INSTRMENT TECHNOLOGY

SCHEME AND SYLLABI (with effect from 2021-22)

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
IN1101	BS	Mathematics – I	4	0	30	70	100	3
IN1102	BS	Physics	4	0	30	70	100	3
IN1103	ES	Engineering Graphics	2	3	30	70	100	3
IN1104	ES	Electronic Devices and Circuits	4	0	30	70	100	3
IN1105	ES	Material Science	4	0	30	70	100	3
IN1106	ES	Workshop	0	3	50	50	100	1.5
IN1107	BS	Physics Lab	0	3	50	50	100	1.5
IN1108	ES	Electronic Devices & Circuits Lab	0	3	50	50	100	1.5
		Total Credits						19.5

B. Tech&B. Tech+M. Tech I Year - II Semester

IN1201	BS	Mathematics – II	4	0	30	70	100	3
IN1202	BS	Chemistry	4	0	30	70	100	3
IN1203	HSS	English	4	0	30	70	100	3
IN1204	ES	Computer Programming and Numerical Methods	4	0	30	70	100	3
IN1205	ES	Analog Electronic Circuits	4	0	30	70	100	3
IN1206	HSS	English Language Lab	0	3	50	50	100	1.5
IN1207	BS	Chemistry Lab	0	3	50	50	100	1.5
IN1208	ES	Computer Programming and Numerical Methods Lab	0	3	50	50	100	1.5
		Total Credits						19.5

B.Tech& B.Tech+M.Tech II Year - I Semester

IN2101	BS	Mathematics- III	4	0	30	70	100	3
IN2102	PC	Strength of Materials and Theory of Machines	4	0	30	70	100	3
IN2103	PC	Electrical Machines	4	0	30	70	100	3
IN2104	PC	Sensors and Transducers	4	0	30	70	100	3
IN2105	HSS	Managerial Economics	4	0	30	70	100	3
IN2106	PC	Analog Electronic Circuits LAB	0	3	50	50	100	1.5
IN2107	PC	Transducers LAB	0	3	50	50	100	1.5
IN2108	PC	Electrical Machines LAB	0	3	50	50	100	1.5
IN2109	SC	Object Oriented Programming through C++	1	2	50	50	100	2
IN2110	MC	Professional Ethics and Universal Human Values	0	0	-	100	100	0
IN2111	MC	NCC/NSS	0	2	-	-	-	0
		Total Credits						21.5

B.Tech& B.Tech+M.Tech II Year - II Semester

IN2201	BS	Mathematics- IV	4	0	30	70	100	3
IN2202 1003	PC	Electrical Measurements and Measuring Instruments	4		0	30	70	
IN2203	PC	Signals and Systems	4	0	30	70	100	3
IN2204	PC	Op Amps and Linear IC Applications	4	0	30	70	100	3
IN2205	PC	Digital Logic Design	4	0	30	70	100	3
IN2206	PC	DLD Lab	0	3	50	50	100	1.5
IN2207	PC	Electrical Measurements Lab	0	3	50	50	100	1.5
IN2208	SC	MATLAB Skills	1	2	50	50	100	2
IN2209	MC	Environmental Science	0	0	-	100	100	0
		Total Credits						20.0

Internship-I

B.Tech& B.Tech+M.Tech III Year - I Semester

IN3101	PC	Control Systems	4	0	30	70	100	3
IN3102	PC	Microprocessors and Microcontrollers	4	0	30	70	100	3
IN3103	PC	Industrial Instruments	4	0	30	70	100	3
IN3104	PE	Professional Elective-I	4	0	30	70	100	3
IN3105	OE	OpenElective-I	4	0	30	70	100	3
IN3106	PC	Industrial Instruments Lab	0	3	50	50	100	1.5
IN3107	PC	Control Systems Lab	0	3	50	50	100	1.5
IN3108	SC	LABVIEW	1	2	50	50	100	2
IN3109	INT	Internship-I			50	50	100	2
		Total Credits						22.0

B.Tech& B.Tech+M.Tech III Year - II Semester

IN3201	PC	Digital Signal Processing	4	0	30	70	100	3
IN3202	PC	Process Control and Control components	4	0	30	70	100	3
IN3203	PC	Biomedical Instrumentation	4	0	30	70	100	3
IN3204	PE	Professional Elective-II	4	0	30	70	100	3
IN3205	OE	Open Elective-II	4	0	30	70	100	3
IN3206	PC	Microprocessors Lab	0	3	50	50	100	1.5
IN3207	PC	Process Control Lab	0	3	50	50	100	1.5
IN3208	PC	Bio-Medical Instrumentation Lab	0	3	50	50	100	1.5
IN3209	SC	Soft Skills	1	2	50	50	100	2
		Total Credits						21.5

Internship-II

B.Tech&B.Tech+M.Tech IV Year - I Semester

IN4101	PE	Professional Elective-III	4	0	30	70	100	3
IN4102	PE	Professional Elective-IV	4	0	30	70	100	3
IN4103	PE	Professional Elective-V	4	0	30	70	100	3
IN4104	OE	Open Elective-III	4	0	30	70	100	3
IN4105	OE	Open Elective-IV	4	0	30	70	100	3
IN4106	HSSE	HSS Elective	4	0	30	70	100	3
IN4107	SC	VHDL Programming	1	2	50	50	100	2
IN4108	INT	Internship - II			50	50	100	2
		Total Credits						22.0

B.Tech& B.Tech+M.Tech IV Year - II Semester

IN4201	PROJ	Project Work			100	100	200	14
		Total Credits						14.0

PROFESSIONAL ELECTIVES

1. Electronics instrumentation
2. Advanced sensors
3. Analog signal processing
4. Power plant Instrumentation
5. Steel Plant Instrumentation
6. Industrial safety Instruments
7. Instrumental communication & Networks
8. VLSI Design
9. Virtual Instrumentation
10. Computer Control processes
11. Advanced control theory
12. Robotics and computer control components
13. Design of Instrument Systems
14. Fibre optics & Laser Instrumentation
15. Analytical Instrumentation

OPEN ELECTIVES

1. Industrial electronics
2. Artificial Intelligence
3. Digital Image processing
4. Computer Organization and Architecture
5. Fundamentals of Nano sensors
6. Programmable control systems
7. Telemetry
8. IOT sensors and Devices
9. Communication systems
10. Micro and Nano Sensors
11. Advanced sensing techniques
12. Non-destructive testing

HSS ELECTIVES

1. Industrial Management and Entrepreneurship
2. Organizational Behavior
3. Operational Research

IN1101MATHEMATICS-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:

1. 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.

IN1102 : 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.

TextBooks :

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

IN1103 : 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.

ReferenceBooks :

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

IN1104 : 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

Reference Books:

1.Electronic Devices and circuits, K. Lal Kishore B.S. Publications

2. Electronic Devices and circuits, G.S.N. Raju, I.K. International publications, New Delhi

IN1105 : 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. Power metallurgy: Steps in Powder Metallurgy Processes- Powder production, Compaction, Sintering, & Secondary operations

Text Books:

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

IN1106 : 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.

Reference Books:

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.

IN1107 : 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_o and Extraordinary m_e ray.
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.

IN1108 : Electronic Devices and Circuits Laboratory

Course Objective:

* The course gives an overview of basic lab equipment 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

IN1201 : 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 Books:

1.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 : CHEMISTRY

Course Objectives:

* To apply the basic knowledge of Chemistry to the Engineering Discipline.

* To develop knowledge about water and its treatment for industrial and potable purposes.

* To develop understanding in the areas of Polymers, Mechanism of Corrosion of Metals and Corrosion Control Methods, Fuels, Lubricants and Nanomaterials for of conducting polymers, bio-degradable polymers and fiber reinforced plastics and apply the knowledge for solving existing challenges faced in various engineering and societal areas.

Course outcome:

* This course applies the basic concepts and principles studied in Chemistry to Engineering.

* It provides an application of chemistry to different branches of engineering

* The students will be able acquire knowledge in the areas of Water Chemistry,Polymers, Corrosion, Fuels and Lubricants and nanomaterials and suggest innovative solutions for existing challenges in these areas.

SYLLABUS

Water Chemistry: 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.

Polymers and Plastics: Polymers:Definition – Types of Polymerization (Addition & Condensation) – Mechanisms of Addition Polymerization – Radical and Ionic – Thermodynamics of Polymerization Process. Plastics:Thermosetting and Thermoplastics – Effect of Polymer Structure on Properties of Cellulose Derivatives – Vinyl Resins – Nylon (6,6), Reinforced Plastics – Conducting Polymers.

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 – Chemical conversion Coatings – Phosphate, Chromate, Anodized, Organic Coatings – Paints and Special Paints.

Fuels and Lubricants: Solid Fuels:Wood and Coal, Ranking of Coal – Analysis (Proximate and Ultimate) Coke Manufacture – Otto Hoffmann's Process – Applications; Liquid Fuels:Petroleum Refining – Motor Fuels – Petrol and Diesel Oil – Knocking – Octane number – Cetane Number; Gaseous Fuels:Biogas, LPG and CNG – Characteristics – Applications; Rocket Fuels:Propellants – Classification – Characteristics

Lubricants:Classification – Mechanism – Properties of Lubricating Oils – Selection of Lubricants for Engineering Applications.

Nanomaterials: Nanomaterials, Properties and application of fullerenes, fullerols, Carbon nanotubes and nanowires. Synthesis - Top-down and Bottom-up approaches - Nanocomposites - Nanoelectronics- Applications of nanomaterials in catalysis, telecommunication and medicine.

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.

Reference Books:

1. Engineering Chemistry – B. K. Sharma – Krishna Prakashan – Meerut.

2. Introduction to Nanoscience - S. M. Lindsay - Oxford University Press

3. Engineering Chemistry - B. L. Tembe, Kamaluddin and M. S. Krishnan, (NPTEL).

IN1203 : 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

ChinduYellama

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

Text Book:

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

Reference Books:

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.

IN1204 COMPUTER PROGRAMMING AND NUMERICAL METHODS

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

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.

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.

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.

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

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.

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

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 Books:

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.

IN1205 : ANALOG ELECTRONIC CIRCUITS

Course Objectives:

In this course student will learn about

* Analysis of single and multistage amplifiers.
* Frequency response of single and multistage 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 multistage 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

SYLLABUS

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, Trans resistance 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:

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

2. Electronic Devices and circuits Theory, Boylsted, Prentice Hall Edition

Reference Books:

1.Electronic Devices and circuits, K. Lal Kishore B.S. Publications

2. Electronic Devices and circuits, G.S.N. Raju, I.K. International publications, New Delhi

IN1206 : 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.

IN1207 : CHEMISTRY LAB

Course Objectives:

* To develop the fine skills of quantitative determination of various chemical components through titrimetric analysis

* To prepare and use ionexchange/ zeolite columns for the removal of hardness of water

* To develop the skill of organic synthesis through the preparation of a polymer/ drug

Course Outcomes:

* The course provides quantitative determine the amount of various chemical species in solutions by titrations and conduct the quantitative determinations with accuracy

* The course provides to develop novel materials to be used as zeolite and prepare columns for removal of hardness of water

* The course provides to synthesize 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 Fe(II)/Mohr's Salt by Permanganometry
4. Determination of Oxalic Acid by Permanganometry
5. Determination of Chromium (VI) by Mohr's Salt Solution
6. Determination of Zinc by EDTA method
7. Determination of Hardness of Water sample by EDTA method
8. Determination of Chlorine in water by Iodometric Titration
9. Ionexchange/ Zeolite column for removal of hardness of water
10. 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.

IN1208 : 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 sub-string 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

Course Objectives:

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

* About the gradient, divergence and curl under the differentiation of scalar and vector point functions, also on Line-, Surface-and Volume integralsunder 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 theirapplications.

* 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 Partial Differential Equations, Homogeneous and Nonhomogeneouslinear 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 flowequations, Laplace's equation in Cartesian and polar coordinates, and howto 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.

Course 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,Vectornormal to a surface, maximumrate of change of a scalar field, test whether two surfaces are to cut orthogonally ornot.

* find the rate per unit volume at which the physical quantity is issuing from a point,the rate of inflowminus outflow using the Diver gence and the angular velocity of rotation at any point of the vector field using the Curl.

* test whether the given motion is irrotationalorrotational, whether avector forceacting on a particle is conservative or not

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

* obtain the well known Laplace and poissone quations from an irrotational field

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

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

* apply the vector integral theorems (Green's theoremin the plane,Stoke's and Diver gence the orems) forevaluating the double and triple integrals as these are used tofindareasandvolumes.

* 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 anelasticbeam, bending of beams, electrical circuits, free and forced vibrations of amembrane and transmission lines,etc.

SYLLABUS

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 divergenceandcurl. Physical interpretation of gradient, divergence and culrl (i.e., 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 the orems without proofs)

Introduction of orthogonal curvilinearcoordinates, cylindrical and spherical polarcoordinates

Partial Differential Equations:

Formation of partialdifferentialequations, 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 Heatflowequation, Two dimensional heat flow insteady state-solution of Laplace's equation in Cartesian and polar coordinates (two dimensional).

Integral Transforms (Fourier Transform): Introduction, definition, Fourierintegral, Sine and Cosine integrals, Complex form of Fourierintegral, Fouriertransform,Fourier Sineand Cosinetrans forms, Finite Fourier Sine and Cosinetrans forms, properties of Fouriertrans forms.

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

Text Books:

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

Reference Books:

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

2. Advanced Engineering Mathematics by Erwin Kreyszig.

3. Atextbook 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.

IN2102 STRENGTH OF MATERIALS AND THEORY OF MACHINES

Course Objectives:

* The basic objective of including this course is to bring awareness in the students about thesubject

* Theory of machines, is that branch of Engineering science which deals with the study ofrelative motion between the various parts of a machine and forces which act on them.

* The strength of materials is a subject from which the stress, strain and several other load factors thatapply for a cantilever & beam can be inferred.

* It brings an insight into various topics of friction,link & element mechanisms.

Course Outcomes:

* Theory of machines gives an idea about several mechanisms which wecome across in several Industries & in our day to day life.

* The students could properly identify the mechanisms that run typical machines.

* This is important because every process industry a student joins needs the basic knowledge about the mechanisms & mechanical science.

SYLLABUS

Simple stresses and strains – Tensile, compressive and shear stresses. Elastic limit, Hook's law, stress-strain relation, poission's ratio, Relationship between Modulus of Elasticity and Modulus of Rigidity. Stresses in bars of varying section, Stresses in bars of composite sections, temperature stresses.

Shear Force Bending Moments– Definitions, Cantilever with concentrated load, uniformly distributed loads, load whose intensity varies uniformly, S.F and B.M diagrams, Simply supported beams with pointed loads, uniformly distributed loads, load whose intensity varies uniformly, S.F and B.M diagrams.

Simple Mechanisms: Link and element, lower and higher pairs, kinematic pairs, types of kinematic pairs, kinematic chain, Mechanism, Inversion, degrees of freedom, joint, Grubler's criteria, Mechanisms with turning and sliding pairs : Four bar mechanism and Inversions of Four bar mechanism, Single slider crank chain and Inversions of Single slider crank chain, Double slider crank chain and Inversions of Double slider crank chain.

Mechanisms with lower pairs- pantograph, Exact straight line mechanisms: Scott-Russel mechanism, Peaucellier mechanism, Harts mechanism, Approximate straight line mechanisms- Modified Scott Russel mechanism, Watt's mechanism ,Tchebicheff's mechanism, Roberts mechanism, Grasshopper mechanism.

Friction and bearings- Friction definition, types of friction, laws of Friction, limiting friction, limiting angle of Friction, angle of repose, Effort required to move a body on a rough horizontal plane, Effort required to move a body on an inclined plane: up the inclined plane and down the inclined plane, Efficiency of Inclined plane, friction between screw and nut, friction in journal bearings, friction circle.

Text Books:

1. Strength of Materials- S.Ramamrutham
2. Machines of structures- S.B.Junnarkar-
3. Theory of machines- Toft.L. and Kersy A.T.J

Reference Books:

1. Strength of materials- J.A.Taraporebala
2. Theory of machines - R.S.Kurmi and J.K.Gupta

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 Outcomes:

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

SYLLABUS

Poly Phase 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.

Reference Books:

1. Electrical machinery by Fitzgerald/kingsley/umans.

2. 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:

* The student will be able to understand about different types of instruments and their performance comparison

* Upon completion the student will be able to understand Mathematical Modelling of physical systems and their dynamic response response.

* 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.

SYLLABUS

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.

Text Books:

1. Patranabis D, "Sensors and Transducers", 2nd Edition, PHI, New Delhi, 2010.

2. Sawney A K and Puneet Sawney, "A Course in Mechanical Measurements and Instrumentation and Control, 12th edition", Dhanpat Rai and Co, New Delhi, 2013.

Reference Books:

1. E.A.Doebelin , "Measurement systems: application & design", Mc Graw Hill.

2. Bell David A. “Electronic Instrumentation and Measurements”, PHI / Pearson Education.

IN2105 : 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.

SYLLABUS

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.

IN2106 : 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

* Understand the operation of different types of amplifiers and oscillators.

* Analyze the characteristics of different types of amplifiers.

