SAURASHTRA UNIVERSITY

RAJKOT

(ACCREDITED GRADE "A" BY NAAC)

FACULTY OF SCIENCE

Syllabus for

INTEGRATED MASTER OF SCIENCE IN ELECTRONICS, COMPUTER AND INSTRUMENTATION

Choice Based Credit System

With Effect From: 2016-17

M.Sc. (ECI) Course Structure (Semester wise), CBCS

Master of Science: Five Year (Ten Semesters)

Total Credits of the Course: 240

SEMESTER – 1 (Total Credits – 24)

Sr. No.	Paper No.	Title of Course	Total Marks Ext+Int = Total (70+30=100)	Passing Standard Ext+Int = Total (28+12=40)	Total Teaching Hours	Exam. Hrs.	Course Credits
1.	1	Foundation of science and Mathematics	70+30=100	28+12=40	15x4=60	2.5	04
2.	2	Foundation of Electronics	70+30=100	28+12=40	15x4=60	2.5	04
3.	3	Fundamental of Digital Electronics	70+30=100	28+12=40	15x4=60	2.5	04
4.	4	Introduction to electronics devices and circuits	70+30=100	28+12=40	15x4=60	2.5	04
5.		Practicals*	200	20+20+20+20=80	15x15=225	3x4=12	08

***Practical's = 50X3=150 marks core subject experiments + 50 marks project;**

Internal	Marks
Assignment	10
Seminar	10
Test	10

SEMESTER – 2 (Total Credits – 24)

Sr. No.	Paper No.	Title of Course	Total Marks Ext+Int = Total (70+30=100)	Passing Standard Ext+Int = Total (28+12=40)	Total Teaching Hours	Exam. Hrs.	Course Credits
1.	5	Basic circuit analysis	70+30=100	28+12=40	15x4=60	2.5	04
2.	6	Advanced digital electronics	70+30=100	28+12=40	15x4=60	2.5	04
3.	7	Mathematics for electronics	70+30=100	28+12=40	15x4=60	2.5	04

4.	8	Amplifier and Oscillators	70+30=100	28+12=40	15x4=60	2.5	04
5.		Practicals*	200	20+20+20+20=80	15x15=225	3x4=12	08

***Practical's = 50X3=150 marks core subject experiments + 50 marks project;**

Internal	Marks
Assignment	10
Seminar	10
Test	10

SEMESTER – 3 (Total Credits – 24)

Sr. No.	Paper No.	Title of Course	Total Marks Ext+Int = Total (70+30=100)	Passing Standard Ext+Int = Total (28+12=40)	Total Teaching Hours	Exam. Hrs.	Course Credits
1.	9	Advanced circuit and network concepts	70+30=100	28+12=40	15x4=60	2.5	04
2.	10	Fundamental of communication electronics	70+30=100	28+12=40	15x4=60	2.5	04
3.	11	Power electronics	70+30=100	28+12=40	15x4=60	2.5	04
4.	12	Circuit simulation and PCB designing tools	70+30=100	28+12=40	15x4=60	2.5	04
5.		Practicals*	200	20+20+20+20=80	15x15=225	3x4=12	08

***Practical's = 50X3=150 marks core subject experiments + 50 marks project;**

Internal	Marks
Assignment	10
Seminar	10
Test	10

SEMESTER – 4 (Total Credits – 24)

Sr. No.	Paper No.	Title of Course	Total Marks Ext+Int = Total (70+30=100)	Passing Standard Ext+Int = Total (28+12=40)	Total Teaching Hours	Exam. Hrs.	Course Credits
1.	13	Advance communication electronics	70+30=100	28+12=40	15x4=60	2.5	04
2.	14	Op-Amp and its applications	70+30=100	28+12=40	15x4=60	2.5	04
3.	15	Elements of C language	70+30=100	28+12=40	15x4=60	2.5	04

4.	16	Basic instrumentation	70+30=100	28+12=40	15x4=60	2.5	04
5.		Practicals*	200	20+20+20+20=80	15x15=225	3x4=12	08

***Practical's = 50X3=150 marks core subject experiments + 50 marks project;**

Internal	Marks
Assignment	10
Seminar	10
Test	10

SEMESTER – 5 (Total Credits – 24)

Sr. No.	Paper No.	Title of Course	Total Marks Ext+Int = Total (70+30=100)	Passing Standard Ext+Int = Total (28+12=40)	Total Teaching Hours	Exam. Hrs.	Course Credits
1.	17	Basic concepts of control system	70+30=100	28+12=40	15x4=60	2.5	04
2.	18	Fundamental of Computer Hardware	70+30=100	28+12=40	15x4=60	2.5	04
3.	19	Advance Instrumentation	70+30=100	28+12=40	15x4=60	2.5	04
4.	20	Microprocessor and Microcontroller	70+30=100	28+12=40	15x4=60	2.5	04
5.		Practicals*	200	20+20+20+20=80	15x15=225	3x4=12	08

***Practical's = 50X3=150 marks core subject experiments + 50 marks project;**

Internal	Marks
Assignment	10
Seminar	10
Test	10

SEMESTER – 6 (Total Credits – 24)

Sr. No.	Paper No.	Title of Course	Total Marks Ext+Int = Total (70+30=100)	Passing Standard Ext+Int = Total (28+12=40)	Total Teaching Hours	Exam. Hrs.	Course Credits
1.	21	Fiber Optics	70+30=100	28+12=40	15x4=60	2.5	04

2.	22	Advance concepts of Control System	70+30=100	28+12=40	15x4=60	2.5	04
3.	23	Basic programmable controllers	70+30=100	28+12=40	15x4=60	2.5	04
4.	24	Computer Aided Designing	70+30=100	28+12=40	15x4=60	2.5	04
5.		Practicals*	200	20+20+20+20=80	15x15=225	3x4=12	08

***Practical's = 50X3=150 marks core subject experiments + 50 marks project;**

Internal	Marks
Assignment	10
Seminar	10
Test	10

SEMESTER – 7 (Total Credits – 24)

Sr. No.	Paper No.	Title of Course	Total Marks Ext+Int = Total (70+30=100)	Passing Standard Ext+Int = Total (28+12=40)	Total Teaching Hours	Exam. Hrs.	Course Credits
1.	25	Introduction to MATLAB	70+30=100	28+12=40	15x4=60	2.5	04
2.	26	Automobile and Automotive Electronics	70+30=100	28+12=40	15x4=60	2.5	04
3.	27	Robotics	70+30=100	28+12=40	15x4=60	2.5	04
4.	28	Electromagnetics	70+30=100	28+12=40	15x4=60	2.5	04
5.		Practicals*	200	20+20+20+20=80	15x15=225	3x4=12	08

***Practical's = 50X3=150 marks core subject experiments + 50 marks project;**

Internal	Marks
Assignment	10
Seminar	10
Test	10

SEMESTER – 8 (Total Credits – 24)

Sr. No.	Paper No.	Title of Course	Total Marks Ext+Int = Total (70+30=100)	Passing Standard Ext+Int = Total (28+12=40)	Total Teaching Hours	Exam. Hrs.	Course Credits
1.	29	Military applications of electronics and technology	70+30=100	28+12=40	15x4=60	2.5	04
2.	30	ARDUINO: Fundamentals & Practice	70+30=100	28+12=40	15x4=60	2.5	04
3.	31	JAVA: Fundamentals and Practice	70+30=100	28+12=40	15x4=60	2.5	04
4.	32	Advance Electromagnetics	70+30=100	28+12=40	15x4=60	2.5	04
5.		Practicals*	200	20+20+20+20=80	15x15=225	3x4=12	08

***Practical's = 50X3=150 marks core subject experiments + 50 marks project;**

Internal	Marks
Assignment	10
Seminar	10
Test	10

SEMESTER – 9 (Total Credits – 24)

