process of photovoltaic energy conversion, solar energy conversion technologies and devices, their principles, working and applications, disposal of solar panel after their usage. Biomass energy: Concept of biomass energy utilization, types of biomass energy, conversion processes, Wind Energy, energy conversion technologies, their principles, equipment and suitability in context of India.

Management of plastic waste and E-waste: Sources, generation and characteristics of various e- and plastic wastes generated from various industrial and commercial activities; Waste management practices including onsite handling, storage, collection and transfer. E-waste and plastic waste processing alternatives. E-Waste management rules and Plastic waste management rules, 2016 and their subsequent amendments.

Text Books:

1. Bharucha,Erach (2004). Textbook for Environmental Studies for Un- dergraduate Courses of all Branches of Higher Education, University Grants Commission, New Delhi.
2. Basu, M., Xavier, S. (2016). Fundamentals of Environmental Studies, Cambridge University Press, India
3. Masters, G. M., &Ela, W. P. (1991). Introduction to environmental engi- neering and science. Englewood Cliffs, NJ: Prentice Hall.
4. Enger, E. and Smith, B., Environmental Science: A Study of Interrela-tionships, Publisher: McGraw-Hill Higher Education; 12th edition, 2010. Reference Books:
1. Sharma, P. D., & Sharma, P. D. (2005). Ecology and environment.Rastogi Publications
2. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
3. Clark R.S. (2001). Marine Pollution, Clanderson Press Oxford (TB)
4. Jadhav, H & Bhosale, V.M. (1995). Environmental Protection and Laws.Himalaya Pub. House, Delhi 284 p.
5. MoEF&CC, Govt. of India, CPCB: E-waste management rules, 2016and its amendments 2018.
6. MoEF&CC, Govt. of India, CPCB: Plastic waste management rules,2016.