* 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 oscillator

INT2107

TRANSDUCERS LAB

Course Objectives:

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

* 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:

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

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

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

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

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

LIST OF EXPERIMENTS:

1. To Calibrate Strain gauge or Load Cell.
2. To study the Characteristics of Linear Variable Differential Transformer (LVDT).
3. Calibration of Pressure gauge using Dead weight tester.
4. Synchro Transmitter and Receiver.
5. Differential pressure transmitter
6. P/I converter.
7. Calibration of Level measurement.
8. Flapper Nozzle system
9. Precision measurement
10. Study of I/V & V/I converter.
11. Study of Instrumentation Amplifier
12. Water level measurement using Static pressure sensor

IN2108 : ELECTRICAL MACHINES LAB

Course Objective:

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

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

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

Course Outcomes:

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

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

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

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

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

* 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 the concepts well.

LIST OF EXPERIMENTS

1. Open circuit test on transformer
2. Ratio polarity test
3. Swin burns test
4. Power measurement using 3 ammeter method
5. Power transformer direct loading
6. Load test on dc shunt generator
7. Circle diagram three phase induction motor
8. Short circuit test on transformer
9. Open circuit characteristics of a dc generator
10. Load test on dc shunt motor

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++

SYLLABUS

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.

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 Pro tected 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

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

IN2110 : Professional Ethics and Universal Human Values

(Common for all Branches)

Course Objectives:

The objective of the course is Six fold:

* Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
* This course will illuminate the students in the concepts of laws and its applicability to engineers
* Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
* Strengthening of self-reflection, Development of commitment and courage to act and also enable the students to imbibe and internalize the Values and Ethical Behaviour in the personal and professional lives
* To enable the students to imbibe the Values and Ethical Behavior in the personal and Professional lives
* The students will learn the rights and responsibilities Individual, employee, team member and a global citizen

Course Outcomes:

By the end of the course Student will be able to:

* Grasp the meaning of the concept – Law and also Get an overview of the laws relating to Engineers and also Apprehend the importance of being a law abiding person and They would have better critical ability
* Self-explore by using different techniques to live in harmony at various levels
* Analyze themselves and understand their position with respect to the moral and ethical character needed for a successful and satisfactory work life
* Students are expected to become more aware of themselves and their surroundings (family, society, nature)
* They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
* They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society

Syllabus

Need, Basic Guidelines, Content and Process for Value Education Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation - as the process for self-exploration, Continuous Happiness and Prosperity - A look at basic Human Aspirations,Right understanding, Relationship and Physical Facility - the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfill the above human aspirations: understanding and living in harmony at various levels. Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking, Include practice sessions and case studies.

Understanding Harmony in the Human Being - Harmony in Myself! Understanding human being as: a co-existence of the sentient 'I' and the material 'Body', the needs of Self ('I') and 'Body' - happiness and physical facility, the Body as an instrument of 'I' (I being the doer, seer and enjoyer), the characteristics and activities of 'I' and harmony in 'I', the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail, P to ensure Sanyam and Health, Include practice sessions and case studies.

Understanding Harmony in the Family and Society - Harmony in Human – Human Relationship Understanding values in human-human relationship: meaning of Justice (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship, the meaning of Trust; Difference between intention and competence, the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship, the harmony in the society (society being an extension of family), Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society, Universal Order from family to world family, Include practice sessions and case studies.

Understanding Harmony in the Nature and Existence - Whole existence as Coexistence Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature recyclability and self-regulation in nature, Understanding Existence as Co-existence of mutually interacting units in all – pervasive space, Holistic perception of harmony at all levels of existence, Include practice sessions and case studies.

Concept of Law and Law of Torts Understanding Essentials of a Valid Contract and the basics of contract law protecting rights and obligations, Introduction to the Law of Torts and the basics to protect oneself and the company Law affecting the Workplace Employers Responsibilities/Duties Hiring Practices, Introduction to Intellectual Property Law, Professional Code of Conduct for Engineers, Relationship between Law and Ethics, Include practice sessions and case studies.

Implications of the above Holistic Understanding of Harmony on Professional Ethics Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations, Include practice sessions and case studies.

Text Books

1. R R Gaur, R Asthana, G P Bagaria, “A Foundation Course in Human Values and Professional Ethics”, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1

2. R R Gaur, R Asthana, G P Bagaria, “Teachers’ Manual for A Foundation Course in Human Values and Professional Ethics”, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

3. R. Subramanian, “Professional Ethics”, Oxford University Press.

4. S.B. Srivasthva, “Professional Ethics & Human Values”, SciTech Publications (India) Pvt. Ltd. New Delhi.

5. D.R. Kiran, “Professional Ethics & Human Values”, TATA Mc Graw Hill Education.

6. Saroj Kumar, “Business Law” and Avtar Singh, “Law of Contract”

Reference Books

1. Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999.

2. A. N. Tripathi, “Human Values”, New Age Intl. Publishers, New Delhi, 2004.

3. The Story of Stuff (Book), Mohandas Karamchand Gandhi “The Story of My Experiments with Truth”, E. FSchumacher. “Small is Beautiful”, Slow is Beautiful –Cecile Andrews, J C Kumarappa “Economy of Permanence”, Pandit Sunderlal “Bharat Mein Angreji Raj” and Dharampal, “Rediscovering India

4. G K Kapoor, “Business Law” and Sen & Mitra, “Business & Commercial Laws” and Calvin Frank Allen, “Business law for Engineers”

5. Hilgard, E. R.; Atkinson, R. C. & Atkinson, R.L. (1975). Introduction to Psychology. 6th Edition. New Delhi: Oxford and IBH Publishing Co. Pvt. Ltd.

6. Govindarajan, M; Natarajan, G. M. &Senthilkumar, V.S. (2013). Professional Ethics & Human Values. Prentice Hall: New Delhi

7. Gogate, S. B. (2011). Human Values & Professional Ethics. Vikas Publishing: New Delhi.

8. Charles E Harris Jr., Michael S Pritchard, Michael J Rabins, “Engineering Ethics, Concepts Cases: 4e, Cengage learning, 2015.

9. Caroline Whitbec, “ Ethics in Engineering Practice & Research: 2e, Cambridge University Press 2015.

IN2201 : MATHS -IV

Course 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 ofhypothesis.

* They should be able to evaluate 5ØMÜ-transform, inverse 5ØMÜ-transforms and apply these transforms to solve differenceequations.

* The student should be able to know the techniques in the evaluation of numerical solution of ordinary differentialequations.

SYLLABUS

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, Geometricalre presentation of f(z). Integration of complex functions, Cauchy’s theorem, Cauchy’s integral formula and their applications.

Conformal Mappings and Contour Integration: Introduction to Conformaltrans formation, Bilinear transformation?

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. IntroductiontoZ-Transforms-Somestandard 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 toDifference equations.

Correlation, Regression and Distributions: Introduction - correlation - coefficient of correlation -Lines of regression. Introduction toDiscrete 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 ofsignificance of large samples- comparison of large samples- Test of significance for meansof two large samples. Student t-distribution - Significance test of sample mean - Significance test of difference between samplemeans-Chi-squaretest-Goodness offit-F-distribution.

TextBook:

1. Scope and treatment a sin" Higher Engineering Mathematics", by Dr.B.S.Grewal, 43rdEdition, Khanna Publications.

Reference Books:

1. Graduate Engineering Mathematics by VB 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, TataMc Graw Hill Company.
6. Engineering Mathematics series by Chandrica Prasad.

IN2202 : 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

SYLLABUS

Measurement of Resistance, 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.

Measurement 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.

Reference Books:

1. Electrical measurements and Measuring instruments By Rajendra Prasad.
2. Electrical measurement and measuring Instruments by Golding and Widdis.

IN2203 : SIGNALS AND SYSTEMS

Course 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:

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

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

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

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

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

SYLLABUS

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 Books:

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

IN2204 : OPAMPS AND LINEAR IC APPLICATIONS

Course Objectives:

* The operational amplifier is responsible for a dramatic and continuing revolution in our approach to analog system design.

* The availability of high performance, inexpensive devices influences the entire spectrum of circuits and systems, ranging from simple, mass-produced circuits to highly sophisticated equipment designed for complex data collection or processing operations.

* At one end of this spectrum, modern operational amplifiers have lowered cost and improved performance; at the other end, they allow us to design and implement systems for various purposes.

Course Outcomes:

* The final outcome of this subject is that they are used in designing many circuits like filters, multivibrators and different amplifier circuits.

SYLLABUS

Operational Amplifier: IC definition, advantages, Classification of ICs, 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, open loop operational amplifier configuration: Differential amplifier configuration, Inverting amplifier configuration and non-inverting amplifier configuration.

An Operational Amplifierwith Negative Feedback: Block diagram representation of feedback configurations: voltage-series feedback, voltage shunt feedback, Current-series feedback, Current-shunt feedback, Voltage-series 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 feeedback, Voltage follower, Voltage shunt

Feedback amplifier analysis: closed loop voltage gain, Inverting input terminal at virtual ground, input resistance with feedback, output resistance with feedback, Bandwidth with feedback, total output offset voltage with feeedback, Current-to-voltage converter, Inverter, Differential Amplifiers: Differential Amplifier with one Op-Amp Differential Amplifier with two Op-Amps.

The Practical Operational Amplifier: Introduction, Input offset voltage, Offset voltages, offset voltage null circuit, offset voltage compensating network, configurations of inverting and non- inverting amplifiers with feedback and offset- voltage compensation, thermal drift, noise.

General Applications of Operational Amplifier: DC and AC amplifiers, the Peaking Amplifier, Summing, Scaling and Averaging Amplifiers: Inverting configuration, Non Inverting configuration, Differential configuration, A Subtractor, Instrumentation amplifier, Instrumentation amplifier using Transducer bridge, V/I converter with floating load, low-voltage DC voltmeter, low-voltage AC voltmeter, V/I converter with grounded load, I/V converter, The Integrator, The Differentiator.

Active Filters: Filter definition, Classification of Filters, First order low pass filter butter worth filter, Filter design, Frequency scaling, Second order low pass filter butter worth filter, Filter design, First order high pass butter worth filter, Filter design, Second order high pass butter worth filter, High order filters, Band pass filters: wide band-pass filter, narrow band-pass filter, Band Reject Filters: wide band-reject filter, narrow band reject filter, All Pass Filter.

Specialized IC Applications: Logarithmic amplifier, antilog amplifier, Basic Comparator, Zero crossing detector, Schmitt Trigger, 555 Timer, 555 Timer as Monostable Multivibrator, Frequency divider, 555 Timer as Astable Multivibrator, free running ramp generator, block diagram of a Phase locked loop and its operating principle.

Text Books:

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

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

Reference Books:

1. Applications of analog integrated circuits by Sidneysoclof PHI.

IN2205 : DIGITAL ELECTRONICS AND LOGIC DESIGN

Course Objectives:

The objectives of this course are to:

Introduce the concept of digital and binary systems

* Be able to design and analyze combinational logic circuits.

* Be able to design and analyze sequential logic circuits.

* Understand the basic software tools for the design and implementation of digital circuits and systems.

* Reinforce theory and techniques taught in the classroom through experiments and projects in the laboratory.

Course Outcomes:

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

* Use the basic logic gates and various reduction techniques of digital logic circuit in detail.

* Design combinational and sequential circuits.

* Design and implement hardware circuit to test performance and application.

SYLLABUS

Number systems &codes : Review of number systems, weighted codes, conversion from one to another, non weighted codes, error detecting codes, error correcting codes , binary arithmetic.

Digital logic & Boolean algebra : Basic gates OR, AND, NOT, universal gates NAND ,NOR, introduction to HDL. Boolean law & theorems, representation of switching functions, Karnaugh map representation, minimization using Karnaugh map, SOP and POS methods. Design of single out put and multi out put functions using conventional gates

Combinational circuits: Arithmetic circuits : Half & full adders and subtractors , 4 bit binary adder, fast adder.

Data processing circuits : Multiplexers, demultiplexers, 1 of 16 decoder, seven segment decoders, encoders.

Synchronous circuits : RS flip - flops, gated flip - flops, edge triggered RS,D,JK flip - flops, master slave flip - flop, T flip- flop switch contact bounce circuits, analysis of sequential circuits.

Registers and Counters : Types of registers, serial in – Serial out, Serial in – parallel out, parallel in – Serial out , Parallel in - Parallel out registers, design of Asynchronous & Synchronous counters, mod counter , Decade counters, Presettable counters, Digital clock.

design of programmable logic array (PLA) and programmable array logic (PLD)

Text Books:

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

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

Reference Books:

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

IN 2206 : DIGITAL LOGIC DESIGN LAB

Course 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

* Understand the operation of different types of Flip Flops and logic circuits

* Analyze the characteristics of logic circuits

* Design an logic circuit

List of Experiments:

1. Verification of Logic gates
2. Construction of adders and subtractors
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 -N counters
11. UP/Down counters.
12. 4 Bit Shift Registers

IN2207 : 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

IN2208 : MATLAB Skills

Course Objectives:

* To study basics of MATLAB, functions and Data types.

* To learn and application of processing of Data techniques from different sources.

* To learn and create customized algorithms.

* To study about linear algebra Fourier transforms and Math functions for analyse data.

* To learn and create Two- and three-dimensional plots, images and graphs.

* To study about functions and file handling.

Course Outcomes:

After completion of the course the students will be able to

* Describe the basic concepts functions and variables.

* Use Calling Functions, Data Types, Operators and Elementary Operations.

* Classify data from text files, spreadsheets, hardware, other software, or the web.

* Solve differentiation and integrals and Math functions for analyzing data.

* Develop Two- and three-dimensional plots, images

* Design algorithms and create models

SYLLABUS

Matlab Basics, Matrices and Arrays, Array Indexing, Variables, Text and Characters, Calling Functions, Data Types, Operators and Elementary Operations, Statements. Import and export data, including large files, pre-processing data, visualize and explore Access data from text files, spreadsheets, hardware, other software, or the web. Explore the data to identify trends, test hypotheses, and estimate uncertainty. Create customized algorithms, visualizations, and models. Linear algebra, differentiation and integrals, Fourier transforms, and other mathematics, Math functions for analyzing data, developing algorithms, and creating models. Core functions. Two- and three-dimensional plots, images, animation, Graphics functions. Scripts, functions, live scripts and classes. Files and folders programming utilities. Develop apps interactively using App Designer, or programmatically using MATLAB® functions

List of Programs:

1. Write a Matlab program to perform some basic operations on matrices such as addition, subtraction, multiplication.

2. Write a Matlab Program to generate various signals and sequences, such as unit impulse, unit step, unit ramp, sinusoidal, square, saw tooth, triangular.

3. Write a Matlab program to plot for two given functions

y1 = cos(x)

y2 = 2cos(x) in the interval 0 d" x d" 2ð.

4. Write a Matlab program for calculating c = a + b ,d = a – b, for the given matrices a = [1 2 3 ; 4 5 6; 7 8 9];

b = [7 5 6 ; 2 0 8; 5 7 1].

5. Write a Matlab program to find inverse of A and determinant of matrix A. A = [1 2 3; 4 5 6 ;7 8 0]

6. Write a Matlab program to solve the following system of linear equations

x + 2y + 3z = 1

4x + 5y + 6z = 1

7x + 8y = 1

7. Write a Matlab program to compare two given number A & B.

8. Write a Matlab program to determine the frequency response of First order system y(n)=x(n)+8y(n-1).

9. Write a Matlab program to generate sum of two given sine waves x1=sin (0.1*pi*n)

x2=sin (0.2*pi*n)

10. Write a Matlab program to determine solution of difference equation dy/dx = (xy - 5ØfÜ 2)/ 5ØeÜ 2

Text Books:

1. A Hand book on Numerical technique lab : MATLAB based experiments, K.K.Sharma, Wiley publisher.

2. Modeling and simulation using MATLAB- Simulink, 2nd Edition, Sailendra Jain, Wiley publisher

3. Basics of MATLAB Programming, R. Balaji

Reference Book:

1. MATLAB Help file documentation available in MATLAB Version 10.1

IN2209 : ENVIRONMENTAL SCIENCES

(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 Undergraduate 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 engineering and science. Englewood Cliffs, NJ: Prentice Hall.

4. Enger, E. and Smith, B., Environmental Science: A Study of Interrelationships, 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)

IN 3101 : CONTROL SYSTEMS

Course Objectives:

* Understand the basics of control systems and mathematical modelling of different types of physical systems and converting into signal flow graph.

* Elucidate procedure for deriving transfer function in different ways

* Study the time domain response of first order and second order systems and design of linear compensation.

* Construct root locus, polar plots and discussing stability of system

* Investigate Routh Hurwitz stability criterion of closed loop systems.

* Enhance the knowledge on frequency response

Course Outcomes:

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

* Identify the type of physical systems and capable to handle mathematical modeling of it

* Select suitable method for deriving transfer function for a required system

* Derive time domain frequency specifications and error coefficients for standard signals

* Acquires the stability analysis of open and closed loop LTI system using time domain as well as frequency domain analysis

* Construct root locus, bode plot, polar plots and Nyquist plot for a given transfer function

* Enhance the knowledge on higher order systems and able to design Lag, Lead, Lag-Lead compensators.

SYLLABUS

Introduction to Control Systems:Categorizing control systems, difference of open and closed loop control systems, Feed-Back Characteristics, servo mechanisms, Differential equations of physical systems.

Transfer functions: procedure for deriving transfer functions, Block diagram, algebra, signal flow graphs, Mason's gain formula, and application of signal flow graph to control systems.

Time Response: Time domain specifications, types of test inputs, I and II order system response, error coefficients, steady state error and error constants. Effects of proportional derivative, proportional integral systems. The Root locus concept, construction of root loci, construction rules, determination of roots from root locus.

The concept of stability: necessary conditions for stability, Hurwitz stability criterion, Routh stability criterion and limitations, application of a Routh stability criterion to Linear feedback systems, Relation between time and frequency response, polar plots.