Sr. No.	Paper No.	Title of Course	Total Marks Ext+Int = Total (70+30=100)	Passing Standard Ext+Int = Total (28+12=40)	Total Teaching Hours	Exam. Hrs.	Course Credits
1.	33	LAB-VIEW: An Introduction	70+30=100	28+12=40	15x4=60	2.5	04
2.	34	Website development using Mysql, PhP and HTML	70+30=100	28+12=40	15x4=60	2.5	04
3.	35	Emerging technology: 3D printer	70+30=100	28+12=40	15x4=60	2.5	04
4.	36	Radar and Navigation	70+30=100	28+12=40	15x4=60	2.5	04
5.		Practicals*	200	20+20+20+20=80	15x15=225	3x4=12	08

***Practical's = 50X3=150 marks core subject experiments + 50 marks project;**

Internal	Marks
Assignment	10
Seminar	10
Test	10

SEMESTER – 10 (Total Credits – 24)

Sr. No.	Paper No.	Title of Course	Total Marks Ext+Int = Total (70+30=100)	Passing Standard Ext+Int = Total (28+12=40)	Total Teaching Hours	Exam. Hrs.	Course Credits
1.	37	Internet of things	70+30=100	28+12=40	15x4=60	2.5	04
2.	38	Fundamentals of Drone Technology	70+30=100	28+12=40	15x4=60	2.5	04
3.	39	Matlab and Simulink for electronics	70+30=100	28+12=40	15x4=60	2.5	04
4.	40	Elective Paper: I: Microwave Electronics II: Fundamentals of Industrial Automation III: Digital Signal Processing	70+30=100	28+12=40	15x4=60	2.5	04
5.		Practicals*	200	20+20+20+20=80	15x15=225	3x4=12	08

***Practical's = 50X3=150 marks core subject experiments + 50 marks project:**

Internal	Marks
Assignment	10
Seminar	10
Test	10

Program Outcome of M.Sc. (ECI)

PO.1:

The program has covered core electronics areas through some courses and some courses are devoted to advanced concepts directly useful in industries. The students in this program are expected to learn the bridge courses like foundation of communication electronics, computer hardware, electromagnetics and electronics technique.

PO.2:

The program is targeted to help skill development and training the students to prepare them for electronic industries.

PO.3:

Program includes concepts of advanced digital electronics, control system, industrial automation, PLC etc. The courses like PLC SCADA, embedded systems, 3D modelling, Radar and navigation, microwave electronics, basic and advance instrumentation, c-language, Java, HTML and digital signal processing are helpful for the employment in the industries.

PO.4:

The program is designed to get the thorough concepts of electronics, computer and instrumentation and raise the chances of employability of the learners.

Program Specific Outcome of M.Sc. (ECI)

PSO.1:

To understand subjects (Electronics, Communication, computer and Instrumentation) with adequate depth.

PSO.2:

Learn to apply the knowledge acquired to make humanity more comfortable and safer.

PSO.3:

To inculcate sense of critical thinking, problem solving, designing projects and developing skill useful to be employed directly in the industries.

PSO.4:

Study of fine blend of basic and advanced subjects prepare students for to the date technology while making their foundation stronger.

M.Sc. (ECI)

Semester – 1

Paper: 1- Foundation of Science and Mathematics

Course outcome:-

CO.1: Student will able to solve and simplify linear and nonlinear equations, algebraic equations, and other basics mathematical logic and equations.

CO.2: Student will able to understand basic principle of speed, acceleration, motion, rest, scalar, vector, velocity, gravity etc.

Unit 1: Motion:

Very brief explanation of displacement, distance, speed, velocity, acceleration, force, gravity, inertia, linear momentum.

--Rest—Motion—Rest and Motion as Relative terms—Scalar and Vector quantities—Common terms related to moving bodies—Displacement-Time graphs—Velocity-Time graphs—Acceleration-Time graphs—Force in Our life-Effects of force

Vectors, Scalars and elementary calculus:

--Scalar quantities—Vector quantities—The need for vectors—Representation of vectors—Types of vectors—Parallelogram law of vectors—Polygon law of vectors—Subtraction of the vectors—Properties of vector addition—Null vector or Zero vector—Unit vector—Rectangular components of a vector—Multiplication of a vector by a real number—Multiplication of a vector by a scalar—Components of a vector in terms of unit vectors $\hat{\imath}, \hat{\jmath}, and\ \hat{k}$ vectors in 3 dimensions—Magnitude and direction of $\vec{r}$—Direction Cosines of a vector—Multiplication of vectors.

Laws of motion

What causes motion?—Gallio's work—Newton's first law of motion or the law of inertia—momentum—Newton's second law—units of force—rectangular components of force—equation of force—mass and weight—inertial mass—impulse—impulsive force—Newton's third law of motion—free body diagram—motion of connected bodies—to find the tension T—Laws of conservation of momentum—

Work, energy and power

--Definition of work—Units of work—Positive and negative work—Sign of work—Graphical method-Work done by a constant force—work done by a varying force—Graphical method-work done by varying force—Conservative force—Central force—Work done to lift a body—Energy—Kinetic energy—Work-energy concept—Potential energy—Definition of potential energy—Gravitational potential energy-P.E. due to position—To show that gravitational P.E. is independent of the path followed—Elastic-P.E. due to configuration—Conversion of P.E. and K.E. in the case of a spring—Power—Unit and dimensional formula.

Uniformly accelerated motion

--Mechanics—Rest and motion—Absolute rest and absolute motion—Cartesian coordinate system—Particle or point object—Motion in one, two and three Dimensions—Distance—Displacement—Speed—Velocity—Uniform velocity—Average velocity—Instantaneous velocity—position-Time graph—Difference between average velocity and instantaneous velocity—Accelerated motion—Acceleration—Average acceleration—Uniform acceleration—Instantaneous acceleration—Velocity-Time graph of accelerated motion.

Projectile motion and relative velocity in two dimension

--Two dimensional motion—Displacement, velocity and acceleration in two dimensional motion—Acceleration—Projectile—The horizontal and vertical motion of a projectile—Projectile fired horizontally from a height—Instantaneous velocity of the projectile—Derivation of expression for maximum height, time of flight and range of a body projected at an angle with the horizontal—Instantaneous Velocity—PROJECTILE MOTION-Range and time of flight on an inclined plane—Relative velocity in two dimensional motion.

Unit 2: Rotational Motion:

Circular motion.

--Motion in a circular path—Angular variables—Angular velocity—Linear displacement in terms of angular displacement—Relation connecting linear velocity and angular velocity—Angular acceleration—Expression for centripetal acceleration—Centripetal force—Fictitious force-Centrifugal force—Examples to illustrate centrifugal force(Fictitious force)—Motion of a Car on a level road—Car on a banked circular road—Motion of a cyclist along a curved path—Banking of rails—Motion in a horizontal circle—Motion of a body in a vertical circle—Conical pendulum.

Oscillations.

--Periodic motion—Oscillations of a Mass supported by a spring—Displacement—Amplitude—Angular frequency—Simple harmonic motion—Definition of SHM—Differential equation of simple harmonic motion—Physical significance of ω—Energy of a harmonic oscillator—Expression for kinetic energy—Characteristics of SHM—Relation between linear SHM and Uniform circular motion-reference circle—Uniform circular motion and SHM—Displacement—Experimental demonstration—Expression for velocity of a particle executing SHM—Expression for acceleration—Graphs to show the variation of Displacement, Velocity, Acceleration—Graphical representation of SHM—Phase difference—Derivation of time period of a body executing SHM—Definition of Spring constant or Force constant—Mass on a Spring-Vertical Oscillation—Seconds pendulum—Angular SHM—Free oscillation, Natural vibration—Dumped Oscillations—Effect of Damping on the Oscillations of Mass attached to a spring—Forced harmonic oscillations—Resonance.

Waves

--Introduction—Wave—Spring-model to understand wave propagation—propagation of sound waves in Air—Characteristics of wave motion—Types of wave—Wavelength, Frequency and velocity of a wave—Formation of transverse wave—Formation of longitudinal waves—Graphical representation of harmonic wave—Expression for displacement in wave motion—Characteristics of a progressive wave—Relation connecting particle velocity and wave velocity—Differential equation of wave motion—Relation connecting elasticity of a medium and the excess pressure—Intensity of a wave

Unit 3: Trigonometry, Algebra, Differentiation and Integration:

--Angle—measurement of angle, trigonometric function—Quadrants—trigonometric formulas of compound angles—trigonometric formulas of multiple and sub-multiple angles—properties of triangle--Quadratic equation—determinants—Crammer's rule—progression—Binomial theorem—exponential and logarithmic series—logarithms--Concept of limit—differentiation—

some rules of differentiation—D.C. of functionofA function—Differentiation of implicit function—The second derivative of a function—dy/dx at a point (x,y)—Definition of integration—table of standard elementary integrals--method of transformation—method of substitution—definite integral

Unit 4: Application of dy/dx, integration, geometric meaning of differentiation and integration, Introduction to graphs

--dy/dx as a rate measure—maximum and minimum value of a function—average of a varying quantity—centre of mass of a body—moment of inertia of a body—slope or gradient of a straight line—tangent of a point to a curve—geometric meaningof definite integration—graphical problems on kinematics—standard geometricalcurves—graphs of exponential, logarithmic and trigonometric functions—graphof a modulus of a function—some additional graphs

Recommended books:

1. Fundamentals of physics By RobertResnick &David Halliday Wiley Eastern limited
2. Mathematical tools for physics By Shakir Hussain, Mcg raw Hill Education (India) PVT. LTD. New Delhi.

Reference Books:

1. Concepts of physics vol-1 by H.C. Verma
2. Higher Engineering Mathematics by Dr. B.S. Grewal, 40th Edition Khanna Publication
3. Higher Engineering Mathematics by Dr. K.R. Kachot, Mahajan publishing house College Physics by Openstax College Rice University

Paper 2: Foundation of Electronics

Course outcome:-

CO.1: This paper inculcate the basic concepts of capacitor, inductor, resistor, semiconductor material, electron, proton and all the basic terms of electronic subject which will be very helpful to understand the advance studies of electronics subjects.

Unit 1: Voltage, current and power:

Two kinds of charges—basic properties of charges—Coulomb's law—electric field and intensity—electric field intensity due to point charge--Meaning of electric potential—relation between E and V—work done in an electrostatic field—formal definition of potential—calculation of electric potential—definition of volt and voltage--Flow of charge: current—source of current: need to maintain potential difference—definition of current--Energy and power in a circuit—definition of power

Unit 2: Resistance, capacitance and inductance:

Resistance of conductor—circular Mils —definition of resistance—temperature effects—series and parallel combination of resistances--Capacitance of a conductor—definition of capacitance--principle of a capacitor—capacitance of parallel plate capacitor—effects of dielectric and metallic slabs—capacitor in series and parallel—energy stored in a capacitor--Magnetic field—magnetic force on a moving charge—motion of a charge in a magnetic field—electron motion and combined influence of E and B—Hall effect—Oersted's experiment—law of Biot-Savart—magnetic field of a straight conductor—magnetic field due to a moving charge—magnetic field of a circular field—magnetic field due to a solenoid—Ampere's circuital theorem—magnetic force on a current carrying conductor—torque on a current loop—discovery of electromagnetic induction—laws of electromagnetic induction—method of producing induced emf—induced emf, current and charge—motional emf—mutual induction—self-induction—definition of inductor—series –parallel connection of inductors—energy stored in an inductor

Unit 3: Basic laws, DC sources and AC sources:

Basics of circuit—Ohm's law—Kirchhoff's laws—resistive networks: series and parallel connection—voltage divider rule and current divider rule--Ideal sources: voltage and current—practical sources: voltage and current—constant voltage source and constant current source—series and parallel combination of sources—dependent sources--Generation of AC voltage—voltage and current conventions for AC—frequency, period, amplitude and peak value—angular and graphic relationships for sine waves—voltages and currents as function of time—introduction to phasors—AC waveforms and average value—AC voltage and current measurement

Unit 4: Introduction to PSpice:

Description of PSpice—types of PSpice—types of analysis—description of simulation software tools—Pspiceplateforms—Pspice schematic versus OrCAD capture—limitations of PSpice—Pspice resources—input files—element values—nodes—circuit elements—sources—types of analysis—output variables—Pspice output commands—format of circuit files—format of output files—examples of PSpice simulations—OrCAD capture—Importing Microsim schematic in OrCAD—Installing the OrCAD software—overview—the circuit analysis process—drawing the circuit—copying and capturing schematics

Recommended books:

1. Circuit analysis: Theory and practice
   Allan H. Robbins and Wilhelm C. Miller
   CENGAGE LEARNING (Fifth Edition)
2. Introduction to PSpice using OrCAD for circuits and electronics
   Muhammad H. RashidPHI Learning PVT Ltd.
   Delhi

Reference Books:

1. Circuits by A. Bruce Carlson
   Cengage Learning publication (Indian Edition)
2. Circuits and Networks: Analysis & Synthesis by A. Sudhakar, Shyammohan S. Palli
   Tata McGraw-Hill Publication Company Ltd. Third Edition
3. Introduction to Circuit Analysis and Design by Tildon Glisson, Jr.
   Springer Publication, International Edition
4. Basic Circuit Analysis by Dr. Cunningham & J.A. Stuller.
   Jasic Publishing House

Paper 3: Fundamental of Digital Electronics

Course outcome:-

CO.1: To make students able to develop digital logic concept and apply it to solve problems.
CO.2: To make students able to analyze, design and implement digital circuits.

Unit 1: Number system, codes and digital arithmetic:

Introduction to number systems—decimal number system—binary number system—number systems-some terms—number representation in binary—finding decimal equivalent—decimal-to-binary conversion—decimal-to-octal conversion—decimal-to-hexadecimal conversion—binary-octal and octal-binary conversion—hex-binary and binary-hex conversion—hex-octal and octal-hex conversion—the four axioms—floating point numbers—binary coded decimal—higher density BCD encoding—packed and unpacked BCD numbers—excess-3 code—gray code—alphanumeric codes—seven segment display code—error detection and correction codes—Basic rules of binary addition and subtraction—addition of larger bit binary numbers—subtraction of larger bit binary numbers—BCD addition and subtraction in Excess-3 code—binary multiplication—binary division—floating point arithmetic

Unit 2: Logic gates and IC families:

AND gate—diode AND gate—transistor AND gate—OR gate—diode OR gate—transistor OR gate—disadvantages of diode gates—multi-inputs(Fan-in)—NOT gate(INVERTER)-complementation, double inversion, IC inverters—loading effects(Fan-out)-buffer/drivers—representation of binary numbers as electrical signals-positive and negative logic in dc and ac systems—positive and negative gates—NAND gate-NAND as inverter—NOR gate-NOR gate as inverter—bubbled gates-significance, bubbled NAND , bubbled NOR—NAND and NOR as universal gates-AND, OR and NOT realization—XOR and XNOR gates—concise account of logic gates—digital ICs—levels of integration—digital IC(logic) families-bipolar families, MOS families—characteristics of digital ICs-voltage and current parameters, noise immunity, speed/propagation delay, power dissipation, fan in/ fan out, operating temperature—DTL AND gate—DTL NAND gate—DTL NAND gate with load circuit analysis, current sinking, noise, wired-AND connection—RTL NOR gate-current sourcing, RTL characteristics—TTL—TTL basic NAND gate—standard TTL NAND gate with totempole output-low-state operation, high-state operation, loading considerations, output circuits, totempole output, open collector output, tristate output, wired-ANDing—TTL series 7400 and 5400-high speed TTL, low power TTL, Schottky TTL, low power Schottky TTL, advanced Schottky TTL, advanced low-power Schottky TTL, Fast TTL—DCTL NOR gate-high and low state operations, disadvantages—ECL—ECL basicaciruit—ECL OR/NOR gate-circuit operation, wired-OR connection, characteristics—I^2L NOR gate-current injector, circuit operation—tristate logic—tristate buffers-inverting and non-inverting buffers—MOS-logic families-NMOS inverter, CMOS inverter—dynamic MOS inverter-rationed dynamic inverter, ratio less dynamic inveter—NMOS-NAND and

NMOS- NOR gates—CMOS-NAND and CMOS NOR gates—CMOS transmission gate—CMOS series—MOS logic characteristics—BiCMOS logic—comparison of logic families—IC gates

Unit 3: Boolean algebra and simplification techniques:

Introduction to Boolean algebra: variables, literals, and terms in Boolean expressions, equivalent and complement of Boolean expressions, dual of Boolean expression—Postulates of Boolean algebra—theorems of Boolean algebra: Operations with 0 and 1(Theorems 1 and 2), Idempotent or identity laws(Theorem 3), complementation law(Theorem 4), commutative law(Theorem 5), associative laws(Theorem 6), distributive laws(Theorem 7), Theorem 8, theorem 9, Absorption law or redundancy law(Theorem 10), Theorem 11, consensus theorem (Theorem 12), DeMorgan's theorem(Theorem 13), Transposition theorem(Theorem 14), Theorem 15, Theorem 16, Involution theorem (Theorem 17) --simplification techniques: sum-of-product Boolean expressions, product-of-sums expressions, expanded forms of Boolean expression, canonical form of Boolean expression, $\sum$ and π nomenclature—Quine-Mccluskey tabular method—Karnaugh map method: construction ofKarnaugh map, Karnaugh maps for Boolean expression with larger number of variables, Karnaugh maps for multi-output functions

Unit 4: Arithmetic and combinational logic circuits:

Combinational circuits—implementing combinational logic—Arithmetic circuits-Basic building blocks: Half-adders, full-adders, Half-subtractor, Full-subtractor, controlled inverter—Adder-subtractor—BCD adder—carry propagation-look ahead carry generator—arithmetic logic unit—multipliers—magnitude comparator—application-relevant information--Multiplexer: inside the multiplexer, implementing Boolean functions with multiplexers, multiplexer for parallel-to-serial data conversion, cascading multiplexer circuits—encoders: priority encoder—de-multiplexers and decoders, cascading decoder circuits—parity generation and checking—application-relevant information

Recommended books:

1. Digital electronics: Principles and integrated circuits
   Anil K. Maini
   Wiley India Pvt. Ltd.
   1st Edition
2. Digital principles and circuits
   Dr. C.B. Agrawal
   Himalaya Publishing House
   1st Edition

Reference books:

1. Digital Design by M. Morris Mano Third edition
   Prentice Hall publisher
2. Fundamentals of Digital Electronics by Prof. Barry Paton Delhousie University
   March 1998 Edition, National Instrument Corporation
3. "Modern Digital Electronics" by R.P. Jain
   TMH Publication
4. Digital Design Principal & Practices by John F. Wakerly
   Prentice Hall Publication 3rd Edition

Paper 4: Introduction to electronics devices and circuits

Course outcome:-

CO.1: To make students able to know the characteristics of diodes and transistors and their applications.

CO.2: To make students able to able to design simple circuits and mini projects.

Unit 1: Semiconductor physics:

Semiconductor materials—elemental semiconductor materials—compound semiconductor materials crystalline structure—energy band theory of crystals—energy bands in solids—conduction in solids—drift and diffusion currents—atomic bonds—Fermi-Dirac energy distribution—intrinsic semiconductors—extrinsic semiconductors—mass action law—charge densities in an extrinsic semiconductor—relaxation time, collision time and mean free path—conductivity of metals—conductivity of semiconductors—carrier concentration in an intrinsic semiconductor—Fermi level in extrinsic semiconductor—carrier life time—continuation equation—hall effect—basic structure of P-N junction—P-N junction as a diode—zero applied bias—reverse applied bias—metal semiconductor junctions

Unit 2: Junction diodes, Zener, other two terminal devices and rectifiers:

Fabrication techniques—diode failure modes and Ohmmeter check—junction break down—Ideal diode—current components in a P-N diode—quantitative theory of P-N diode currents—temperature dependence of P-N diodes—diode resistance—real diode—DC load line—transition and diffusion capacitances—equivalent circuit of a diode—P-N diode switching times—switching diodes—P-N diode applications—diode data sheets--Zener diodes—zedner diode applications—tunnel diode—PIN diode—varactor diode—point contact diode—step recovery diode—fast-recovery diode—Schottky diode—backward diode—power diode—varistors or voltage dependent resistors(VDRs)—thermistors--Half-wave rectifiers—full-wave rectifiers—three-phase rectifiers—filter circuits—bleeder resistor—voltage regulation—rectifier specifications—voltage multipliers

Unit 3: Bipolar junction transistors and field effect transistors:

transistor terminals—transistor action—transistor biasing—important point regarding working of transistors—transistor current components—current amplification factors—relationship between α and β—

base spreading resistance—Ebers-Moll model—transistor circuit configurations—common base configuration—early effect and base-width modulation—common emitter configuration—common collector configuration—comparison of characteristics of transistors in different configurations—transistor as an amplifier—transistor load lines—standard notations for voltages and currents—transistor fabrication—transistor maximum ratings—numbering system for semiconductor devices—transistor data sheets—transistor packaging—transistor lead identification and testing—transistor as diode—thermal run-away and heat sink—transistor approximation—DC equivalent circuits—different methods of drawing transistor circuits—Beta rule—importance of collector-emitter voltage, V_{CE}—Junction field effect transistors—characteristics of JFETs—merits and demerits of JFETs—practical FET structure—FET configurations—JFET temperature effects—JFET as an amplifier—JFET parameters—JFET data sheets—DC load line and bias point—FET biasing—FET small signal models—common source JFET amplifier—common drain JFET amplifier—common gate JFET amplifier—applications of FETs—FET as a voltage variable resistor(VVR)—Metal-insulator-semiconductor Field effect transistor(MISFETs)—depletion-enhancement MOSFETs(DE-MOSFETs)—MOSFET small signal model—enhancement only MOSFETs(E-MOSFETs)—MOSFET resistor—MOS capacitor—Dual-gate MOSFET—power MOSFETs(or V-FETs)—complementary MOSFET or CMOS—MOSFET handling—testing FETs—comparison of N-channel FETs with P-channel FETs—comparison of JFETs and MOSFETs—comparison between NMOS and PMOS

Unit 4: Hybrid parameters, transistor biasing and stabilization:

Two-port devices and the Hybrid model —transistor hybrid model—experimental determination of hybrid parameters—determination of h-parameters from static characteristics—variations of Hybrid-parameters of a transistor—typical vales of h-parameters for a transistors—conversion of hybrid parameters in transistor three configurations—transistor amplifier circuit performance in h-parameter—limitation of h-parameters—transistor amplifier configuration comparison—physical model of a CB transistor--Transistor biasing—selection of operating point—bias stabilization—stability factor—transistor biasing circuits—guidelines for design of transistor biasing circuits—bias compensation—thermal resistance—condition for thermal stability

Recommended books:

1. Electronic devices and circuits
   J.B.Gupta
   S.K.Kataria& Sons
   Delhi

Reference books:

1. Electronic devices and circuit theory
   Robert L. Boylestad and Louis Nashelky
   Pearson
2. Electronic Devices: Electron Flow Version ninth edition
   By Thomas L. Floyd
   Pearson Publication
3. Electronic Devices & Application NII, PHI
4. Complete Guide to Semiconductor Devices by Kwok N.G.