Frequency Response: Using Bode plots design of Lag, Lead, Lag-Lead compensators, Nyquist stability criterion, gain margin and phase margin Analysis, closed loop frequency response, State Space Analysis of LTI Systems.

Text Books:

1. Control Systems principles and design, M. Gopal, Tata McGraw Hill education Pvt Ltd., 4th Edition.

2. Automatic control systems, Benjamin C. Kuo, Prentice Hall of India, 2nd Edition.

Reference Books:

1. Digital Control and State Variable Methods: Conventional and Intelligent Control Systems M.Gopal McGraw Hill 3rd Edition, 2008.

2. Franklin and Powell. Feedback Control of Dynamics Systems. Addison-Wesley.

IN3102 : MICROPROCESSORS AND MICRO CONTROLLERS

Pre requisites: Digital Electronics and logic Design

Course Objectives:

The course is designed

* To introduce students with the architecture and operation of typical 8 bit,16 bit and 32 bit Microprocessors and micro controllers.

* To familiarize the students with the programming and interfacing of microprocessors and Micro controllers.

* To introduce various peripheral interfacing devices and their interfacing with various microprocessors.

* To provide strong foundation for designing real world applications using microprocessors and micro controllers.

Course Outcomes:

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

* Understand about microprocessors and its architecture, instruction sets and demonstrate programming proficiency using various addressing modes and data transfer instructions of the target microprocessor and microcontroller.

* Design logic circuits for I/O ports in order to interface the microprocessor to various types of external devices.

* Make use of various peripheral interface devices for performing parallel and serial I/O and timers/ counters.

* Understand about advanced microprocessors and micro controllers and their performance for programming and applications in real time systems.

* To understand about real time embedded system using advanced microcontroller for measurement and control applications.

SYLLABUS

Introduction to microprocessors- microprocessor architecture-address, data and control buses-8bit microprocessors -8085- architecture- addressing modes- instruction set – programming –stacks and subroutines-interrupts of8085.

Interfacing concepts-memory interfacing-I/O interfacing methods-memory mapped I/O and direct I/O. Types of I/O-simple, polled and interrupt I/O-DMA. Interfacing keyboard and led interfacing data converters interfacing.

Data Communication:Data communication with parallel and serial devices-8255A PPI, 8253-programmable interval timer, 8257 programmable

DMA controller interface-8259 programmable interrupt controller- Serial data communication techniques.8251 USART serial interfacing device.

16-bit microprocessors-8086 architecture-Addressing modes-instruction set-Programming 8086. 80286 microprocessor-Real address and PVAM mode of operation -32 Bit microprocessors-80386 microprocessor and its features- Memory management -paged addressing mode- 80486 microprocessor-features- Pipelining-NDP processor -Cache Memory organization.

Microcontrollers- 8bit microcontrollers-8051 architecture-program memory-data memory organization-addressing modes- Timers/Counters organization, serial I/O organization- Interrupt handling- Advanced microcontrollers-8096-PIC microcontrollers-AT mega controllers and their features.

Text Books:

1. R. S. Goankar, Microprocessors architecture, programming and applications – Wiley Eastern IndiaPublications.

2. Kenneth J Ayala, The 8051 Microcontroller Architecture Programming and Application, third Edition, Penram International Publishers

3. D.V. Hall Microprocessors and interfacing – 2nd edition –, McGraw HillPublications.

4. Badri Ram Fundamentals of microprocessors and microcomputers –Dhanpat Rai &sons publications.

Reference Books:

1. Mohamed Rafiquzzaman, Microprocessor and Microcomputer based system design, second edition, CRC press.

2. A.K Ray & K.M. Burchandani, Advanced Microprocessor and peripherals Architectures, Programming and interfacing ", second edition, Tata McGraw Hill Publications

3. Ajit Pal, Microcontrollers: Principles and applications-PHI Publications

IN3103 : INDUSTRIAL INSTRUMENTS

Course Objectives:

* To Introduce Calibration & measuring techniques of transducers and sensors.

* Acceleration & Vibration measurement using different types of transducers.

* To provide sound knowledge about measurement of several Industrial parameters such as Humidity, Viscosity and Moisture.

* To make students familiar with measurement, control & Calibration of multiple parameters like Level, Temperature, Flow and Pressure etc….

Course outcome:

At the end of the course students will be able

* To measure and control various kinds of Industrial parameters like Level, Humidity, and Flow etc…

* To acquire knowledge on the working principle, measuring Units and Characteristics of those Industrial parameters.

* To perform Calibration of those parameters using several kinds of Transducers & sensors.

* To gain Vast Knowledge about Selection of suitable sensors & transducers for sensing, detecting different objectives in Industrial applications.

SYLLABUS

Selection of Measuring and Test Equipment & Calibration procedures: Identification of Measurement needs, Formulating Specifications, Evaluation of M & TE and Calibration procedure formats.

Vibration and Acceleration measurement: Standards, working principle, types, materials, design criterion: Eddy current type, piezoelectric type, Seismic Transducer, Accelerometer: Potentiometric type, LVDT type, Piezo-electric type.

Pressure measurement: Elastic types-Resistive- Capacitive and Inductive pressure pickups. Piezoelectric- Piezoresistive types. Vacuum measurement: McLeod gauges-Ionization gauges- Alphatron gauge. High Pressure measurement. Force balance and Motion balance type transmitters – P/I and I/P converters. IC pressure sensors and calibration of pressure measuring devices.

Temperature measurement: Filled-in thermal systems- Bimetallic thermometers - RTD, Thermistor, Thermocouple - Radiation and Optical pyrometers - Digital IC thermometers - Accuracy, errors and compensation.

Flow measurement: Head flow meters- types, Area flow meters– Rotameter bypass rotameter- Turbine meter. Electromagnetic flow meter – Principle – DC AC and pulsed type. Ultrasonic flow meters – Principles – transit time – Doppler shift – beam deflection– Cross correlation flowmeters. Vortex flowmeters -Coriolis flowmeters- Solid flow measurement- conveyor belt type. Installation and Calibration procedures of various flowmeters

Level Measurement: Conductive and Capacitive methods –Ultrasonic, Microwave and RADAR level sensors - Solid level measurement by Paddlers method. Capacitance method for powder level measurement. Density, Viscosity and PH measurement.

Allied Sensors: leak detector, flame detector, smoke detector, density, Sound sensors, and Proximity sensors, Gas Sensors and digital transducers.

Text Books:

1. Industrial Instrumentation – D.Patranabis.

2. A Course on Electrical and Electronic Measurements and Instrumentation -A.K.Sawhney.

3. Instrumentation Devices and Systems – C.S.Rangan. , Mani, Sharma

Reference Books:

1. Mechanical and Industrial Instruments – R.K Jain.

2. Process Instrumentation and Analysis – G.B.Liptak.

3. Sensors and Transducer – D.Patranabis.

4. Transducers and Instrumentation – D.V.S. Murthy.

IN3106 : INDUSTRIAL INSTRUMENTS LAB

Course Objectives:

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

* 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 in theory

Course Outcomes:

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

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

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

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

* Select appropriate transducer for the measurement of specified parameter

List of Experiments:

1. To Study the measurement and control of temperature using Resistance Temperature Detector (RTD)

2. To Study the measurement and control of temperature using Thermocouple.

3. Flow measurement using orifice meter.

4. Calibration of PH measurement of given solution.

5. Study of Vibration measurement.

6. Control valve characteristics.

7. Interfacing through liquid level system.

8. Speed measurement using Photo electric pickup.

9. Speed measurement using Inductive pickup.

10. I/P Converter.

11. Capacitance level Transmitter.

12. Humidity Measurement.

IN3107 : CONTROL SYSTEMS LAB

Course Objectives: Students undergoing this course are expected to: Understand the design and implementation of Lead and Lead-Lag networks· Able to analyze speed torque characteristics for different Motors· Be able to report the results of their work in the laboratory accurately, in appropriate detail, and concisely.Course Outcomes:

At the end of the course, students will be able to Design Compensating networks for control systems· Analyze speed torque characteristics for armature and field control of Dc servo motors· Design speed control of DC and AC servo motors

LIST OF EXPERIMENTS

1. AC Servo Motor (Speed – Torque Characteristics)
2. DC Motor Speed Control Unit (Closed Loop System)
3. DC Motor Speed Control Unit (Open Loop System)
4. DC Servomotor – Armature Control
5. DC Servomotor – Field Control
6. Magnetic Amplifier
7. Study of Compensating Network Lead – Lag Network
8. Study of Potentiometer as Error Detector
9. Study of Compensating Network Lead Network
10. Synchro Transmitter – Receiver Pair

IN 3108 : LABVIEW (SC)

Course Objectives:

* To design addition and subtraction of two numbers with and without case structure.

* To find sum of ‘n’ natural numbers, factorial of a number.

* To find roots of quadratic equation, average of two numbers.

* Generating &analyzing of signals, merging, addition and subtraction of two signals.

* To understand filtering of signals, simulation of function generator, Plot circle.

* To implement Addition of 2-D number array, determinant of 2x2 matrix.

Course Outcomes:

On completion of the course, student will be able to

* Design addition & subtraction of two numbers with and without case structure.

* Find sum of 'n' natural numbers, factorial of a number for different 'n' values.

* Find roots of quadratic equation, average of two numbers.

* Analyze merging, addition and subtraction of two signals for different wave forms.

* Design LPF, HPF, Butterworth of signals, simulation of function generator and plot circle.

* Implement Addition of 2-D number array, determinant of 2x2 matrixes.

List of experiments

1. Addition and subtraction of two numbers using Lab view.
2. Addition and subtraction of two numbers with case structure using Lab view.
3. Average of two numbers using Lab view.
4. Sum of 'n' natural numbers using Lab view.
5. Factorial of a number using Lab view.
6. Roots of quadratic equation using Lab view.
7. Generating &analyzing of signals using Lab view.
8. Merging of two signals using Lab view.
9. Addition and subtraction of two signals using lab view.
10. Filtering of signals using Lab view.
11. Simulation of function generator using Lab view.
12. Plot circle using Lab view.
13. Addition of 2-D number array using Lab view.
14. Determinant of 2x2 matrix using Lab view.

IN3201 : DIGITAL SIGNAL PROCESSING

Course Objectives:

* To understand the basic Discrete time signals and system types,convolutionsum,impule and frequency response concepts

* To understand the realization of LTI systems and basic properties of these

* To understand the DFT and relation between DFT and other transforms.To understand convolution and its types

* To understand the FFT . Differences between DIT and DIF algorithms

* To understand the concept of Frequency selective filters

* To understand the concept of architecture of DSP processor

Course Outcomes:

After completion of the course the students will be able to

* Explain digital signal,sampling, convolution

* Explain Discrete fourier transform in DIT and DIF

* Explain programmable DSPs

SYLLABUS

Introduction to Systems: Discrete – Time Signals and Linear Systems: Signals, systems, signal processing, advantages and applications of digital signal processing, Analog to digital conversion, reconstruction of analog signal, types of A/D converters, digital- to- analog converters.

Discrete Fourier Transform: Discrete Fourier series, properties of Discrete Fourier series, The discrete Fourier Transform, relationship of the DFT to other transforms, properties of Discrete Fourier Transform, comparison between circular convolution and linear convolution, methods to evaluate circular convolution of two sequences, linear convolution from circular convolution.

Fast Fourier Transforms: Introduction, direct evolution of the DFT, the fast Fourier transforms, Decimation-in-time algorithm, Decimation-in-frequency algorithms, differences and similarities between DIT and DIF algorithms, IDFT using FFT algorithms.

Infinite Impulse Response Filters: Introduction, Frequency selective filters, design of digital filters from analog filters, analog low pass filter design, analog low pass Butterworth filters, analog low pass Chebyshev filters, frequency transformation in analog domain, realization of digital filters.

Introduction to DSP Processors: Introduction to programmable DSPs: Multiplier and Multiplier Accumulator (MAC), Modified Bus Structures and Memory Access schemes in DSPs Multiple access memory ,multiport memory, VLSI architecture, Pipelining, Special addressing modes, On-Chip Peripherals.

Text Books:

1. Digital Signal Processing : Principals, Algorithms and Applications- John G. Proakis, and Dimitris G.Manolakis, Pearson Edn.,,PHI, 2007.

2. Digital Signal Processing –Alan V. Oppenheim, Ronald W. Schaffer PHI Ed 2006

Reference Books:

1. Manson H Hayes," Digital Signal Processing," TMH Publications, 2004.

2. P.RameshBabu," Digial Signal Processing ," Scitech Publications Pvt. Ltd, Chennai

IN3202 : PROCESS CONTROL & CONTROL COMPONENTS

Course Objectives:

* To study and review of Process Control Principles.

* To study basic Servo mechanisms and discrete state control systems.

* To learn Process control block diagram and identification of elements.

* To study about various evaluation-stability.

* To learn about steady state regulation, transient regulation, evaluation criteria.

* To study about Process control (P&I) drawings.

Course Outcomes:

After completion of the course the students will be able to

* Describe control systems- process control principles.

* Can use various Controller Principles.

* Classify Evaluation criteria-1/4 decay ratio.

* Able to Explain various Multi loop control systems.

* Categories variouscontrol elements.

* Can explain Control valve characteristics and sizing

SYLLABUS

Introduction: control systems- process control principles, servo mechanisms, discrete state control systems; Process control block diagram-identification of elements; Control system evaluation-stability, steady state regulation, transient regulation, evaluation criteria; Process

control (P&I) drawings.

Controller Principles: Process characteristics: process equation, process load, process lag,selfregulation; control system parameters; Controller Modes: Discontinuous control modes- two position mode, multi-position mode; Continuous controller modes: Proportional control modes, Integral control mode, Derivative control mode, Composite control modes: PI, PD, PID; Special terminology

Optimum controller settings: Evaluation criteria-1/4 decay ratio, I.A.E., ISE, ITAE; Tuning of controllers: Continuous oscillation and damped oscillation methods- process reaction curve method.

Multi loop control systems: Feed forward, ratio, cascade and split range controls. Multi variable control –examples from distillation column and boiler systems.

Final control elements: Flapper-Nozzle system, I/P, P/I converters, pneumatic, electric and hydraulic actuators. Globe and Butterfly valves, volume booster relays.

Control valve characteristics and sizing: Valve characteristics-quick opening, linear and equal percentage characteristics; Sizing: Flow formulae through control valves. Specific gravity and Viscosity correction, range ability, turn down ; cavitation and flashing in control valves.

Expert Controllers and Applications: Expert controller- Fuzzy logic systems-fuzzy controller-Fuzzy logic tools -Artificial neural networks – perceptron -neural controllers.

Text books :

1. Patrinabis,D, Principles of process control.

2. Pollard A, Process control.

3. Eckman, D.P., Automatic Process and Control.

Reference Books:

1. Harriot,P., Process control.

2. Curtis.D.Jhonson: Process control instrument Technology, Pearson education.

IN3203 : BIOMEDICAL INSTRUMENTATION

Course Objectives:

* To introduce the fundamentals of bio electric potentials, resting and action potentials

* To understand the anatomy of heart and physiological measurements of cardio vascular system

* To understand anatomy of respiratory system and its diagnostic and therapeutic equipment

* To provide the insight into the of nervous system and its physiological measurements

* To understand the working of X Ray, CT scan and MRI Scanning equipment

* To know the shock hazards and electrical safety in hospitals

* To train the students to measure temperature and Oxygen saturation in blood

Course Outcomes:

At the end of the course the students will be able to Understand the physiology of Cardiovascular system, Respiratory system and Nervous system

* Measure, detect and analyze the bio-electric potentials

* Select and apply the appropriate medical instruments for measurement

* Design medical devices for diagnosis and therapeutic applications

* Analyze simple bio-sensing and transduction problems.

* Apply safety standards and select disposal method and procedures for electrical diagnostic equipment

* Learn to measure the Oxygen Saturation in blood

SYLLABUS

Introduction to the Man-Instrument system – components of the system – Problems encountered in measuring a living system — sources of bioelectric potentials – Structure of a cell- resting and action potentials.

The cardiovascular system – The heart anatomy – Generation of Electrocardiogram – Recording ECG – Blood pressure measurement- Direct and Indirect methods – Sphygmomanometer – Blood flow measurement – heart sounds – Phono Cardiograph – measurement of blood flow and cardiac output – plethysmography– pacemakers – defibrillators.

Physiology of the respiratory system – tests and instrumentation for the mechanics of the breathing – Spirometers- respiratory therapy inhalators – ventilators-humidifiers nebulizers and aspirators.

The nervous system and its anatomy – neuronal communication – the organization of brain – neuronal receptors – the somatic nervous system – the autonomic nervous system – measurements from the nervous system – electrode placement-neuronal firing measurements EEG and EMG.

Non-invasive diagnostic instrumentation– temperature measurement – principles of ultra sound measurement and diagnosis – echo cardiogram – echo encephalogram – ultra sonogram. X-ray machine- CT Scan- MRI Scan- Computer in biomedical instrumentation. Physiological effects of electric current – shock hazards from electric equipment – methods of accident prevention. Basal skin resistance measurement, Temperature measurement, Thermogram, Oximeters.

Text Books:

1. Biomedical Instrumentation and Measurements – C. Cromwell, F.J. Weibell, E.A. Pfeiffer – Pearsoneducation.

2. Handbook of biomedical instrumentation R. S. Khandpur, Tata McGraw hill company Ltd, NewDelhi.

Reference Books:

1. John G Webster, “Medical Instrumentation – Application and Design”, 4th ed., John Wiley and Sons, 2007.

2. Leslie Cromwell, Fred. J. Weibell, Erich. A. Pfeiffer, “Biomedical Instrumentation & Measurements, 2nd ed., Pearson Education., 2001.

3. Ed. Joseph D. Bronzino, The Biomedical Engineering Hand Book, Third Edition, Boca Raton, CRC Press LLC, 2006.

4. Joseph J Carr and John M.Brown, Introduction to Biomedical Equipment Technology, John Wiley and sons, New York, 4th edition, 2012.

IN3206 : MICROPROCESSORS LAB

Course Objectives:

* To write and execute addition & subtraction of two 8 &16 bit numbers.

* To implement Multiplication and Division of two 8 bit numbers.

* To find smallest & largest from the given array in stored in address fields.

* To understand Sum of n numbers.

* To understand Arrange ascending and descending order of a given string.

* To Display “Fire” & “Help Us”, “SUPERB” in seven segment of trainer kits.

Course Outcomes:

On completion of the course, student will be able to

* Execution ADD& SUB of two 8&16 bit numbers on MPS-85, ESA-85E trainer kits.

* Find Multiplication and Division of two 8 bit numbers.

* Find smallest & largest from the given array and Sum of n numbers.

* Displaying decimal and Hex decimal count.

* Arrange ascending and descending order of a given string.

* Display “Fire” & “Help Us”, “SUPERB” in seven segment display.

List of experiments

1. Addition of two 8 bit numbers .
2. Subtraction of two 8 numbers by 2’s complement method.
3. Addition of two 16 bit numbers.
4. 2’s complement of a 16 bit number.
5. Multiplication of two 8 bit numbers.
6. Division of two 8 bit numbers.
7. Smallest from data array.

8. Largest from data array.
9. Sum of n numbers
10. Arranging data in ascending order.
11. Arranging data in descending order.
12. Generating and displaying decimal count.
13. Generating and displaying Hex decimal count.
14. Display “Fire” & “Help Us” in address and data fields.
15. Display “SUPERB” in address and data fields.

IN3207 : PROCESS CONTROL LAB

Course Objectives:

* To control process parameters with the help of different control modes.
* To verify the operation of different controllers.
* To verify the operation of I/P & P/I converters.
* To study about data acquisition systems.
* To verify the operations of PLC.

Course Outcomes:

After completion of the course the students will be able to

* Explain I/P Converter characteristics.
* Use the various P, PD and PID Control actions.
* Design data acquisition systems for various applications.
* Describe temperature measurement using RTD.
* Design and ladder logic programming of programmable logic controller (PLC).

List of experiments:

1. I/P Converter characteristics.
2. Pressure process control loop.

a) P, PD and PID Control actions.

b) Tuning of PID controller for optimum control settings

3. Study of SCADA systems
4. ON-OFF Control of temperature with RTD as a measuring element and LED as an indicator.
5. Programmable logic controller ladder diagram programming.

a) Door bell and switching of light simulation

b) Logic gates simulation.

c) Stepper motor control simulation

d) DC Servo motor control simulation

e) Simulation of tank level control

f) Simulation of elevator

g) Simulation of bottle filling

h) Simulation of washing machine

i) A.C .servo motor control simulation

j) Simulation of automatic coffee vending machine.

IN3208 : Bio-Medical Instrumentation Lab

Course Objectives:

The course has the following objectives:

* To introduce fundamentals of transducers as applicable to physiology.
* To explore the human body parameter measurements setups.
* To introduce students with timer circuits & heart-rate meter.
* To emphasis on the study of EMG, ECG, EEG waveform & analysis.
* To familiarize students with the design of biopotential amplifiers.
* To introduce students with basic operation of X-ray system.
* To introduce students on the study of isolation of biosignals.

Course Outcome:

After completion of this course the students will be able to

* Understand and implement isolation techniques in designing biomedical instruments.
* Measure and Analyze EMG, ECG, EEG and PCG waveforms in diagnostic point of views
* Measure and Analyze QRS components from diagnostic point of view.
* Design and analyze the characteristics of Biopotential amplifiers.
* Understand & describe the basic operation of an X-ray system.
* Measure heart rate meter using F-V Converter.
* Measure ON-Time & OFF-Time delay of a waveform using Timer circuit.

List of Experiments:

1. Monitoring of Pulse Rate using Pulse Rate Monitor.
2. Monitoring of Heart Sounds using Phono Cardiogram.
3. Measuring the blood flow rate using Blood Flow Meter,
4. Recording ECG using Electrocardiography.

5. Recording the electrical activity of the brain using EEG.
6. Recording the muscle electrical activities using EMG.
7. Measurement of lung parameters using Spirometer.
8. Measuring the respiration rate using Respiration Rate Monitor.
9. Studying the working of AED using Mannequin.
10. Studying the working of Pacemaker using Mannequin.

IN3209 : Soft Skills

Course Objectives:

* To develop skills to communicate clearly.
* To aid students in building interpersonal skills.
* To enhance team building and time management skills.
* To inculcate active listening and responding skills.

Course Outcomes:

* Make use of techniques for self-awareness and self-development.
* Apply the conceptual understanding of communication into everyday practice.
* Understand the importance of teamwork and group discussions skills.
* Develop time management and stress management.

SYLLABUS

Introduction to Soft Skills: Communication – Verbal and Non Verbal Communication - Personal grooming (Etiquette, Attitude, Body Language), Posture, Gestures, Facial Expressions, Eye Contact, Space Distancing, Presentation Skills, Public Speaking, Just a Minute (JAM) sessions, Adaptability.

Goal Setting and Time Management: Immediate, Short term, Long term, Smart Goals, Strategies to Achieve goals, Types of Time, Identifying Time Wasters, Time Management Skills, Stress Busters.

Leadership and Team Management: Qualities of a Good Leader, Team Dynamics, Leadership Styles, Decision Making, Problem Solving, Negotiation Skills.

Group Discussions: Purpose (Intellectual ability, Creativity, Approach to a problem, Tolerance), Group Behaviour, Analysing Performance.

Job Interviews: Identifying job openings, Covering Letter and CVs / Resumes, Interview (Opening, Body-Answer Q, Close-Ask Q), Telephone Interviews, Types of Questions.

Reference Books:

1. Krannich, Caryl, and Krannich, Ronald L. Nail the Resume! Great Tips for Creating Dynamite Resumes. United States, Impact Publications, 2005.
2. Hasson, Gill. Brilliant Communication Skills. Great Britain: Pearson Education, 2012
3. Prasad, H. M. How to Prepare for Group Discussion and Interview. New Delhi: Tata McGraw-Hill Education, 2001.
4. Pease, Allan. Body Language. Delhi: Sudha Publications, 1998.
5. Rizvi, Ashraf M. Effective Technical Communication: India, McGraw-Hill Education. 2010
6. Thorpe, Edgar &Showick Thorpe. Winning at Interviews. 2nd Edition. Delhi: Dorling Kindersley, 2006.

IN4107 : VHDL Programming

Course Objectives:

This course will enable students to:

- Familiarize with the CAD tool to write HDL programs.
- Understand simulation and synthesis of digital design.
- Program FPGAs/CPLDs to synthesize the digital designs.
- Interface hardware to programmable ICs through I/O ports.

Course Outcomes:

At the end of this course, students are able to:

* Write the VHDL programs to simulate Combinational circuits in Dataflow, Behavioural and Gate level Abstractions.
* Describe sequential circuits like flip flops and counters in Behavioural description and obtain simulation waveforms.
* Synthesize Combinational and Sequential circuits on programmable ICs and test the hardware.
* Interface the hardware to the programmable chips and obtain the required output

SYLLABUS

Combinational Logic: Basic gates, multiplexer, comparator, adder/ substractor, multipliers, decoders, address decoders, parity generator, ALU.

Part II: Sequential Logic: D-Latch, D-Flip flop, JK-Flip flop, registers, ripple counters, synchronous counters, shift registers (serial-to-parallel, parallel-to-serial), cyclic encoder/ decoder.

Part III: Memories and State Machines: Read only memory (ROM), random-access memory (RAM), mealy state machine, Moore state machine, arithmetic multipliers using FSMs.

List of Experiments:

1. Modelling of Full adder, Full Subtractor using VHDL
2. Modelling of 2-4 decoder, 4-2 encoder and 2-1 Multiplexer using all three modelling style
3. Modelling of BCD – to – 7 Segment Display Code Converter using VHDL
4. Modelling of 8-Bit Parity Generator using VHDL
5. Modelling od D-latch and D-FF with synchronous and asynchronous clock signal
6. Modelling of Registers (PIPO, PISO,SIPO,SISO, Bidirectional and Universal shift register)
7. Modelling of Counters(up-counter, down-counter and up-down counter and BCD counter)
8. Modelling of RAM and ROM
9. Modelling of Mealy and Moore FSM's
10. Mini Project

PROFESSIONAL ELECTIVES

1. ELECTRONIC INSTRUMENTATION

Course Objectives:

* To introduce the fundamentals about the basic Instrumentation system and the units of measurement.
* To equip the students with the design details of Conventional CRO and Special purpose CRO's.
* To explore the various signal generators, Wave analyzers, Spectrum analyzers and Q Meters.
* To provide the insight into the design of AC and DC Electronic Volt Meters.
* To understand the design aspects of various types of Digital Instruments
* To familiarize the students about the overall design of Electronic Instruments

Course Outcomes:

At the end of the course the students will be able to

* Compare and analyze the performance of Mechanical, Electrical and Electronic Instruments.
* Apply the theoretical design aspects to develop Cathode Ray Oscilloscope
* Obtain the knowledge on the different signal generators.
* Analyze and compare the working of AC and DC voltmeters
* Evaluate the performances of Digital Instruments.
* Develop the Electronic Instruments by applying the theoretical concepts

SYLLABUS

Generalized Instrumentation system: Units and standards- Calibration methods- Standards of measurement- Classification, Introduction to mechanical, electrical and electronic instruments.

Cathode ray oscilloscope: Block diagram vertical and horizontal amplifiers, sweep circuits, delay line, electrostatic focusing and electrostatic deflection. Special purpose oscilloscopes- sampling oscilloscopes, analog storage and digital storage oscilloscopes, dual beam and dual trace oscilloscopes.

Instruments for generating and analyzing wave forms: square wave, pulse, standard-signal, random noise and function generators, wave analyzers, spectrum analyzers, Q-meters, vector – voltmeters, vector impedance meters.

Electronic analog meters: Electronic voltmeters VTVM, TVM, FETVM Voltmeters, electronic – multimeters differential voltmeters. DC voltmeters- Loading- Transfer volt meter- Chopper type– Differential voltmeter – Peak responding voltmeter – True RMS voltmeter – Calibration of DC instruments.

Digital Instruments: – Digital multimeters – Digital frequency meter – Digital Measurement of time – Universal counter – Electronic counter – Digital Tachometer- Digital voltmeter– Ramp Type DVM – Dual slope Ramp DVM- Integrating type DVM – Successive approximations type DVM – Resolution and sensitivity of digital meters – General specifications of a DVM, Data acquisition system.

Text Books:

1. Modern electronic instrumentation measurements techniques by Helfrickandcooper.
2. A coursein electrical and electronic measurement and instrumentation by A.K.Shawney.

Reference Books:

1. Electronic Instrumentation by H.S.Kalsi.
2. S. Gupta and J.P Gupta, 'PC Interfacing for Data Acquisition and Process Control', Instrument society of America, 1994.

2. ADVANCED SENSORS

Course Objectives:

* To provide in depth knowledge in physical principles applied in sensing, measurement and a comprehensive understanding on how measurement systems are designed, calibrated, characterised, and analysed.

* To introduce the students to sources and detectors of various semiconductor sensors and provide in-depth understanding of the principle of measurement, and theory of instruments and sensors.

* An understanding of the principles of silicon sensors.

* To give a fundamental knowledge on the basic laws and phenomena on which operation of Chemical and biomedical sensors.

* To impart a reasonable level of competence in the design, construction, and execution of micro sensors.

Course Outcomes:

* Explain the various principles employed in transducers.

* Examine the methods of fabricating a sensor.

* Apply knowledge in designing smart sensors.

* Discuss the techniques of fabrication and application of MEMS.

* Describe the various applications of smart sensors.

* Discuss advanced sensing technology.

SYLLABUS

Chemical Sensors: Amperometry-Potentiometry-Conductivity sensors-Semi conductive sesors- MEMS sensors. Materials for sensors-Electrical conducting materials- Ionic conductors-zirconia- alumina-NASICON. Semiconductor materials-Titania-tinoxide-zinc oxide. Insulating materials-Ferroelectric Materials-Negative temperature ceramic thermistors.

Thin and Thick film sensors: Thick film processes-Thin film processes-Thin film deposition methods- thin film characterization methods-thin film delineation techniques-compatibility issues- Longmuir-Blodgett films for sensor materials-film forming apparatus-dipping-ion sensors-gas sensors. Applications of thin and thick film sensors.

Biosensors: Colorimetric- Optical- Potentiometric- Amperometic-Conductometric- Semiconductor- Mechanical and Molecular electronic based sensors. Chemiluminescence based biosensors. Applications of biosensors in medical and health care- food and agricultural- Industrial process and environmental monitoring.

Integrated Magnetic Sensors: Overview of magnetic field sensor Technology-AMR-GMR- SQUIDS-Optoelectronic MFS- Semiconductor magnetic effects-materials and figure of merit- Standard MFS technologies-limitations and applications.

Sensor Applications: Automotive Sensors- Environmental Sensors-Sensors for Medical Diagnosis and patient monitoring- Aerospace sensors.

Text Books:

1. Sensors- A Comprehensive study-W.Gopal, J Hesse, J N Zemel – VHC Press,1989.

2. Sensors Handbook-SabreeSoloman—McGraw Hill Publishers-1998

Reference Books:

3. Electro Optical Instrumentation- SilvanoDonati, Pearson Education2005.

4. Introduction to Medical Equipment Technology: Carr and Brown-Addison Weseley- 2001.

3. ANALOG SIGNAL PROCESSING

Course Objectives:

* To study basic introduction of different amplifier components and operations.

* To study and review analog signal filter functions and realizations.

* To understand the pole locations and low pass filter specifications.

* To study Delay equalization procedures modules and strategies.

* To Define Bode sensitivity.

* List out the different types of Techniquescomponents and properties of Lossless ladders.

Course Outcomes:

After completion of the course the students will be able to

* Describe the analog signal processing concepts and components.

* Design amplifiers and filters.

* Develop magnitude response, pole locations and specifications of low-pass filters.

* Design delay equalization and Define Bode sensitivity.

* Analyse properties of Lossless ladders and develop negative components.

* Develop new techniques for realization of simple ladders.

SYLLABUS

Introduction to domains and the analogue/digital trade off, Introduction to basic building blocks: null or, voltage feedback amplifier, operation transconductance amplifier, current conveyor, current feedback amplifier. Analog signal filtering: introduction to bilinear transfer functions and active realizations. First-order and second-order filter realization, filter design parameters (Q and ù0), frequency response, effect of finite gain of op-amp, realization of Single-Amplifier Biquad and General Impedance Convertor circuit.

Filter Design: Ideal low-pass filter, Butterworth and Chebyshev magnitude response, pole locations, low-pass filter specifications.

Delay equalization: equalization procedures, equalization with first-order and second- order modules, strategies for equalization design. Definition of Bode sensitivity.

General realizations: Properties of Lossless ladders, the general impedance convertor (GIC), optimal design of the GIC, realization of simple ladders, Gorski-Popiel's Embedding Technique, Bruton's FDNR technique, creating negative components.

Text books

1. R. Schaumann and M.E. Valkenberg," Design of Analog Circuits", Oxford University

Reference Books:

1. R.Schaumann and M.E. Valkenberg,Design of Analog Circuits, Oxford University Press.

2. E. Kudeki and D. C. Munson, Analog Signals and Systems, Prentice Hall, 2008.

4. POWER PLANT INSTRUMENTATION

Course Objectives:

* To introduce the fundamentals about different types of energy sources
* To understand the different methods of power generation and performance parameters of power plants
* To explore the various controls in a thermal power plant
* To know the details of operations of thermal power plant
* To understand the basic operations of turbines and governers
* To train the students to work in Industries

Course Outcomes:

At the end of the course the students will be able to

* Compare and analyze the performance of various power plants
* Develop the control loops for any control actions in power plant
* Obtain the detailed knowledge on the operations of thermal power plant
* Design the control loops for turbine speed control
* Apply the theoretical aspects of power plants to design the entire control system.
* Install and commission the power plant

SYLLABUS

Energy sources: their availability. Introduction to Power generation-Classification: Renewable and nonrenewable energy generation resources. Renewable-wind power, solar, geothermal and bio-fuels, Nonrenewable-fossil fuels (coal, oil and natural gas) and nuclear power.

Comparison of thermal power plant, hydroelectric power plant, wind, solar, nuclear power plant: on the basis of Performance, efficiency, site selection, Economics capital and running, safety standards, pollution, effluent management and handling.

Basic boiler operations: Boiler safety standards, Combustion controls; series-parallel operation, optimizing control for air-flow- oxygen trimming control, Drum level control: feed water control, drum level control, steam flow control, two-element control, and three-element control, Furnace pressure control, steam temperature control, super heatercontrol.

Thermal Power Plant: Method of power generation, layout and energy conversion process, major input variables, major control variables.

Turbines and Governers: basic operations, turbine speed control methods. Automatic startup systems- safety systems.