TMH Publication

Semester – 2

Paper 5: Basic circuit analysis

Course outcome:-

CO.1: To make students able to apply concept of electrical network nodes, branches, loops, mesh to solve circuits.

CO.2: To make students able to understand the basic concept of graph and analyze the circuits using them.

CO.3: To make students able to simplify network circuits using proper network Theorems.

Unit 1: Graph Theory- Fundamental Theorems:

Introduction – Tree and Co-Tree – twigs and links – Incident Matrix (A) – Properties of incidence Matrix A – Incidence Matrix and KCL – Link currents: Tie-Set Matrix – Cut-set and tree branch Voltage

Mesh analysis – Mesh equation by inspection method super-mesh analysis – Nodal analysis – Nodal equation by inspection method – Super-node analysis – Source transformation technique Star-delta transformation – Superposition theorem – Thevenin's theorem – Norton's theorem – Reciprocity theorem – Compensation theorem – Maximum power transfer theorem – Dual and Duality – Tellegen's theorem – Millman's theorem

Unit 2: Concepts of AC analysis:

The Sine wave – angular relation of a sine wave – the sine wave equation – Voltage and Current value of a sine wave – Phase relation in pure resistor- inductor and capacitor
Impedance diagram – Phasor diagram – Series circuits – Parallel circuits – Compound circuits
Instantaneous Power – Average Power – Apparent Power and Power factor – Reactive Power – The Power Triangle

Unit 3: Steady State AC Analysis and Resonance:

Mesh analysis – Mesh analysis by inspection – Nodal analysis – Nodal equation by inspection – Superposition theorem – Thevenin's theorem – Norton's theorem – Maximum Power transfer theorem
Series response – Impedance and Phase angle of a series resonant circuit – Voltage and current in series resonant circuit – Bandwidth of an RLC circuit – The quality factor (Q) and its effect on bandwidth – magnification in resonance – Parallel resonance – Resonance frequency for a tank Circuit – Variation of impedance with frequency – Q factor of parallel resonance – Magnification – Reactance current in parallel resonance – Locus diagram

Unit: 4 Coupled Circuits and Transients:

Introduction – Conductively compound circuit and mutual impedance – Mutual impedance – Dot Convention – Coefficient of Coupling – Ideal transformer – Analysis of multi-winding coupled circuits – Series Connections of coupled inductors – Parallel connection of coupled coils – Tuned circuits – analysis of magnetic circuits – Series magnetic circuit – Comparison of Electric and Magnetic circuits – Magnetic leakage and fringing – Composite series circuit – Parallel magnetic circuit
Steady state and Transient response – DC response of an RL circuit- RC and RLC circuit – Sinusoidal response of RL- RC and RLC circuit

Recommended book:

1. Circuits and Networks: Analysis and Synthesis
   A. Sudhakar and Shyammohan S. Palli
   Tata McGraw-Hill Publication 3rd Edition New Delhi

Reference Books:

1. Network analysis and Synthesis
A.K. Chakraborty- Lipika Datta and Shankar Prasad Ghosh
Tata McGraw-Hill education
2. Network analysis and Synthesis: A conceptual approach

U.A Bashi and A.V. Bakshi
Technical Publication

Paper 6: Advanced digital electronics

Course outcome:-

CO.1: Students will be able to design analyze and implement different sequential circuits.
CO.2: Students will be able to design various digital circuits using appropriate PLDs.

Unit 1: Flip-Flops

R-S Flip-Flop: Active LOW Inputs - Active HIGH Inputs - Clocked R-S Flip-Flop - Level-Triggered and Edge-Triggered Flip-Flops
J-K Flip-Flop: with PRESET and CLEAR Inputs – Master-Slave Flip-Flops - Toggle Flip-Flop (T Flip-Flop) - J-K Flip-Flop as a Toggle Flip-Flop
D Flip-Flop: J-K Flip-Flop as D Flip-Flop - D Latch
Synchronous and Asynchronous Inputs - Flip-Flop Timing Parameters - Set-Up and Hold Times - Propagation Delay - Clock Pulse HIGH and LOW Times - Asynchronous Input Active Pulse Width - Clock Transition Times - Maximum Clock Frequency
Flip-Flop Applications: Switch Debouncing - Flip-Flop Synchronization - Detecting the Sequence of Edges - Application-Relevant Data

Unit 2: Counters

Modulus of a Counter- Ripple (Asynchronous) Counter- Propagation Delay in Ripple Counters- Synchronous Counter;
Binary Ripple Counter: Operational Basics- Binary Ripple Counters with a Modulus of Less than 2^N- Ripple Counters in IC Form;
Synchronous (or Parallel) Counters
UP/DOWN Counters
Decade and BCD Counters
Presettable Counters: Variable Modulus with Presettable Counters
Decoding a Counter;
Cascading Counters: Cascading Binary Counters- Cascading BCD Counters;
Designing Counters with Arbitrary Sequences: Excitation Table of a Flip-Flop; State Transition Diagram- Design Procedure
Shift Register: Serial-In Serial-Out Shift Register; Serial-In Parallel-Out Shift Register; Parallel-In Serial-Out Shift Register- Parallel-In Parallel-Out Shift Register- Bidirectional Shift Register- Universal Shift Register- Shift Register Counters
Ring Counter- Shift Counter;

Unit 3: Digital to Analog and Analog to Digital Converters

Digital-to-Analogue Converters:
Simple Resistive Divider Network for D/A Conversion- Binary Ladder Network for D/A Conversion- D/A Converter Specifications: Resolution- Accuracy- Conversion Speed or Settling Time- Dynamic Range- Nonlinearity and Differential Nonlinearity- Monotonicity-
Types of D/A Converter: Multiplying D/A Converters- Bipolar-Output D/A Converters- Companding D/A Converters-
Modes of Operation- Current Steering Mode of Operation- Voltage Switching Mode of Operation- BCD-Input D/A Converter-
Integrated Circuit D/A Converters: DAC-08- DAC-0808- DAC-80- DAC-1408/DAC-1508
A/D Converters:
A/D Converter Specifications: Resolution- Accuracy- Gain and Offset Errors- Gain and Offset Drifts- Sampling Frequency and Aliasing Phenomenon- Quantization Error- Nonlinearity- Differential Nonlinearity- Conversion Time- Aperture and Acquisition Times- Code Width;
Converter Terminology: Unipolar Mode Operation- Bipolar Mode Operation- Coding- Low Byte and High Byte- Right-Justified Data- Left-Justified Data- Command Register- Status Register- Control Lines;
Types of A/D Converter: Simultaneous or Flash A/D Converters- Half-Flash A/D Converter- Counter-Type A/D Converter- Tracking-Type A/D Converter- Successive Approximation Type A/D Converter- Single, Dual and Multi-slope A/D Converters- Sigma-Delta A/D Converter;
Integrated Circuit A/D Converters: ADC-0800- ADC-0808- ICL 7106/ICL 7107
Converter Applications: Data Acquisition

Unit 4: Programmable Logic Devices

Fixed Logic Vs Programmable Logic: Advantages and Disadvantages; Programmable Logic Devices: An Overview- Programmable ROMs- Programmable Logic Array- Programmable Array Logic- Generic Array Logic- Complex Programmable Logic Device- Field-Programmable Gate Array-
Programmable Interconnect Technologies: Fuse- Floating-Gate Transistor Switch- Static RAM-Controlled Programmable Switches- Antifuse - Design and Development of Programmable Logic Hardware- Programming Languages: ABEL-Hardware Description Language- VHDL-VHSIC Hardware Description Language- Verilog- Java HDL

Recommended Books:

1. Digital Electronics Principles- Devices and Applications by Anil K. Maini (John Wiley & Sons)

Reference Books:

1. Digital Electronics by G.K. Kharate (Oxford Higher Education)
2. Digital Systems Principles and Applications by Ronald J. Tocci (Prentice Hall India)
3. Digital Fundamentals by Floyd (Pearson)
4. Digital Integrated Electronics by Taub and Schilling (Tata McGraw Hill)

Paper 7: Mathematics for electronics Paper

Course outcome:-

CO.1: To make students able to understand the mathematical concepts used in further study of electronic subjects.