Text Books:

1. D. Patranabis: Principles of process control., TMH, New Delhi, secondedition.

2. Bela.G.Liptak: Instrumentation Engineers Handbook

Reference Books:

3. George Stephanopoulos: Chemical process control; Prentice Hall India PvtLtd.

4. Luenberger. Introduction to Dynamic Systems. Wiley. 1979

5. STEEL PLANT INSTRUMENTATION

Course Objectives:

* To learn about the process of making steel from the raw materials.
* To know the role of instrumentation in a steel industry
* To deal with the control operations carries out at various stages
* To know the role of various utilities

Course Outcomes:

After completion of the course the students will be able to

* Describe various process in Iron and Steel industry
* Indicate the use of instruments in steel making and Suggest suitable sensor for a typical measurement
* Develop control systems for the various operations in Steel Industries
* Evaluate the usefulness of Instrumentation in monitoring and control in the Steel industry

SYLLABUS

Basics of steel production: mill zones: iron zone, steel zone, mill zone, utility zone Automation strategy: different levels, input, and output data. Iron zone: supervisory control, direct digital control; instrumentation for-raw material handling, coke oven, sinter plant, Blast furnace; input/output data, control architecture. Steel zone: Automation for- LD converters, continuous casting, soaking pit control, blooming mill controls.

Utility zone: instrumentation for-Gas distribution, liquid fuel distribution, power generation, steam generation, compressed air generation.

Instrumentation for water management system.

Pollution control and monitoring for steel plant environment.

Text Books:

1. D. Patranabis: Principles of process control, TMH, New Delhi, second edition.

2. Krishna Kant: Computer based industrial control, Prentice Hall India Pvt Ltd.

Reference Books:

1. Bela. G. Liptak : Instrumentation Engineers Hand book

2. George Stephanopoulos: Chemical process control; Prentice Hall India Pvt Ltd.

6. INDUSTRIAL SAFETY INSTRUMENTS

Course Objectives:

* To impart adequate knowledge in safety rules, standards and different codes in Engineering Industry.
* To understand the safety importance and study various machines .
* To impart basic knowledge of different welfare and safety measures in industry .
* To study the operation of protective devices and their importance of safety.
* To familiarize the safety risks and the working principle of different processes in the Industry .
* To learn the working principle of machine guarding .

Course Outcomes:

* Understand and memorize the safety rules, standards and codes.
* Design machine guarding systems for different machines.
* Implement safety concepts in different processes.
* Have knowledge in testing and inspection in the heat treatment operations and boilers as per rules .
* Explain the working principle of processes such as metal forming and joining process and their safety risks.
* Understand how to take accident preventive measures in health and the welfare of workers in Engineering Industry.

SYLLABUS

Safety In Metal Working Machinery And Wood Working Machines:General safety rules, principles, maintenance, Inspections of turning machines, boring machines, milling machine, planning machine and grinding machines, CNC machines, Wood working machinery, types, safety principles, electrical guards, work area, material handling, inspection, standards and codes- saws, types, hazards.

Principles of Machine Guarding: Guarding during maintenance, Zero Mechanical State (ZMS), Definition, Policy for ZMS – guarding of hazards - point of operation protective devices, machine guarding, types, fixed guard, interlock guard, automatic guard, trip guard, electron eye, positional control guard, fixed guard fencing- guard construction- guard opening. Selection and suitability: lathe-drilling-boring-milling-grinding-shaping-sawingshearingpresses- forge hammer-flywheels-shafts-couplings-gears-sprockets wheels and chains-pulleys and belts- authorized entry to hazardous installations-benefits of good guarding systems.

Safety In Welding And Gas Cutting:Gas welding and oxygen cutting, resistances welding, arc welding and cutting, common hazards, personal protective equipment, training, safety precautions in brazing, soldering and metalizing – explosive welding, selection, care and maintenance of the associated equipment and instruments – safety in generation, distribution and handling of industrial gases-colour coding – flashback arrestor – leak detection-pipe line safety- storage and handling of gas cylinders.

Safety In Cold Forming And Hot Working Of Metals:Cold working, power presses, point of operation safe guarding, auxiliary mechanisms, feeding and cutting mechanism, hand or foot- operated presses, power press electric controls, power press set up and die removal, inspection and maintenance-metal sheers-press brakes. Hot working safety in forging, hot rolling mill operation, safe guards in hot rolling mills – hot bending of pipes, hazards and control measures. Safety in gas furnace operation, cupola, crucibles, ovens, foundry health hazards, work environment, material handling in foundries, foundry production cleaning and finishing foundry processes.

Safety In Finishing, Inspection And Testing:Heat treatment operations, electro plating, paint shops, sand and shot blasting, safety in inspection and testing, dynamic balancing, hydro testing, valves, boiler drums and headers, pressure vessels, air leak test, steam testing, safety in radiography, personal monitoring devices, radiation hazards, engineering and administrative controls, Indian Boilers Regulation.

Text Books:

1."Safety Management by John V. Grimaldi and Rollin H. Simonds, All India Travelers Book seller, New Delhi, 1989.

2. "Safety in Industry" N.V. Krishnan JaicoPublishery House, 1996.

Reference Books:

1. "Accident Prevention Manual" – NSC, Chicago, 1982.
2. "Occupational safety Manual" BHEL, Trichy, 1988.
3. Indian Boiler acts and Regulations, Government of India.
4. Safety in the use of wood working machines, HMSO, UK 1992.
5. Health and Safety in welding and Allied processes, welding Institute, UK, High Tech. Publishing Ltd., London, 1989.

7. INDUSTRIAL COMMUNICATION & NETWORKS

Course Objectives:

* To study and review Industrial communication & networks.

* To build an understanding among students about the fundamental concepts of computer networking, protocols, architectures, and applications.

* To study Data Communications and Networking, Evolution of network, Requirements, Applications, Network Topology.

* To help students to acquireknowledge in design, implementand analyze performance of OSI and TCP-IP based Architectures.

* To study Switched Communications Networks – Circuit Switching – Packet Switching.

* To implement new ideas in Networkingthrough assignments.

Course Outcomes:

After completion of the course the students will be able to

* Interpret the different building blocks of Communication network and its architecture.

* Contrast different types of switching networks and analyze the performance of network

* Identify and analyze error and flow control mechanism sin data link layer

* Design subnetting and analyze the performance of networklayer

* Construct and examine various routing protocols.

* Able to know the Implementation of Industrial communication & Networks.

SYLLABUS

Networking Principles and layered architecture: Data Communications and Networking: A Communications Model – Data Communications - Evolution of network, Requirements , Applications, Network Topology (Line configuration, Data Flow), Protocols and Standards, Network,Models (OSI, TCP/IP).

Circuit and Packet switching :Switched Communications Networks – Circuit Switching – Packet Switching – Comparison of Circuit Switching and Packet Switching – Implementing Network Software, Networking. Parameters (Transmission Impairment, Data Rate and Performance).

Data Link Layer: Error Detection and Correction – Hamming Code , CRC, Checksum- Flow control mechanism – Sliding Window Protocol - GoBack - N - Selective Repeat - Multiple access Aloha - Slotted Aloha -CSMA, CSMA/CD – Multiple Access Networks (IEEE 802.3), Token Ring(IEEE 802.5) and Wireless Networks (IEEE 802.11, 802.15.

Network Layer: IPV4 Address Space – Notations – Classful Addressing – Classless Addressing – Network Address Translation – IPv6 Address Structure – IPv4 and IPv6 header format.

Routing Protocols: Routing-Link State and Distance Vector Routing Protocols- Implementation-Performance Analysis- Packet Tracer.

Text books:

1. Computer Networks: A Systems Approach, Larry Peterson and Bruce Davie, 5th Ed, The Morgan Kaufmann Series, Elsevier, 2011.

2. Computer Networking: A Top-Down Approach Featuring the Internet, J.F. Kurose and K.W.Ross, 6th Ed., Pearson Education, 2012.

Reference books

1. Data Communications and Networking, Behrouz A. Forouzan, McGraw Hill Education, 5th Ed., 2012.

2. TCP/IP Protocol Suite, Behrouz A. Forouzan, McGraw-Hill Education, 4 Ed., 2009.

3. Data and Computer Communications, William Stallings, Pearson Education, 10th Ed, 2013.

8. VLSI DESIGN

Course Objectives:

* To understand the concept of different IC technologies and analyse basic electrical properties of Bi-polar, MOS, CMOS, NMOS, PMOS, Bi-CMOS devices.

* Analyse the concepts of alternate gate circuits, interconnect delays, fan-in and fan-out relationship.

* Acquire knowledge of Semi-custom and full custom ASICS, standard cell design, PLA, PAL, Programmable gate Arrays-CPLD, FPGAs.

* Outline the concepts and Methodologies for chip design using circuit design flow in VHDL synthesis, design verification tools, validation & testing techniques.

* To understand the different types of VLSI packages and VLSI design rules.

* To analyze the Electrical, Mechanical, Thermal design considerations of IC packages.

Course Outcomes:

After completion of the course the students will be able to

* Understanding the characteristics of MOS, CMOS, NMOS, PMOS, Bi-CMOS devices and the comparison between different MOS technologies and processes.

* Able to design CMOS combinational and sequential logic at the transistor level.

* Design of different functional units using Programmable gate Arrays.

* Getting the idea of VHDL synthesis, verification tools, validation & testing.

* Identify the various VLSI packages and design rules.

* Be able to complete a significant VLSI design project having a set of objective criteria and design constraints.

SYLLABUS

Introduction to MOSTechnology: Various types of technologies – Bi-polar, MOS, CMOS, NMOS, PMOS. Comparison, fabrication of NMOS, PMOS, CMOS, Bi-CMOS devices. Basic Electrical Properties: Drain-to- source current versus Voltage relationship, Threshold voltage, MOS transistor trans conductance and output conductance, figure of merit, Pass transistor, determination of Pull-up to Pull-down ratio of NMOS Inverter driven by another Inverter, determination of Pull-up to Pull-down ratio of NMOS Inverter driven through one or more Pass transistors.

Circuit Design Processes: NMOS circuits: Inverter, NAND and NOR gates, CMOS circuits: Inverter, NAND and NOR gates. Stick Diagrams: NMOS Design style and CMOS Design Style. Design rules: Lambda based design rules, contact cuts, CMOS Lambda based design rules, Layout diagrams: NMOS Inverter, NAND and NOR gates, CMOS Inverter, NAND and NOR gates. Inverter delays, propagation delays.

Integrated Circuit Design: Types of ASICs: full custom and semi-custom devices, Major activities in ASIC Design, ASIC Design and Development flow, Standard Cell based ASICs, Gate arrays based ASICs including channeled, sea-of gates, structured gate arrays. PLDs: Block diagram of PLA, PLA design, Bipolar PLA, NMOS PLA, PLA organization, folded PLA, CPLD, PAL design,

FPGA block diagram, CLB, interconnect, I/O blocks

VLSI Design Tools: VHDL synthesis, VHDL synthesizer, Circuit design flow, Circuit Synthesis, Simulation, types of Simulations, Simulation versus Synthesis, Design verification tools, Test vector generation, Scan based techniques, Boundary scan test, BIST.

Packaging: Types of packages, VLSI design rules, Constraints: Electrical, Mechanical, Thermal design considerations of IC packages.

Textbooks:

1) Basic VLSI Design by Douglass 3rd Edition, A Pucknell and Kamran Eshraghian, PHI,1994.

2) Applications specific integrated Circuits by Michel John Sebastian Smith, Addison Wesley, 1997.

Reference Books:

3) Introduction of VLSI by Mead and Convay.

9. VIRTUAL INSTRUMENTATION

Course Objectives:

* To know the History of Instrumentation systems.

* To understand software Environment.

* To describe Virtual Instrumentation & sub Virtual Instrumentation.

* To know the Analog inputs, Analog outputs.

* Describe input and output files.

Course Outcomes:

After completion of the course the students will be able to

* Describe Virtual Instrumentation versus Traditional Instruments

* Explain concept of LabVIEW.

* Classify output verification Tools Waveform Graphs.

* Appraise the DAQ Hardware configuration.

* Explore output verification waveform charts..

SYLLABUS

Introduction to Virtual Instrumentation: History of Instrumentation systems, Evolution of Virtual Instrumentation, premature challenges, programming requirements, Drawbacks of recent approaches, conventional Virtual Instrumentation, Distributed Virtual Instrumentation, Virtual Instrumentation versus Traditional Instruments, Advantages.

Introduction to LabVIEW: Introduction, Advantages of LabVIEW, software Environment, Front panel, Block diagram, Data flow programming, G programming.

Programming Concepts of Virtual Instrumentation: VI & sub VI, loops, shift registers, feedback node, formula node, case and sequence structures, arrays, clusters.

Output Verification: Tools Waveform Graphs, Waveform charts, files I/O, local and global variables.

Data Acquisition system: Introduction, transducers, Signals, Signal conditioning, DAQ Hardware configuration, DAQ Hardware, Analog inputs, Analog outputs, counters, Digital I/O, DAQ software architecture, DAQ assistant.

Text Books:

1. S. Sumathi, P. Surekha, "Virtual Instrumentation with LabVIEW," ACME Learning Pvt. Ltd 2007.

Reference Books:

1. Jovitha Jerome, "Virtual Instrumentation Using LabVIEW," PHI learning Pvt. Ltd 2006.

2. Jeffrey Travis," LabVIEW for everyone," Pearson Education 2009.

10. COMPUTER CONTROL OF PROCESSES

Course Objectives:

* To study and review of current trends in computer control of process plants.

* To study basics of automatic process control and basic building blocks.

* To learn DDC Structure and algorithms.

* To study about Distributed Digital Control systems and its architectures.

* To study Personal Computers in real time environment.

* To study Industrial control applications.

Course Outcomes:

After completion of the course the students will be able to

* Describe historical developments and current trends in computer control of process.

* Explain about various controllers.

* Describe various DDC algorithms.

* Explain distributed process control systems.

* Describe Personal Computers applications in real time environment.

* Design Industrial control applications.

SYLLABUS

Introduction: Historical developments of control systems-current trends in computer control of process plants. Fundamentals of automatic process control: Introduction - Process definition feedback control - Single controller loop - Two Position control - multi-position control - PID control – Multivariable control - Feed forward control. Building blocks of Automation system: Introduction - Processing system – Multi-microprocessor systems - local area networks- Analog and digital I/O modules - supervisory and data acquisition systems - Remote terminal unit.

Direct Digital Control (DDC): Introduction - DDC Structure - DDC software position algorithm and velocity algorithm, Microcomputer based DDC structure. Programmable logic controllers (PLC's)-Principles of operation, Architecture of programmable controller- Programming the programmable controllers-Ladder diagram instructions-Software-configuration-applications.

Distributed Digital Control: Introduction - Distributed vs Centralized control - Advantages-Functional requirements of distributed process control system - System Architecture-Distributed Control System (DCS)-Sub-systems-Local field station-Presentation and monitoring device-Communication options in DCS - configuration. Some popular distributed control systems. Display systems-Display parameters-Display in process control environment-Computer graphics.

Personal Computers in real time environment:PC system and facilities-PC bus and signals - interrupts-interfacing PC to outside world - PC in real time environment - Application of IBM PC in real time - PC based distributed control systems.

Modeling and simulation: Mathematical model of a plant-model evaluation and improvement-modern tools for modeling and simulation of systems, application examples. Industrial control applications - cement plant - thermal power plant- water treatment plant irrigation canal management steel plant.

Text books

1. Computer - Based Industrial Control, by Krishna Kanth , Second edition , PHI.

2. Process control , by S.K.Singh ,PHI

Reference Books:

1. R Bitter, T Mohiuddin, M Nawrocki, LabVIEW: Advanced Programming Techniques, CRC Press, 2007.

2. Kevin James, 'PC Interfacing and Data Acquisition: Techniques for Measurement, Instrumentation and Control', Newness, 2000.

11 ADVANCED CONTROL THEORY

Course Objectives:

* To study basic compensators in time domain and frequency domain

* Derive the Cascade, Feedback compensations

* To study state variables and state space analysis of controllability and observability

* To study and learn the linearization methods of linear systems

* Demonstrate the non-linear system behavior by phase plane analysis

* Describe the function analysis of non-linear systems

Course Outcomes:

After completion of the course the students will be able to

* The design of phase-lead, phase-lag compensators in time domain

* The design of lead-lag compensators in time domain and frequency domain

* Concept of state space analysis for linear time invariant systems

* Concept of phase plane analysis for linear systems

* Concept of phase plane analysis for non-linear systems

* The stability behavior of non-linear systems

SYLLABUS

Introduction To Design: The deign problem, preliminary considerations of classical design, realization of basic compensators like phase lead compensation, phase lag compensation in time domain using root locus method

Design Of Compensators: Cascade compensation in time domain and frequency domain, feedback compensation using both root locus and bode plot and Lead-Lag compensation using bode plot.

State Variable Analysis: Concept of state variables – State models for linear and time invariant Systems –Solution of state and output equation in controllable canonical form –Concepts of controllability and observability – Effect of state feedback.

Phase Plane Analysis: Features of linear and non-linear systems - Common physical non-linearity's–Methods of linearization Concept of phase portraits –Singular points –Limit cycles –Construction of phase portraits – Phase plane analysis of linear and non-linear systems –Isocline method.

Describing Function Analysis: Basic concepts, derivation of describing functions for common non-linearities –Describing function analysis of non-linear systems –limit cycles –Stability of oscillations.

Text Books:

1. K. P. Mohandas, "Modern Control Engineering", Sanguine Technical Publishers,2006.

2. Gopal, M. – "Modern control theory", New Age International publishers,2002

Reference Books:

1. Digital Control and State Variable Methods: Conventional and Intelligent Control Systems M.Gopal McGraw Hill 3rd Edition, 2008.