CO.2: To make them able to understand the concepts like, integration, differentiation, various types of series calculation, derivation, and matrix derivation etc.

Unit 1: Advance vector Algebra

Vector function- Differentiation of vectors - formula of differentiation- Scalar and vector function- Gradient of a scalar function – Geometric meaning of gradient- Normal- Normal and directional derivative- Divergence of a vector function- Physical interpretation of divergence – Curl - Physical interpretation of curl.

Line integral- Surface Integral- Volume integral- Green's theorem - Area of the plane region by Green's theorem - Stoke's theorem - Gauss's theorem of divergence - deduction from Gauss diversion theorem- Helmholtz theorem

Unit 2: Orthogonal curvilinear coordinates- double and triple integral and their applications

Curvilinear coordinates- Differential of an Arc length- Geometrical significance of h1- h2 and h3 - Differential operator- Divergence- Curl- Laplacian operator- Cylindrical (Polar) coordinates - Spherical polar coordinates - Transformation of cylindrical polar coordinates into $\hat{\imath}$- $\hat{\jmath}$ and $\hat{k}$ - Conversion of spherical polar coordinates (r- $\theta - \emptyset$) into $\hat{\imath}$- $\hat{\jmath}$ and $\hat{k}$ - Relationship between cylindrical and spherical coordinates.

Double integration- Evaluation of double integral- Evaluation of double integrals in polar coordinates – Change of order of integration – change of variables

Area in Cartesian coordinates – Area in polar coordinates – Volume of solid by notation of an area (double integration) – Center of gravity – Center of gravity of an arc

Triple integration – integration by change in Cartesian coordinates into spherical coordinates

Volume = $\iiint dx\, dy\, dz$ – Volume of solid bounded by sphere or by cylinder – Volume of solid bounded by cylinder or cone – Volume bounded by peraboloid – Surface area

Unit 3: Fourier series- differential equation

Periodic function – Fourier series – Dirichlet's condition for a Fourier series – Advantages of Fourier series – Useful integrals – determination of Fourier coefficients (Euler's formula) – Fourier series of discontinuous functions – Function defined in two or more sub ranges – Discontinuous functions – Even function and odd function – Half range series- period 0 to π – Change of interval and functions having arbitrary period – Half period series – Parseval's formula – Fourier series in complex form – Practical harmonic analysis –

Definition of differential equation – Order and degree of differential equation – Formation of differential equation – Solution of differential equation – Geometrical meaning of a first order and first degree – Differential equation of first order and first degree – Variables separable - Homogeneous differential equations – equations reducible to homogeneous form – linear differential equations – Equations reducible to linear form (Bernoulli equation) – Exact differential equation – Equation reducible to exact equation (by inspection) – Equation of first order and higher degree – Orthogonal trajectories – Polar equation of the formula of curves

Linear differential equation – Nonlinear differential equation – Linear differential equation of second order with constant coefficients – Dimension of space of solution – Non homogeneous – Homogeneous – Superposition or linearity principle – Linear independence and dependence – Wronskian – Existence of linearly independence – Structure Theorem – Superposition principle – Abler formula – Complete solution = Complementary solution + particular solution – Method of finding the Complementary function – Rules to find particular integral - $\frac{1}{f(D)}e^{x} = \frac{1}{f(a)}e^{x}$, $\frac{1}{f(D)}x^{n}$

= [f (D)]$^{-1}$ x^n , $\frac{1}{f(D^2)} \sin ax = \frac{\sin ax}{f(-a^2)}$, $\frac{1}{f(D)} e^x \emptyset(x) = e^{ax} \frac{1}{f(D+a)} \emptyset(x)$, To find the value of $\frac{1}{f(D)} x^n \sin ax$, general method to finding the particular interval of any function$f(x)$

Unit 4: Complex Number

Introduction – Complex numbers – Geometrical representation of imaginary numbers – Argand diagram – Equal complex numbers – Addition of complex numbers – Addition of complex number by geometry – Subtraction – Power of i – Multiplication – i (I_0 + a) as an operator – Conjugate of complex number – Division – Division of complex number by geometry – Modulus and argument – Polar term – types of complex numbers – square root of complex numbers – Exponential and circular function of complex variables – De moivre's theorem (by exponential function) - De moivre's theorem (by induction) – Roots of complex numbers – Circular function of complex numbers – Hyperbolic functions – Relation between circular and hyperbolic function –Formula of hyperbolic function –Separation of real and imaginary parts of circular function - Separation of real and imaginary parts of hyperbolic function – Logarithmic function of a complex variable – Inverse function – Inverse hyperbolic function – Some other inverse functions.

Recommended books:

1. Higher mathematical physics
   H.K. Dass and Dr. Rama Verma-
   S. Chand & Co. Pvt. Ltd.
   New Delhi

Reference Books:

1. Mathematical physics
   B.S. Rajput
   Pragati Prakashan
2. A books on engineering mathematics
   By: N.P. Bali- Dr. Ashok Saxena and Dr. N.Ch- S. Narayan Iyergan Luxmi Publication (P) Ltd
   New Delhi.

Paper 8: Amplifier and Oscillators

Course outcome:-

CO.1: Students will able to identify as well as making their own amplifies and oscillator circuits. Students also be able to understand various amplifiers and oscillator circuits used in most of electronic devise.

CO.2: To make students able to understand the basic concepts of transistor and transistor amplifiers and oscillator.

Unit 1: Transistor Biasing and Stabilization

Transistor biasing – Selection of operating point – Bias stabilization – Stability factor – Transistor Biasing circuits – Guidelines for design of transistor biasing circuits – Bias compensation – Thermal resistance – Condition for thermal stability

Single stage Transistor Amplifiers

Introduction – Transistor amplifier practical circuits – Phase reversal – Load line analysis – Amplifier gains – AC emitter resistance – Simplified Common-Emitter hybrid model – The r'_e model – The r'_e model of CB transistor amplifier – The r'_e model of CE transistor amplifier – The r'_e model of CC transistor amplifier – T-Equivalent circuit and r-parameters – Analysis of a CE transistor amplifier using h-parameters – Analysis of a CB transistor amplifier using h-parameter - Analysis of a CC transistor amplifier using h-parameter – Classification of amplifiers – Distortion in amplifiers – Noise in amplifiers – Basic amplifiers

Unit 2: Amplifier Frequency Response

Introduction – Decibels – Linear and Logarithmic scales – Transistor cutoff frequencies – Low-Frequency analysis bode plot – Miller's theorem – Low-Frequency response-BJT amplifier – Low-Frequency response-FET amplifier – Effect of internal transistor capacitances – Miller effect