2. Richard C. Dorf and Robert H. Bishop, "Modern Control Systems", Eleventh Edition, Prentice Hall, Pearson Education, 2008.

12 ROBOTICS & COMPUTER CONTROL OF MACHINE PARTS

Course Objectives:

* To introduce the basics of Robotics their principles and their classification.

* To understand the concept of Robot kinematics, dynamics, and their control.

* To provide adequate knowledge in Robot programming languages and computers that control manufacturing automation.

* To describe various automation techniques and methods in the design and selection of a Robot.

* To familiarize the basics of machine vision and its applications in the field of Robotics.

* To impart fundamental knowledge of the latest technologies in the area of Robotics and Automation.

Course Outcomes:

* Understand the Laws of Robotics and classify robot's joint and arm configurations.

* Program a robot to perform a specific task.

* Analyse the design and selection of robots for manufacturing and Non-manufacturing applications.

* Determine forward and inverse kinematics of different robots.

* Selection of suitable sensors for robotic application.

* Identify major components of the vision system.

SYLLABUS

Robot anatomy: Definition, law of robotics, History and Terminology of Robotics Accuracy and repeatability of Robotics Simple problems Specifications of Robot Speed of Robot Robot joints and links Robot Classifications Architecture of robotic systems.

Introduction to automation: Components and subsystems, basic building block of automation, manipulator arms, wrists and end effectors. Transmission elements: Hydraulic, pneumatic and electric drives. Gears, sensors, materials, user interface, implications for robot design, controllers.

Machine Vision: Introduction, Low level &High-level vision, Sensing &Digitizing, Image processing & analysis, Segmentation, Edge detection, Object description & recognition, Interpretation, Applications

Kinematics, dynamics and control: Object location, three-dimensional transformation matrices, inverse transformation, kinematics and path planning, Jacobian work envelope, manipulator dynamics, dynamic stabilization, position control and force control, present industrial robot control schemes.

Robot programming: Robot programming languages and systems, levels of programming robots, problems peculiar to robot programming, control of industrial robots using PLCs.

Automation and robots: Case studies, multiple robots, machine interface, robots in manufacturing and non manufacturing applications, robot cell design, selection of a robot.

Text Books:

1. S.R.Deb,Robotics technology and flexibl automation, Tata McGraw Hill Education company 2009.

2. Mikell P Groover & Nicholas G Odrey, Mitchel Weiss, Roger N Nagel, Ashish Dutta, Industrial Robotics, Technology programming and Applications, McGraw Hill, 2012.

Reference Books:

1. Richard D.Klafter,Thomas.AChriElewski,MichaelNegin, Robotics Engineering, and Integrated Approach, Phi Learning, 2009.

2. Francis N. Nagy, Andras Siegler, Engineering Foundation of Robotics, Prentice Hall Inc, 1987.

3. P.A.Janaki Raman, Robotics and Image Processing an Introduction, Tata McGraw Hill Publishing company Ltd, 1995.

13. DESIGN OF INSTRUMENT SYSTEMS

Course Objectives:

* To deal with various types of pressure and vacuum gauges
* To discuss manometers and flow meters of various types.
* To gain knowledge on the design aspects of temperature measuring systems like RTD, Thermistors.
* To explain the design procedures of Displacement measuring systems
* To understand the Design of strain gauges , LVDT measuring circuits.
* To utilize concepts of control system components and valves

Course Outcomes:

After completion of the course the students will be able to

* Analyze the various instruments and the design of measurement meters
* Identify the additional attributes in various types of flow meters, liquid level measuring instruments.
* Select the relevant transducer for measurement of physical quantities, different valves to meet the requirements of industrial applications.
* Identify the type of transducer based on the transduction principles (Temperature, pressure, flow, displacement)
* Identify the type of transducer based on the transduction principles and design of differential capacitors, LVDTs.
* Identify the type of transducer based on the transduction principles and design of strain gauges, piezoelectric transducers.

SYLLABUS

Design of Pressure and vacuum gauges: bourdon tubes, bellows and diaphragm Pressure gauges. Design of manometers-single, two liquid U-Tube manometers, inclined tube, well and ring type manometers.

Design of flow meters: orifice, venturi and Rota meters. Design of liquid level measuring instruments displacer and bubble types.

Design of control system components: flapper nozzle with ball valve, pneumatic globule valve, butterfly valve and Saunders patent valve.

Design of temperature measuring systems:Resistance Temperature Detectors (RTDs), Thermocouples and Thermistors.

Design of displacement measuring circuits: LVDT, and differential capacitors.Design of strain gauges and measuring circuits. Design of piezoelectric transducers and measuring circuits.

Text Books:

1. Patranabis D, “Sensors and Transducers”, 2nd Edition, PHI, New Delhi, 2010.

2. Sawney A K and Puneet Sawney, “A Course in Mechanical Measurements and Instrumentation and Control, 12th edition”, Dhanpat Rai and Co, New Delhi, 2013.

Reference Books:

1. DP Eckman-Industrial Instrumentation.

2. Webster John G., “Instrumentation and Sensors Handbook”, CRC Press, 1st Ed., 1999.

14. FIBER OPTICS AND LASER INSTRUMENTATION

Course Objectives:

* To know the principles of light propagation theory.
* To learn different types of fibers and their individual properties, characteristics.
* To study about various fiber optic sensors.
* To learn about various fiber optic communication systems.

* To study about fundamentals of lasers and their types.

* To study about applications of various lasers.

Course Outcomes:

After completion of the course the students will be able to

* Describe the properties and characteristics of optical fibers.

* Estimate the losses due to attenuation, absorption, scattering.

* Construct the various fiber optics communication systems.

* Classify the various types of lasers and its properties.

* Illustrate various laser applications with laser instruments for medical field.

* Design systems for Industrial application of Lasers.

SYLLABUS

Introduction: Principles of light propagation through fiber- Different types of fibers and their properties– transmission characteristics of optical fibers - absorption losses-scattering losses-dispersion.

Fiber optic sensors: Fiber optic communication and instrument system – Advantages of optical communications – Different types of Modulators – Detectors – Fiber optic communication setup – Applications in instrumentation.

Characteristics and fundamentals of lasers: Laser emission and light amplification – Optical Resonators – Modes of resonators – Q-Factors , Q-Switching, Mode locking in lasers – Properties of Laser Beams - Types of lasers – Gas lasers – Solid lasers – liquid lasers – semiconductors lasers.

Lasers for Analysis:Laser application in holographic microscopy, holographic interferometer and applications -Medical applications of lasers. Laser and tissue interactive – Laser instruments for surgery, removal of tumors of vocal cards, Brain Surgery, Plastic surgery, gynecology & oncology.

Industrial application of Lasers: Measurement of distance and length, velocity, acceleration, atmospheric effects, pollutants, Material processing, laser heating, melting, scribing, splicing, material removal.

Text Books:

H.C. Allen, An Introduction to Optical Fibers, McGraw-Hill International Book Co., 1983.

2. John and Harry, Industrial lasers and their applications, McGraw Hill publications,1974

Reference books

1. Gerd Kaiser, Optical fiber communications, McGraw Hill International Edition,2000

2. D.C. Oshea and W.Russel Callen, Introduction to lasers and their Applications, Addison Wesley, 1978.

3. BS. Wherrelt, Laser Advances and Applications, John Wiley, 1979.

4. W.O.N. Guimarass and A.Mooradian, Lasers and Application Springer Verlag, 1981

15. ANALYTICAL INSTRUMENTATION

Course Objectives:

* To study the electromagnetic radiation, the Beer Lambert law.

* To study the concepts related to spectroscopy computerized NMR. Electro spin resonance spectrometer (ESR).

* To study the X-ray absorption meters X-ray fluorescence spectrometers.

* To Demonstrate the functions of chromatographic system.

* To study Measuring circuits. electro-chemical cell.

* To study Hydrogen gas analyzers-IR gas analyzers.

* To study the ozone automated wet chemical analyzers water pollution monitoring.

Course Outcomes:

After completion of the course the students will be able to

* Able to implement and Colorimeters & Spectrophotometers.

* Able to describe Nuclear magnetic resonance spectrophotometer (NMR).

* Able to describe Gas & liquid chromatographic systems.

* Able to implement X-ray spectrometer: X-ray spectrum.

* Able to analyze Systems working on thermal conductivity.

* Able to analyze industrial gas analyzers.

* Able to describe ozone automated wet chemical analyzers water pollution monitoring.

SYLLABUS

Introduction, laboratory and industrial analyzers classification of the methods of analysis block diagram of an analyzing system. Colorimeters & Spectrophotometers (visible & ultraviolet) electromagnetic radiation, the Beer Lambert law. Infra - red spectrophotometers types of instruments, principles of operation, basic components of the systems.

Nuclear magnetic resonance spectrophotometer (NMR) principle, construction, details Fourier transform NMR, spectroscopy computerized NMR. Electro spin resonance spectrometer (ESR), principle of operation construction of the ESR spectrometer.

X-ray spectrometer: X-ray spectrum, instrumentation for X-ray spectrometry X-ray diffractometers X-ray absorption meters X-ray fluorescence

spectrometers. Gas & liquid chromatographic systems: Principles of chromatography, Schemes and constructional details and functions of chromatographic system components.

Systems working on thermal conductivity. Principle of operation- conductivity cell construction. Measuring circuits. electro-chemical cell, construction. conductivity meters, polarography.

Industrial Gas Analyzers: Types of gas analyzers- flue gas analyzers, paramagnetic oxygen analyzers, electrochemical gas analyzers. Hydrogen gas analyzers-IR gas analyzers, analyzers based on gas density systems based on ionization of gases.

Environmental Pollution Monitoring Instruments: Air pollution monitoring, instrument systems for-carbon monoxide-Sulphur dioxide-nitrogen oxides-hydro carbons-ozone automated wet chemical analyzers water pollution monitoring.

Text Books:

1. R.S. Khandpur, Handbook of Analytical Instruments, Tata McGraw Hill publishing Co. Ltd., 2nd edition, 2006.

2. Instrumental methods of analysis - HH Willard, Jr., JADean, FASettle, JR,CBS Publications.

Reference Books:

1. Instrument engineers Handbook. Instrumentation and Analysis-GB Liptak Edition Charge Chilton book Company

2. John G Webster, “Medical Instrumentation – Application and Design”, 4th ed., John Wiley and Sons, 2007.

OPEN ELECTIVES:

1. INDUSTRIAL ELECTRONICS

Course Objectives:

Students undergoing this course are expected to:

* Familiarize industrial and power electronic devices

* chose different polyphase rectifiers for different applications

* Able to know electric welding and high frequency heating· analyze voltage controlled rectifiers

* Explain electronic speed control of motors

Course Outcomes:

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

* Summarize the operation of various industrial and power semiconductor devices

* Outline various polyphase rectifiers against various performance parameters

* Explain different methods of Electric welding

* Analyze the performance of phase controlled rectifiers for various loads

* Demonstrate the Electronic speed control of motors

SYLLABUS

Introduction To Industrial Electronics: Scope of Industrial Electronics, Main task of Power Electronics, Applications, Advantages, Disadvantages, Applications, Block diagram of Power Electronic System, PNPN device- Basic structure, two transistor version, Volt Ampere Characteristics, Holding current. Latching current, Gate circuit of Thyristor, Thyristor gate characteristics, Design of firing circuit, Triggering methods of thyristor, thyristor connected in series and parallel, Thyristor ratings, Silicon Controlled Switch(SCS): Basic structure, Two transistor equivalent, characteristics, Uni-junction transistor- Basic structure, Potential divider equivalent, Static emitter characteristics, delay firing of SCR by UJT. Bilateral PNPN diode switch(DIAC): Basic structure, Volt-Ampere characteristics, Triac- Basic structure, Volt- Amperecharacteristics.

Polyphase Rectifiers: Introduction, uses of Polyphase Rectifiers, Three phase half wave delta-wye rectifier with resistive load, Six -phase star Half wave rectifier with resistive load, Delta line to line double wye half wave rectifier with inter phase transformer and with resistive load, Three phase delta wye bridge rectifier with resistive load, General m-phase rectifier DC power outputs, efficiencies and ripple factors, Transformer utility factor, Rectifier performance, Commutation in Polyphase rectifiers.

Electric Welding And High Frequency Heating: Methods of high frequency heating,Welding: Plastic Welding, Fusion Welding, Basic block diagram for a.c. resistance welding, types: Spot welding. Projection welding. Butt welding, Seam welding and Pulsating welding arrangements. InductionHeating: Principle of induction heating.

Applications. Dielectric Heating: Principle of dielectric heating. Electrodes used in dielectric heating. Methods of coupling of Electrodes to R.F. Generator. Applications.

Voltage Controlled Rectifiers: (outlines of topics only): Single-Phase Half-wave controlled rectifier with resistance load. Single-Phase Full-wave controlled rectifier with resistance load. Three-Phase Half wave controlled rectifier with resistance load. Six-phase half- wave Controlled rectifier with resistance load.

Electronic Speed Control Of Motors: (outlines of topics only): DC Motor speed Control: single phase dc drives, single phase half wave converter drives, phase control, SCR feedback circuit for series motor drive. Half wave controlled SCR bridge for series motor drive. Choppercontrolleddcdrives. ACmotorspeedcontrol-Speedcontrolbyvariationofstator voltage using SCRs, Variable-frequency A.C motor drive, Voltage-fed inverter control.

P.W.M. control scheme, Current-fed inverter control, chopper controlled wound rotor Induction motor, rotor resistance control.

Text Books:

1. 1.Industrial Electronics and by Power Electronics G.K.mithal, Khannapublishers.

2. Power Electronics by P.C.Sen,T.M.H.

Reference Books:

1.Power Electronics by Dr.P.S.Bimbra, Khanna publishers

2. ARTIFICIAL INTELLIGENCE

Course Objectives:

* To introduce to the basic concepts of Artificial Intelligence with illustrations of current state of the art research and applications.

* To identify the type of an AI problem in search inference, decision making under uncertainty, game theory etc.

* To recognize the characteristics of AI languages that make it useful to real-world problems.

* To describe the strengths and limitations of various search algorithms and choose the appropriate algorithm.

* To understand the basic concept of fuzzy sets, fuzzy logic and defuzzification.

* Identify and describe Neural network and Fuzzy logic techniques in building intelligent system.

Course Outcomes:

After completion of the course the students will be able to

* Exhibit strong familiarity with a AI techniques including in particular search, knowledge representation, planning and constraint management.

* Interpret the modern view of AI as the study of agents that receive percepts from the environment and perform actions.

* Ability to apply AI techniques to real-world problems to develop intelligent systems.

* Build awareness of AI facing major challenges and the complexity of typical problems within the field.

* To analyze various techniques in feedback and feed forward Neural networks.

* Apply the basic knowledge of fuzzy sets and fuzzy logics to implement a new algorithms.

SYLLABUS

Basic ProblemSolving Methods: Production systems – state space search –control strategies – heuristic search – forward and backward reasoning – hill climbing techniques – breadth first search – depth first search – best search – staged search.

Knowledge Representation: Predicate logic – resolution question answering – non monotic reasoning – statistical and probabilistic reasoning semantic nets – conceptual dependency – frames- scripts.

Image Restoration:AI Languages: important characteristics of AI languages- PROLOG, introduction to expert systems, structure of an expert system-interaction with an expert design of an expert system.

Neural Networks: basic structure of a neuron, perception feed forward, back propagation, Hopfield network.

Fuzzy Logic: fuzzy sets, member ship function, rules and algorithms, de-fuzzication and implementation.

Text Books:

1. Rich E and knight K- Artificial intelligence. Tata McGraw Hill, New Delhi 1991.

2. Nillson NJ – Principals of artificial intelligence, Springer Veriag Berlin 1980.

Reference Books:

3. Barr A.Fergenbaum E A & Cohen P R- Artificial intelligence, edition-Wesley reading (mass 0,1989).

4. Water man D A- A guide to expert systems, edition- Wesley reading (mass),1986.

3. DIGITAL IMAGE PROCESSING

Course Objectives:

* To study and review of Light and Electromagnetic spectrum.

* To study basic image processing concepts and components.

* To learn and application of various image enhancement techniques.

* To study about various image restoring techniques in various domains.

* To learn and application of various color image processing techniques.

* To study algorithms for image compression and image segmentation.

Course Outcomes:

After completion of the course the students will be able to

* Describe the image processing concepts and components.

* Use the various image enhancement techniques.

* Classify the various noise models.

* Explain various color image processing techniques.

* Categories various error free and loss-less image compression models.

* Design algorithms for image segmentation

SYLLABUS

Digital image fundamentals: Light and Electromagnetic spectrum, Components of Image processing system, Image formation and digitization concepts, Neighbors of pixel adjacency connectivity, regions and boundaries, Distance measures, Applications.

Image Enhancements: Image Enhancements: In spatial domain: Basic gray level transformations, Histogram processing, Using arithmetic/Logic operations, smoothing spatial filters, Sharpening spatial filters. In Frequency domain: Introduction to the Fourier transform and frequency domain concepts, smoothing frequency-domain filters, Sharpening frequency domain filters.

Image Restoration: Various noise models, image restoration using spatial domain filtering, image restoration using frequency domain filtering, Estimating the degradation function, Inverse filtering.

Color Image processing: Color fundamentals, Color models, Color transformation, Smoothing and Sharpening, Color segmentation

Image compression: Introduction, Image compression model, Error-free compression, Lossy compression.

Image segmentation: Detection of discontinuities, Edge linking and boundary detection, thresholding

Text Books:

1. R. C. Gonzalez and R. E. Woods, Digital Image Processing, 3rd edition, Prentice Hall, 2008.

2. R. C. Gonzalez, R. E. Woods and Steven L. Eddins , Digital Image Processing Using MATLAB , 2rd edition, Prentice Hall, 2009.

Reference Books:

3. Anil K.Jain, “Fundamentals of Digital Image Processing”, Prentice Hall of India, 9th Edition.

4. Jayaraman, S. Esakkirajan, and T. Veerakumar, Digital Image Processing, Tata McGrawHill Education, 2011.

4. COMPUTER ORGANIZATION AND ARCHITECTURE

Course Objectives:

* Discuss the Basic Operational Concepts.

* Assess the performance of Multiprocessors and Multi Computers.

* Learn the Basic Concepts of Semiconductor RAM Memories

* Assess the performance of Input-Output Processor.

* Assess the performance of various multiplication algorithms.

* List out the different types of Micro-Operations.

Course Outcomes:

After completion of the course the students will be able to

* Apply the fundamental issues related to computer arithmetic operation and circuits to support the system computation.

* Understand the various components of memory system to organize the operational units of CPU.

* Analyze the data processing operations of central processing and control unit to design the CPU specification.

* Understand the concepts of pipeline design techniques to increase the execution rate of a processor.

* Analyze File System Implementation and File System Structure.

* Analyze various mechanisms used in virtual memory management.

SYLLABUS

Basic Structure of Computers: Computer Types, Functional UNIT, Basic Operational Concepts, Bus, Structures, Software, Performance, Multiprocessors and Multi Computers, Data Representation, Fixed Point Representation, Floating - Point Representation.Register Transfer Language and Micro Operations: Register Transfer Language, Register Transfer Bus and Memory Transfers, Arithmetic Micro Operations, Logic Micro Operations, Shift Micro Operations, Arithmetic Logic Shift Unit, Instruction Codes, Computer Registers Computer Instructions - Instruction Cycle. Memory - Reference Instructions, Input - Output and Interrupt, STACK Organization, Instruction Formats, Addressing Modes, DATA Transfer and Manipulation, Program Control, Reduced Instruction Set Computer.

Micro Programmed Control: Control Memory, Address Sequencing, Microprogram Examples, Design of Control Unit, Hard Wired Control, Microprogrammed Control. The Memory System: Basic Concepts of Semiconductor RAM Memories, Read-Only Memories, Cache Memories Performance Considerations, Virtual Memories secondary Storage, Introduction to RAID.

Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer Modes, Priority Interrupt, Direct Memory Access, Input-Output Processor (IOP), Serial Communication; Introduction to Peripheral Components, Interconnect (PCI) Bus, Introduction to Standard Serial Communication Protocols like RS232, USB, IEEE1394.

Operating Systems Overview: Overview of Computer Operating Systems Functions, Protection and Security, Distributed Systems, Special Purpose

Systems, Operating Systems Structures-Operating System Services and Systems Calls, System Programs, Operating System Generation. Memory Management: Swapping, Contiguous Memory Allocation, Paging, Structure of the Page Table, Segmentation, Virtual Memory, Demand Paging, Page-Replacement Algorithms, Allocation of Frames, Thrashing Case Studies - UNIX, Linux, Windows Principles of Deadlock: System Model, Deadlock Characterization, Deadlock Prevention, Detection and Avoidance, Recovery from Deadlock.

File System Interface: The Concept of a File, Access Methods, Directory Structure, File System Mounting, File Sharing, Protection. File System Implementation: File System Structure, File system Implementation, Directory Implementation, Allocation Methods, Free-Space Management.

Text books

1. Computer Organization - Carl Hamacher, ZvonksVranesic, SafeaZaky, 5th Edition, McGraw Hill.

2. Computer System Architecture - M. morismano, 3rd edition, Pearson

Reference Books:

1.Operating System Concepts – AbrehamSilberchatz, Peter B. Galvin, Greg Gagne, 8th Edition, John Wiley.

5. FUNDAMENTALS OF NANO SENSORS

Course Objectives:

* To study and review of Micro and nano-sensors.
* To study basic Accelerometer, Pressure Sensor, Night Vision System.
* To learn Sensor for bio-medical applications.
* To study about RF MEMS – MEMS variable capacitors.
* To learn and application of various color image processing techniques.
* To study Nanolithography Basics of lithography.

Course Outcomes:

After completion of the course the students will be able to

* Describe Integration of sensor with actuators and electronic circuitry.
* Use the various Sensors for bio-medical applications.
* Classify DNA Biosensors, Optical sensors. Biochips.
* Explain RF MEMS – MEMS variable capacitors.
* Categories various doping wet chemical etching – stencil lithography and sacrificial etching.
* Able to explain Nanolithography and Basics of lithography

SYLLABUS

Nanosensors I: Micro and nano-sensors, Fundamentals of sensors, biosensor, micro fluids, Packaging and characterization of sensors, Method of packaging at zero level, dye level and first level. Sensors for aerospace and defense: Accelerometer, Pressure Sensor, Night Vision System, Nano tweezers, nano-cutting tools, Integration of sensor with actuators and electronic circuitry.

Nanosensors II: Sensor for bio-medical applications: Cardiology, Neurology and as diagnostic tool, For other civil applications: metrology, bridges etc. Biosensors. Clinical Diagnostics, generation of biosensors, immobilization, characteristics, applications, conducting Polymer based sensor, DNA Biosensors, optical sensors. Biochips. Metal Insulator Semiconductor devices, molecular electronics, information storage, molecular switching, Schottky devices.

NEMS:Inertial sensors – accelerometer – gyroscope - micromechanical pressure sensors – piezoresistive –capacitive - micro robotics – micro channel heat sinks – optical MEMS – visual

display – precision optical platform – optical data switching – RF MEMS – MEMS variable capacitors – MEMS switches – Resonators.

Nanolithography: Basics of lithography, optical, micro, ion beam lithography,

lithographic tools, nanoimprint lithography – polymeric nanofiber templates – focused ion beam doping wet chemical etching – stencil lithography and sacrificial etching – large scale integration – future challenges – applications.

Text Books:

1. K. Goser, P. Glosekotter and J. Dienstuhl, “Nanoelectronics and Nanosystems-From

Transistors to Molecular Quantum Devices”, Springer, 2004.

2. W.R.Fahrner, “Nanotechnology and Nanoelectronics – Materials, Devices and Measurement Techniques” Springer, 2006.

3. Sensors: Micro &Nanosensors, Sensor Market trends (Part 1&2) by H. Meixner.

4. Nanoscience & Technology: Novel structure and phenomea by Ping Sheng (Editor).

Reference Books:

1. Nano Engineering in Science &Technology: An introduction to the world of nano design by Michael Rieth.

2. Tai –Ran Hsu, “MEMS & Microsystems Design and Manufacture”, Tata McGraw-Hill publication, 2001.

3. P. Rai-Choudhury, “MEMS and MOEMS technology and applications”, PHIlearning private Ltd, 2009.

4. Mohamed Gad-el-Hak, “The MEMS Handbook”, CRC Press

6. PROGRAMMABLE CONTROL SYSTEMS

Course Objectives:

* At the end of chapter one will able of understand the knowledge of Industrial automation and control tools such as DCS, SCADA, PLC etc.,

* Making aware of standard communication protocols implementation of RS 232, RS 485 and comparison with MODBUS process and its advantages.

* Comparision of HART used to communicate with devices for device configuration- reconfiguration, Diagnosis, Trouble shooting, device health and status. Devicenet, Industrial ethernet applications

* PLC programming methods and Analog controlling using PLC and its its interfacing with SCADA /DCS using communication links.

* PLC its architecture and comparision of PLC with DCS and concepts on ladder diagrams and relay diagrams and study of industrial PLC.

* Distributed Control Systems introduction, functions , advantages and its limitations, database management system.

Course Outcomes:

* After conclusion of control and automation topic we can understand the calibration process for PLC and DCS systems.

* A brief knowledge on OSI (open System Inter connection) model and OPC (Object Linking and embedding for Process Control) is achieved.

* Graphical representation and mathematical analysis can be implemented for different timers and counters and for High speed counter can be achieved.

* In depth knowledge on different PTO, PWM and PID blocks in PID design and study can be fulfilled.

* Programming methods as per IEC 61131 for PLC can be implemented and executed.

* In depth knowledge can be achieved in various functions of Distributed Control Systems like interfacing, Display, Historical data Management etc., can be studied.

SYLLABUS

Control Systems and Automation Strategy:Evolution of instrumentation and control, Role of automation in industries, Benefits of automation, Introduction to Descriptive automation tools PLC, DCS, SCADA, Hybrid DCS/ PLC, Automation strategy evolution, Control system audit, and performance criteria.

Instrumentation Standard Protocols: Definition of protocol, Introduction to Open System Interconnection (OSI) model, Communication standard (RS232, RS485), Modbus (ASCII/RTU), Introduction to third party interface, concept of OPC (Object linking and embedding for Process Control), HART Protocol: Introduction, frame structure, programming, implementation examples, benefits, advantages and limitation.

Foundation Fieldbus H1: Introduction, frame structure, programming, implementation examples, benefits, advantages and limitation. Comparison of HART, Foundation Fieldbus, Devicenet, Profibus, Controlnet, Industrial Ethernet.

Programmable logic controllers (PLC): Introduction, architecture, definition of discrete state process control, PLC Vs PC, PLC Vs DCS, relay diagram, ladder diagram, ladder diagram examples, relay sequencers, timers/counters, high speed counter, PTO, PWM and PID blocks in PLC, PLC design, study of at least one industrial PLC.

Advance Applications of PLC and SCADA: PLC programming methods as per IEC 61131, PLC applications for batch process using SFC, Analog Control using PLC, PLC interface to SCADA/DCS using communication links (RS232, RS485) and protocols (Modbus ASCII/RTU)

Distributed Control Systems: DCS introduction, functions, advantages and limitations, DCS as an automation tool to support Enterprise Resources Planning, DCS Architecture of different makes, specifications, configuration and programming, functions including database management, reporting, alarm management, communication, third party interface, control, display etc. Enhanced functions viz. Advance Process Control, Batch application, Historical Data Management, OPC supports, Security and Access Control etc.

Text Books:

1. Distributed Computer Control for Industrial Automation, PoppovikBhatkar, Dekkar Publications.

2. Programmable Logic Controllers: Principles and Applications, Webb and Reis, PHI.

Reference Books:

1. Computer Aided Process Control, S. K. Singh, PHI.

2. Introduction to Programmable Logic Controllers, Garry Dunning, Thomson Learning.

3. Computer Based Process Control, Krishna Kant, PHI. 6. The Management of Control System: Justification and Technical Auditing, N. E. Battikha, ISA.

7. TELEMETRY

Course Objectives:

* Comprehend frontier areas of knowledge in modulation techniques and telemetry systems.

* To describe the Knowledge on functions of telemetry system

* To classify various methods in land telemetry

* To construct about the radio telemetry and positioning telemetry systems

* To Understand analog communication and modulation methods

* To Learn frequency modulation methods and pulse code communication techniques.

Course Outcomes:

* List the subsystems used to build a telemetry system and to classify the methods of telemetry

* To know the appropriate use of land line and radio telemetry and to list various transmitting and receiving techniques in radio telemetry.

* Comprehend the performance of Amplitude modulation and demodulation techniques.

* Analyze AM and FM transmitters, receivers and design of AM and FM detectors

* outline of pulse modulation techniques used in telemetry.

* Explain sampling and examine the performance of pulse code modulation and demodulation techniques used in telemetry systems

SYLLABUS

Classification of Telemetry Systems: voltage, current position, frequency, pulse, land-line and radio telemetry. Land-Line Telemetry: voltage telemetering system, current telemetering system, motion balance current telemetering system, position telemetering system using bridge configuration, position telemetering system using synchro's .

Amplitude Modulation and Demodulation of a Carrier Wave: Expression for an AM- wave, frequency spectrum of an AM-wave, bandwidth, AM-detector, illustration of AM for measuring system, full-wave phase sensitive demodulator, block diagram of carrier amplifier system.

Frequency Modulation and Demodulation of A Carrier Wave: Expression for an FM-wave, frequency spectrum of an FM-wave, bandwidth, diode FM modulator, phase shift discriminator, ratio detector.

Amplitude Modulation and Demodulation Circuits for Measurement Systems: Basic configuration for a modular electromechanical chopper, semiconductor modulator, balanced modulator, basic configuration of a demodulator chopper, demodulator semiconductor, demodulators, balanced demodulator. Block diagrams of DC and AC signal conditioning systems.

Multiplexing in Telemetry Systems: Block diagram of multiplexer and its mechanical switch, equivalent block diagram of a demultiplexer and its mechanical switch, equivalent frequency division multiplexing, time division multiplexing, sample-and –hold circuit, an outline of pulse modulation techniques used in telemetry.

Radio Telemetry Systems: Analog TDM system, FM-FM telemetry system, standard telemetry channel, frequencies for FDM, block diagrams of PAM, PCM, and FDM telemetry systems.

Transmission Channels: Wire line channels, radio channels, microwave channels, power line carrier channels and fiber optic transmission.

Text Books:

1. Electrical and electronics measurements and instrumentation, by A.K.Sawhney, Dhanpat Rai & Sons .

2. Introduction to Telemetry by Alan Andrews, Foulsham-Sams technical books, published by W-Foulsham&Co Ltd., England.

Reference Books:

1. Understanding telemetry circuits, by John D.Lenk, Foulsham – Sams technical books, Published by W.Foulsham& Co., England

8. IOT SENSORS AND DEVICES

Course Objectives:

* To introduce the concepts of IOT with hardware platforms.

* To make Familiar with History of IOT Architecture

* Applications of IOT.

* To share knowledge about security aspects in IOT

* Explain the concept of applications of IOT

Course Outcomes:

* Student can understand the History & overview of IOT.

* Gain knowledge about IOT supported hardware

* Learn security concepts of IOT.

* Vast knowledge on applications of IOT.

* Visualize the interfacing with Embeddedboards.

* Familiarize with Industry 4.0 concepts.

SYLLABUS

IoT Platform overview

Overview of IoT supported Hardware platforms such as: Raspberry pi, ARM Cortex

Processors, Arduino and Intel Galileo boards.

IoT Architecture:

History of IoT, M2M – Machine to Machine, Web of Things, IoT protocols

Applications: Remote Monitoring & Sensing, Remote Controlling, Performance Analysis

The Architecture

The Layering concepts, IoT Communication Pattern, IoT protocol Architecture, The 6LoWPAN

Security aspects in IoT

Case Study & advanced IoT Applications:

IoT applications in home, infrastructures, buildings, security, Industries, Home

Appliances, other IoT electronic equipment. Use of Big Data and Visualization in IoT,

Industry 4.0 concepts. Sensors and sensor Node and interfacing using any Embedded target boards (Raspberry Pi / Intel Galileo/ARM Cortex/ Arduino)

Text Books:

1. Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems, Dr. OvidiuVermesan, Dr. Peter Friess, River Publishers.

2. Interconnecting Smart Objects with IP: The Next Internet, Jean-Philippe Vasseur, Adam Dunkels, MorganKuffmann.

Reference Books:

1. 6LoWPAN: The Wireless Embedded Internet, Zach Shelby, Carsten Bormann, Wiley.

9. COMMUNICATION SYSTEMS

Course Objectives:

* To know the steps involved in the analysis of digital communication systems.

* To know how to function a digital communication module with the given specifications

Course Outcomes:

After studying this course the students shall be able to:

* The ability of visualization and practical implementation of baseband modulation techniques.

* The skill to analyze and implement analogue to digital converters like PCM, DM.

* The ability to design pass band digital modulation systems and techniques with desired specifications

* The ability to design pass band digital demodulation techniques

SYLLABUS

Analog-to-Digital Conversion: Pulse modulation techniques, Sampling, Time Division Multiplexing, Pulse Amplitude Modulation, Pulse Width Modulation, Pulse Position Modulation, Digital Modulation Techniques: Pulse Code Modulation, Differential Pulse Code Modulation, Delta Modulation, Adaptive Delta Modulation, Continuously Variable Slope Delta Modulation, Companding, Noise in Pulse-Code and Delta-Modulation Systems.

Binary Phase-Shift Keying, Differential Phase-Shift Keying, Differentially-Encoded PSK (DEPSK), Quadrature Phase-Shift Keying (QPSK), M-ary PSK, Quadrature Amplitude Shift Keying (QASK), Binary Frequency Shift-Keying, Similarity of BFSK and BPSK, M-ary FSK, Minimum Shift Keying (MSK), Duo-binary Encoding.

Mathematical Representation of Noise: Some Sources of Noise, Frequency-Domain Representation of Noise, The Effect of Filtering on the Probability Density of Gaussian Noise, Spectral Components of Noise Response of a Narrowband Filter to Noise, Effect of a Filter on the Power Spectral Density of Noise, Superposition of Noises, Mixing Involving Noise, Linear Filtering, Noise Bandwidth, Quadrature Components of Noise, Power Spectral Density of n(t) and n(t), Probability Density of n(t), n(t), and their Time Derivatives, Representation of Noise Using Orthonormal Coordinates, Irrelevant Noise Components

Data Transmission: A Base-band Signal Receiver, Probability of Error, The Optimum Filter, White Noise: The Matched Filter, Probability of Error of the Matched Filter, Coherent Reception: Correlation, Phase-Shift Keying, Frequency-Shift Keying, Non-coherent Detection of FSK, Differential PSK, Four Phase PSK (QPSK), Error Probability for QPSK, Probability of Error of Minimum Shift Keying (MSK), Comparison of Modulation Systems.