Multistage Amplifiers

Introduction – Multistage amplifier – n-Stage cascaded amplifier – Frequency response of coupled amplifiers – R-C (Resistance-Capacitance) coupled transistor amplifier – Transformer coupled transistor amplifier – Impedance coupled transistor amplifier – Direct coupled transistor amplifier – Cascaded FET amplifier – Cascode or CE-CB configuration – Bandpass of cascaded stages – Comparison of different types of couplings

Large Signal or Power Amplifiers

Introduction – Difference between voltage and power amplifiers – Terms used in power amplifiers – Classifications of power amplifiers – Practical power amplifier stages – Class A power amplifiers (Direct coupled with resistive load) – Class A power amplifier (Transformer coupled with resistive load) – Class B power amplifiers – Harmonic distortion in power amplifiers – Variation of output power in transformer coupled power amplifier – Class AB power amplifiers – Class C power amplifiers – Class D power amplifiers – Push-Pull amplifiers – Class A Push-Pull amplifiers – Class B Push-Pull amplifiers – Cross over distortion – Class AB Push-Pull amplifiers – Phase-Splitter circuit for Push-Pull amplifiers [Or phase invertor] –
Complementary symmetry Push-Pull amplifiers – Quasi-Complementary Push-Pull amplifiers – Derating curve of a power transistor

Unit 3: Feedback in Amplifiers

Introduction – Principle of feedback in amplifier – Advantages of Negative feedback – Stabilization of gain with negative feedback – Reduction in frequency distortion with negative feedback – Reduction in nonlinear distortion with negative feedback – Reduction in noise with negative feedback – Effect of negative feedback on input resistance – Effect of negative feedback

on output impedance – Effect of negative feedback on bandwidth – Voltage-Series feedback – Voltage-Shunt feedback – Current-Shunt feedback – Current-Series feedback – Effects of negative feedback amplifier characteristic – Emitter follower – Darlington amplifier – Comparison between Darlington amplifier [Darlington pair or Darlington emitter follower] and emitter follower – Bootstrapped Darlington circuit – Feedback pair connection – Nyquist criterion for stability – Gain and phase margins

Tuned amplifiers

Introduction – Classification of tuned amplifiers – Single tuned amplifiers – Double tuned amplifiers – Large signal tuned amplifiers – Oscillation in a tuned amplifiers – Stagger tuned amplifier

Unit 4: Differential amplifiers

Introduction – Differential amplifier – Differential amplifier circuit configuration – Dual-Input balanced-Output differential amplifier – Dual-Input- Unbalanced-Output differential amplifier – Current source circuits – Constant current bias – Current mirror – Differential amplifier with active load

Sinusoidal Oscillators

Introduction – Operation of oscillator – Essentials of transistor oscillators – Frequency stability of oscillator – Types of transistor oscillator – L-C oscillators – Tuned-Collector oscillators – Tuned-Drain oscillator (FET) – Tuned-Base oscillator – Franklin oscillator – Colpitt's oscillator – Clapp oscillator – Hartley oscillator – Crystal oscillators – Audio oscillators – Phase shift oscillator – Wien bridge oscillator – Beat frequency oscillator – Negative resistance oscillators – Selection of oscillator

Recommended Book:

1. Electronic Devices & Circuits by J.B. Gupta (Katson Educational series)

Reference Books:

1. Electronic Devices and Circuits by S Salivahanan- N Suresh Kumar- A Vallavaraj- Second Edition- The McGraw Hill Companies.
2. Electronic Devices by Floyd- Pearson Education.
3. Complete Guide to Semiconductor Devices" by Kwok. N. G. - TMH Publication.
4. Basic Electronic Devices- NIIT- PHI.

Semester- 3

Paper 9: Advanced circuit and network concepts

Course outcome:-

CO.1: To apply concepts of electric network topology, nodes, branches, loops to solve circuit problems including the use of computer simulation.

CO.2: To disseminate the basic concepts of graph and analyze the basic electrical circuits using graph theory.

CO.3: To make students understand various functions of network and also the stability of network.

CO.4: To make students able to synthesize the network using passive elements

Unit 1: Laplace transforms and its applications to circuit analysis:

Definitions of Laplace transform – step function – impulse function – functional transforms – operational transforms – Laplace transforms of periodic functions – inverse transforms – initial and final value theorems

Circuit elements in the S-domain – applications – transfer function – use of transfer function in circuit analysis – the transfer function and steady state sinusoidal response – the impulse function in circuit analysis

Unit 2: S-domain analysis and Elements of realizability and synthesis of one port networks:

The concept of complex frequency – physical interpretation of complex frequency – transform impedance and transform circuits – series and parallel combination of elements – terminal pairs or ports – network functions for the one-port and two-port – poles and zeros of network functions – significance of poles and zeros – properties of driving point functions – properties of transfer functions – necessary conditions for driving point functions – necessary conditions for transfer functions – time domain response from pole-zero plot – amplitude and phase response from pole-zero plot – stability criteria for active network – Routh criteria

Hurwits polynomials – positive real functions – frequency response of reactive one-ports – synthesis of reactive one-ports by Foster's method and Cauer method – Synthesis of RL netework ny Foster and Caur methods – synthesis of RC network by Foster and Cauer method

Unit 3: Two-port networks:

Two-port network – open circuit impedance (Z) -parameters – short circuit admittance parameters – transmission (ABCD) parameters – inverse transmission (A'B'C'D') parameters - hybrid (h) parameters – inverse hybrid (g) parameters – inter relationship of different parameters – inter connection of two port networks – T and π representation – terminated network – lattice networks – image parameters

Unit 4: Filters and attenuators:

Classification of filters – filter networks – equations of filter networks – classification of passband and stopband – characteristics impedance in pass band and stop band – constant-K low pass filter – constant-K high pass filter – m-derived T-section – band pass filter – band elimination filter – attenuators – T-type attenuator – π-type attenuator – lattice attenuator – bridge-T attenuator – L-type attenuator – equalizers – inverse network – series equalizer – full series equalizer – shunt equalizer – full shunt equalizer – constant resistance equalizer – bridge-T attenuation equalizer – bridge-T phase equalizer – lattice attenuation equalizer – lattice phase equalizer

Recommended books:

1. Circuits and networks: Analysis and synthesis
   A. Sudhakar amd Shyammohan S. Palli
   Tata McGraw-Hill Publishing Company Limited
   New Delhi

Reference books:

1. Network analysis and synthesis
   A K Chakraborty, Lipika Datta and Shankar Prasad Ghosh
   Tata McGraw-Hill publishing Company Limited
   New Delhi
2. Network analysis & synthesis: A conceptual approach
   U A Bakshi and A V Bakshi
   Technical publications Pune
3. Circuits
   A Bruce Carlson
   Cengage learning
   New Delhi
4. Introduction to circuit analysis and design
   Tildon Glisson,Jr.
   Springer
   New Delhi

Paper 10: Fundamental of communication electronics

Course outcome:-

CO.1: To make the students understand the basic concepts of communication in the world of electronics, how the whole system of communication system works.