Spread Spectrum Modulation: Direct Sequence (DS) Spread Spectrum, Use of Spread Spectrum with Code Division, Multiple Access (CDMA), Ranging using DS Spread Spectrum, Frequency Hopping (FH) Spread Spectrum, Generation and Characteristics of PN Sequences, Acquisition (Coarse Synchronization) of a FH Signal, Tracking (Fine Synchronization) of a FH Signal, Acquisition (Coarse Synchronization) of a DS Signal, Tracking of a DS Signal.

Text Books:

1. Analog and Digital Communication Systems by Martin S. Roden, 3rd edition, Prentice Hall, 1994;

2. Principles of Communications By Taub and Schilling.

Reference Books:

1. Simon Haykin and Michael Moher, Introduction to Analog & Digital Communications, Wiley 2007.

2. Proakis, John, and Masoud Salehi. Communication Systems Engineering. 2nd ed. Upper Saddle River, NJ: Prentice Hall, 2001

10. MICRO AND NANO SENSORS

Course Objectives:

* To make them understand various advanced concepts in Nano Technology.

* Explore the fundamentals of different kinds of Sensors and it's applications.

* Understand various methods used for production of carbon nanotubes.

* Gain the concepts of Micro and nanoelectronics .

* Understand various nanostructures and its applications towards Micro/ Nano cantilever sensors

* Acquire the fundamentals of DNA structures

* Obtain the knowledge on optical Bio sensors

Course Outcomes:

* Have a good vision to the future of micro/nano technology.

* Vast knowledge on synthesis, Characteristics & applications of Carbon Nano tubes.

* Obtain an idea about preparation of cantilevers along with it's applications.

* Sound knowledge on Optical sensors.

* Gain experience on Bio molecule, Protein, DNA structures etc..

* Familiarize with Classic sensors for Micro/Nano electronic applications.

SYLLABUS

Introduction sensors, Micro technology, Nano technology, Micro and nanobiosensors: Introduction to Micro/Nano biosensor, Biosensor history and current status, Classical Sensors. Applications of micro electrons and nano electrons.

Carbon-Nanotube-Based Sensors:Introduction , Synthesis of Carbon Nanotubes, Relevant Physical Characteristics of Carbon Nanotubes, Chemical Sensors and MEMS-Based Nanotube Sensors. Carbon-Nanotube-Based Fluidic Shear-Stress Sensors: Overview of Carbon Nanotube Sensors , Types of Shear-Stress Sensors.

Nanomechanical Cantilever Sensors: Theory and Applications: Introduction, Operation Principles, Preparation of Microcantilever Sensors. Protein in Films: Sensing Elements for Sensors: Protein-Containing LB Films for Biosensor Applications, Antibody-Containing LB Films, Enzyme-Containing LB Films.DNA Sensors: DNA Hybridizations, DNA sequencing, DNA-Containing Monolayers and LB Films

Biomolecules, Protein, DNA structures and their immobilizations on sensor surface, Thermodynamic and Kinetics at biosensor surface.Microfluidics: Advances in micro fluidics, Sensor integrations. Immunosensors: antibody- antigen, Single molecule detections.

Optical Capillary Sensors for Intelligent Classification of Micro fluidic Samples: Introduction, Operating Principles and Construction Aspects of the Optical Capillary Head, General Description of the Sensor System, e Measurement Cycle of the Capillary Sensor. Optical biosensors: Optical Imaging, Optical Sensing, Opto-genetics.

Text Books:

2. Nanosensors: Theory and Applications in Industry, Healthcare and Defense Edited ByTeik-Cheng Lim (https://www.taylorfrancis.com/books/e/9780429130793).

3. Introduction to Biosensors, Jeong-Yeol Yoon et al. Springer.

Reference Books:

1. Handbook of Biosensors and Biosensor Kinetics, AjitSadana, Elsevier.

2. Nanofabrication Towards Biomedical Applications, Challa Kumar, Wiley-VCH.

3. Optical Biosensors: Present & Future, Frances Ligler, Elsevier

11. ADVANCED SENSING TECHNIQUES

Course Objectives:

* To provide in depth knowledge in different phases of automation.

* To introduce the students to designing and modelling of advanced sensing techniques.

* An understanding of the principles of physical sensors.

* To give a fundamental knowledge on the basic laws and phenomena on which operation of Chemical sensors.

* To impart a reasonable level of competence in the design, construction, and execution of Lab on chip.

Course Outcomes:

* Explain the various principles employed in Different Phases of automation.

* Examine the designing and modelling of advanced sensing techniques.

* Apply knowledge in designing of physical sensors.

* Discuss the techniques of fabrication and application of chemical sensors.

* Describe the various applications of chemical sensors.

* Discuss advanced sensing technology.

SYLLABUS

Introduction Different Phases of automation. Importance of sensor/smart sensor in automation. Features of Advanced sensing techniques. Sensor classifications according to the energy domains. Introduction of advanced sensing materials. Properties (physical, electrical, chemical, biological) of materials which makes it suitable for sensing in differentdomain.

Design and modelling, Design and modelling issue in advanced sensing technique, Introduction of different mathematical tools used in sensor design, Study of analytical design from given specification, conformal mapping, Optimization techniques used in sensor design. Numerical design such as FEM, FDM, etc. Study of Tomography and Concept of Feedback in sensing Fabrication and packaging Introduction to MEMS sensor. Comparison between MEMS and Macro sensor. Fabrication and packaging issue in sensor design, Thick film and thin film technique.

Physical sensors, Hall Effect sensors, Eddy current sensors, magneto resistive and magneto strictive detectors, Accelerometers: Capacitive, Piezoelectric, Piezoresistive, Thermal, Humidity and moisture sensor, Proximity detectors using polarized light, Semiconductor gas sensor, Fluidic and Micro-fluidic sensors.

Chemical sensor, Chemical sensor characteristics, specific difficulties related to chemical sensor, Classification of Chemical sensing mechanism, Study of chemical sensor based on the principle of direct sensing techniques such as Metal oxide chemical sensor, electro chemical sensors, potentiometric sensors, conductive sensors, amperometric sensors, enhanced catalytic gas sensors, enzyme sensors, Study of chemical sensors in indirect mode such as thermal sensor, optical chemical sensor, biochemical sensor, enzyme sensor, Sensor array.

Introduction to the concept of Lab on chip/senor platform technology, The role of PCA, LDA, Neural network in designing sensor array, Study of temperature cycle, mode of sensing to obtain virtual sensor array, Case study of a gas sensing platform, liquid sensing.

Text Books:

1. Sensors- A Comprehensive study-W.Gopal, J Hesse, J N Zemel – VHC Press,1989.

2. Sensors Handbook-SabreeSoloman—McGraw HillPublishers-1998

Reference Books:

1. Electro Optical Instrumentation- SilvanoDonati, Pearson Education2005.

2. Introduction to Medical Equipment Technology: Carr and Brown- Addison Weseley- 2001.

12. NON-DESTRUCTIVE TESTING

Course Objectives:

* To elucidate in depth information in importance of material inspection.

* To Comprehend the characteristics of non-destructive testing approaches and estimate the status of necessary properties

* To summarize the deep knowledge on magnetic methods for non-destructive testing.

* To acquaint the students with a variety of real-worldscenarios related with ultrasonic testing

* To discuss the principles of radiographic testing methods.

* To give the fundamental idea of electrical methods for non-destructive testing.

Course Outcomes:

At the end of the course the students will be able to

* Explain the benefits, advantages and uses of non-destructive testing.

* Describe the process of inspection and quality of inspection.

* Identify different magnetic methods Outline the applications of magnetic methods for non-destructive testing.

* Have an elementary information of ultrasonic testing. Distinguish numerous fault types and choose the proper non-destructive testing methods.

* Classify a comprehensive theoretical and hands-on understanding of the radiographic testing, interpretation and evaluation.

* Illustrate different electrical methods for non-destructive testing and its applications.

* Describe some other types of non-destructive testing methods such as Optical holography and Thermography.

SYLLABUS

Need for inspection- quality of inspection-Benefits of NDT-Liquid penetrant inspection- Principles- Characteristics of a penetrant- Water washable system post emulsifiable system- Solvent removable system- Surface preparation and cleaning- Penetrant application- Sensitivity- Viewing- Recording- Applications.

Magnetic methods; Basic principles- Magnetising methods- Characteristics of magnetic particles- Magnetic links- Magnetography- Field sensitive probes- Measurement of metal properties- Ferrography-Applications.

Ultrasonic testing: Basic principles- different kinds of ultrasonic waves- Properties propagation- Mode conversion- Construction of normal and angle probes- Piezo electric materials- attenuation. Different methods of flow detection - Transmission, reflection and immersion methods. Pulse- Echo method- Different types of display- A- Scan, B-Scan, C-Scan methods- Identification of detects- Sensitivity- calibration and reference standards-Applications.

Radiographic methods: general priciples- X-ray and gamma ray sources- Shadow formation- Enlargement and distortion recording of radiation-Radio graphic techinics- Single and double image techniques- Sensitivity- Penetramaters- Fluoroscopic method- Real time radiography- Application.

Electrical methods: Principle of eddy current testing- Conductivity of material- Magnetic properties- Coil impedance. Lift off factor and edge effect- Skiing effect- Impedance plant diagrams- inspection frequency- Coil arrangements inspection problems- Types of circuit- Reference standards- Phase analysis-Display methods- Typical applications.

Other methods: Optical holographic methods- Electronic / speckle pattern inter-formetry dynamic inspection-Neutron Radiography-Laser induced ultrasonic-Crack depth gauges- Thermography-Surface texture analysis- Acoustic emissionmethods.

Text Books:

1. Non-destructive testing by Barry Hull and VennonjohnELBS/ Momillon,1988,

2. Non-destructive testing by R.Halmshaw Edward Arnold,London.

3. Non destructive testing by Warren J.McgonnagleMcGraw-hill book Co.,1961.

Reference Books:

1. 1.Ultrasonic testing of material by J.Krantkramer and H. Krant kramer Springer Verlag, Newyork.

2. Ultrasonic Engineering by Julien r. Frederick, chapters 1,2,4,7, John wiley & son Newyork.

HSS ELECTIVES

1. INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP

Course Objectives:

* To familiarize the students with the concepts of Management.

* To relate the concepts of Management with industrial organizations.

* To explain the factors affecting productivity and how productivity can be increased in an Industrial undertaking.

* To set forth a basic framework for understanding Entrepreneurship.

Course Outcomes:

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

* Understand the roles, skills and functions of management.

* Distinguish the different types of business organizations.

* Identify the factors involved in Production Operations Management.

* Diagnose organizational problems and take suitable decisions.

* Establish good Human Resource Management practices.

* Acquire necessary knowledge and skills required for organizing and carrying out entrepreneurial activities.

SYLLABUS

Basic Concepts of Management: Management :- Definition, Nature and Importance ; Functions of the Management; Levels of Management; F.W Taylor's Scientific Management; Henry Fayol's Principles of Management;

Forms of Business Organizations:Introduction, Types of Business organizations: Private Sector- Individual Ownership , Partnership, Joint stock companies and Co-Operative organizations; Public sector- Departmental Organizations, Public Corporations and Government Companies; The Joint sector Management.

Production and operations Management: Plant location- Factors to be considered in the selection of Plant location; Break - even analysis- Significance and managerial applications; Importance of Production Planning and Control and its Functions; Human Resource Management and Functions of Human Resource Manager (in brief); Functions of Marketing; Methods of Raising Finance.

Entrepreneurship : Definition, Characteristics and Skills , Types of Entrepreneurs, Entrepreneur vs. Professional Managers, , Growth of Entrepreneurs, Nature and Importance of Entrepreneurs, Women Entrepreneurs, Problems of Entrepreneurship.

Entrepreneurial Development and Project Management: Institutions in aid of Entrepreneurship Development, Idea generation: Sources and Techniques;, Stages in Project formulation ; Steps for starting a small enterprise - Incentives for Small Scale Industries by Government.

Text Books:

(1) Sharma, S.C, and Banga, T.R., Industrial Organization & Engineering Economics, Khanna Publishers, Delhi, 2000.

(2) Vasant Desai , The Dynamics of Entrepreneurial Development and Management (Planning for future Sustainable growth),HImalayan Publishing House, 2018.

Reference Books:

(1) Aryasri , A.R., Management Science, McGraw HIll Education (India Private Limited, New Delhi 2014.

(2) Sheela, P. , and Jagadeswara Rao, K., Entrepreneurship, Shree Publishing House, Guntur, Andhra Pradesh, 2017.

2. ORGANIZATIONAL BEHAVIOUR

Course Objectives:

* To understand the basic concepts of organisational behaviour, its foundations and importance.

* To enable students to have a basic perspective of Motivation and Motivation theories.

* To acquaint the students about group behaviour in organizations, including communication, leadership conflicts and organizational change and how these are linked to and impact organizational performance.

Course Outcomes:

* Indentifying fundamental aspects of organizational dynamics.

* Evaluate main theories of motivation and formulating suitable motivational strategies.

* Analyze the behaviour of individuals and groups in organizations.

* Understanding of Leadership theories and Leadership behaviour.

* Apply relevant theories, concepts to address important Organizational Behaviour questions.

SYLLABUS

Organisational Behavior : Concept of Organisation - Concept of Organisational Behaviour - Nature of Organisational Behaviour - Role of Organisational behaviour - Disciplines contributing to Organisational Behaviour.

Motivation:Definition - Nature of Motivation - Role of Motivation - Theories of Motivation : Maslow's Need Hierarchy Theory, Herzberg's Motivation Hygiene Theory and Mc Gregor's Theory X and Theory Y.

Group Dynamics: Meaning - Concept of Group - Types of groups -Formal and Informal groups - Group development - Group cohesiveness and factors affecting group cohesiveness.

Leadership: Concept of Leadership - Difference between Leadership and Management - Importance of Leadership - Leadership styles: Autocratic leadership, Participative leadership and Free Rein leadership.

Communication:Meaning - Communication Process - Forms of communication: Oral, Written and Non- Verbal communication - Direction of communication : Downward, Upward and Horizontal communication.

Organisational conflicts:Concept of conflict - Reasons for conflict - Types of Conflict: Intrapersonal conflict, Interpersonal conflict, Intragroup conflict, Intergroup conflict, Interorganisational conflict - Conflict management.

Organisational Change:Nature - Factors inOrganisational change - Planned change: Process of planned change - Resistance to change: Factors in resistance to change - Overcoming resistance to change.

Text Books.

1. L.M.Prasad: Organisational Beaviour, Sultan Chand & Sons, New Delhi -110002

2. K. Aswathappa: Organisational Behaviour, Himalaya Publishing House, New Delhi

Reference Books.

1. Stephen Robbins: Organisational Behaviour, Pearsons Education, New Delhi.

3. OPERATIONS RESEARCH

Course Objectives:

* Formulate a real world problem as a mathematical programming model.

* Provide knowledge of optimization techniques and approaches.

* Understand and study inventory problems.

* Know the network models.

* Put on knowledge in solving replacement problems and different queueing models

Course Outcomes:

* Learned to translate a real-world problem into a mathematical formulation.

* Formulate and Solve Transportation, Assignment and sequencing problems.

* Resolve inventory problems.

* Able to solve maximum flow and shortest path problems.

* Capable to solve replacement problems and analyze queueing models.

SYLLABUS

Introduction:Definitions of Operations Research; Phases of Operations Research; Types of Operations Research models; applications, merits and demerits of Operations Research.

Allocation: Linear Programming problem formulation; Basic assumptions; Graphical solution; Simplexmethod; Artificial variabletechnique; Two phase method; Big M method; Duality principle; Primal and Dual relation.

Transportation: Formulation; Solution methods; Unbalanced transportation problems - North west corner rule;Least cost entry method; Vogel's approximation method; Optimal solution; degeneracy.

Assignment: Formulation; Variations in Assignment problem; Travelling salesman problem.

Sequencing: Sequencing of - n jobs through two machines; n jobs through three machines; njobs through m machines; 2 jobs through m machines.

Inventory Control:Introduction; Types of Inventory; Inventorycosts; Deterministic models- Economic order quantity (EOQ) and Economic Production Quantity (EPQ) with and without shortages; Quantity discounts; P system; Q system; Inventory control Techniques.

Network Analysis: Network definitions; Time estimates in network analysis; Labeling using Fulkerson's rule; Forward pass computations; Backward pass computations; Project management using Critical Path Method (CPM) and Programme Evaluation and Review Technique (PERT).

Replacement: Introduction, Replacement of items that deteriorate with time - Value of money unchanging and changing, Replacement ofitemsthat fail completely.

Queueing models: Introduction; Single channel poisson arrivals; Exponential service times; Unrestricted queue with infinite population and finite population models; Multichannel poisson arrivals; Exponential service times with infinite population and restricted queue.

TextBooks:

1. Hamdy A Taha, "Operations Research- An Introduction" by TAHA , Prentice Hall, 2009.

2. F.S.Hiller, G.J. Liberman,B. Nag and P.Basu "Introduction To Operations Research, Mc Graw Hill Education(India), 2012.

3. S.D.Sharma,"Operations Research", KedarnadhRamnadh& Co.,2017

Reference Books:

1. R. Pannerselvam, "Operations Research", PHI..

2. Richard Bronson, Schaum's Series," Operations Research", Mc Graw Hill

3. N.V.S.Raju,"Operations Research- Theory and Practice" BS publications.

4. V.K. Kapoor, "Operations Research" Sultan Chand & Sons.