Unit 1: Introduction to electronic communication and signal analysis and mixing

Introduction – power measurements (dB, dB_m , and Bel) – electronic communication systems – modulation and demodulation – the electromagnetic frequency spectrum – bandwidth and information capacity – noise analysis –

Signal analysis – complex waves – frequency spectrum and bandwidth – Fourier series for a rectangular waveform – linear summing – non-linear mixing

Unit 2: oscillators, phase-locked loops, frequency synthesizers and amplitude modulation transmission

Oscillators – feedback oscillators – frequency stability – crystal oscillators – large-signal integration oscillators – phase locked loops – PLL capture and lock ranges – voltage controlled oscillator – phase comparator – PLL loop gain – PLL closed -loop frequency response – integrated-circuit precision phase-locked loop – digital PLLs – frequency synthesizers

Principles of amplitude modulation – AM modulating circuits – linear integrated-circuit AM modulators – AM transmitters – trapezoidal patterns – carrier shift – AM envelopes produced complex non-sinusoidal signals – quadrature amplitude modulation

Unit 3: Amplitude modulation reception and single side-band communication systems

Receiver parameters – AM receivers – AM receiver circuits – double-conversion Am receivers – net receiver gain

Single side-band systems – comparison of single side-band transmission to conventional AM – mathematical analysis of suppressed-carrier AM – single side-band generation – single side-band transmitters – independent sideband – single side-band receivers – amplitude-compandoring single sideband – single-sideband suppressed carrier and frequency-division multiplexing – double-sideband suppressed carrier and quadrature multiplexing – single-sideband measurements

Unit 4: Angle modulation transmission and angle modulation reception and FM stereo

Angle modulation – mathematical analysis – deviation sensitivity – FM and PM waveforms – phase deviation and modulation index – frequency deviation and percent modulation – phase and frequency modulators and demodulators – frequency analysis of angle-modulated waves – bandwidth requirements of angle-modulated waves – deviation ratio – commercial broadcast

band FM – phasor representation of an angle modulated wave – average power of an angle-modulated wave – noise and angle modulation – preemphasis and deemphasis – frequency and phase modulators – frequency up-conversion – direct FM transmitters – indirect FM transmitters – angle modulation versus amplitude modulation

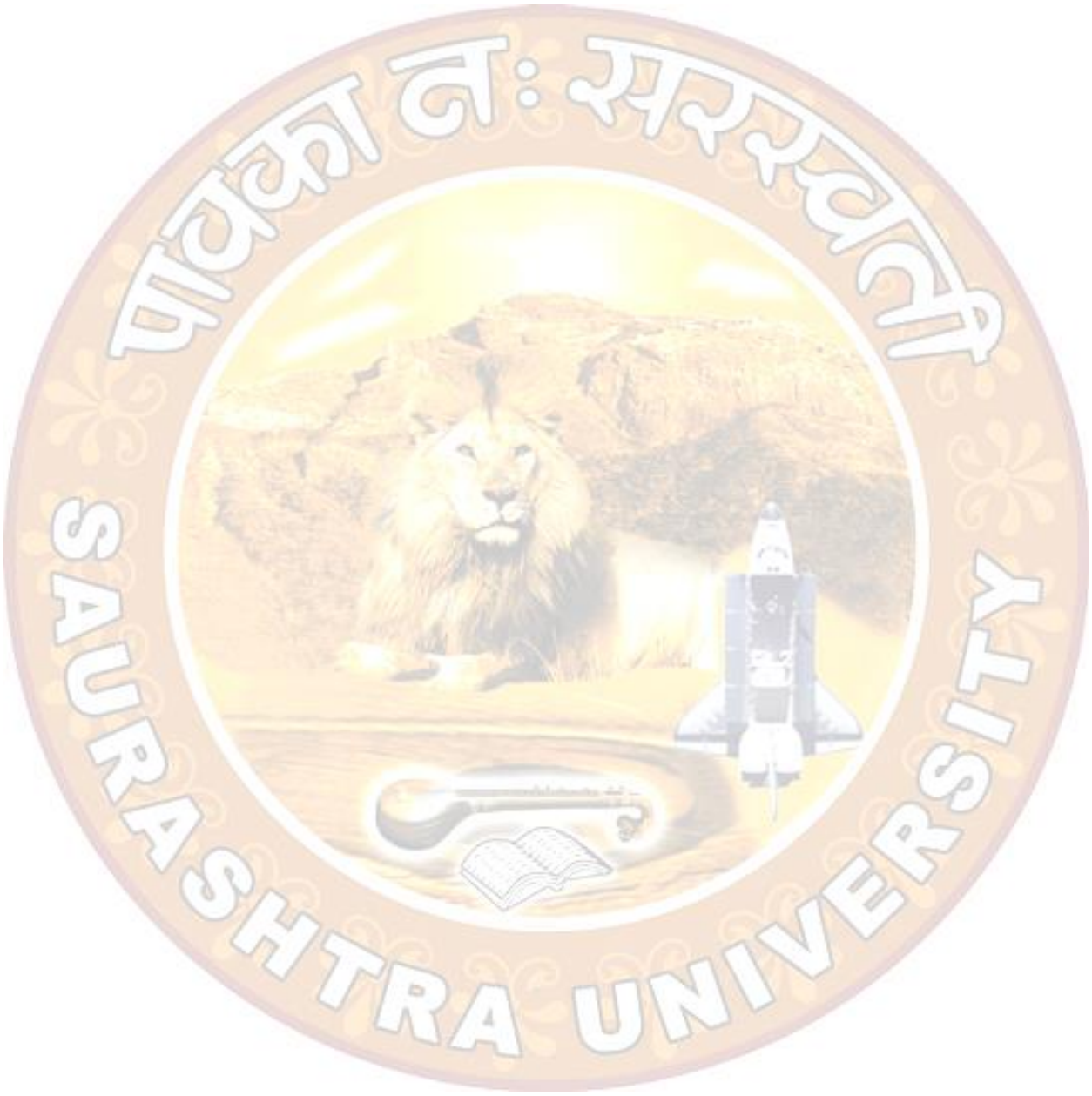
FM receivers – FM demodulators – phase-locked-loop FM demodulators – quadrature FM demodulator – FM noise suppression – frequency versus phase modulation – linear integrated-circuit FM receivers – FM stereo broadcasting – two-way mobile communications service – two-way FM radio communications

Recommended books:

1. Electronic communication systems: Fundamentals through advanced
   Wayne Tomasi
   Pearson education (second impression)
   Delhi

Reference books:

1. Communication systems (Analog & digital)
   Sanjay Sharma
   Katson books (Fourth revised edition)
   New Delhi
2. Communication systems
   Simon Haykin
   Wiley (Fourth edition)
   New Delhi
3. Basics of electronic communications
   NIIT
   Prentice-Hall of India Pvt Ltd
   New Delhi


पाठका तः सरस्वती
SAURASHTRA UNIVERSITY

Paper 11: Power electronics

Course outcome:-

CO.1: To make the students understand the concepts of power diodes, choppers, power amplifiers, controllers and inverters. Students can troubleshoot the power electronics circuit by learning this course.

Unit 1: Power diodes, transistors and thyristors:

Power semiconductor diode – power bipolar junction transistor – power metal oxide semiconductor FET – enhancement type power mosfet – comparison of bipolar junction transistor(BJT) and field effect transistor – insulated gate bipolar junction transistor – comparison of power mosfet and IGBTs – new semiconductor materials

Thyristors – thyristor turn on methods – gate control – trigger current, trigger voltage – details of turn on process, conduction and turn off process – turn on and turn off times – thyristor specifications and ratings – selection of parameters of triggering circuit – methods to improve di/dt and dv/dt ratings – DIAC – TRIAC: Bi-directional SCR – heat sinks and mountings -uni-junction transistor (UJT) – relaxation oscillator using UJT – SCR triggering circuits – pulse transformer triggering circuit – commutation of SCR – protection of thyristors – thyristors in series – thyristors in parallel – string efficiency, derating – triggering of thyristors in series – triggering of parallel connected thyristors – thyristor family – comparison between transistors and thyristors – power integrating circuits

Unit 2: controlled rectifiers and inverters:

Performance indices pf rectifiers – single phase half wave converter – single phase half wave converter with R-L load and freewheeling diode – single phase full wave converter – single phase bridge converter – fully controlled bridge converter – fully controlled bridge converter with RLE load – semi-converter, resistive load – semi-converter, RLE load – single phase series converter – three phase full controlled bridge converter – three phase semi-converter – conversion of 3 phase and single phase converters – effect of source impedance on converter operation – single phase dual converter – three phase dual converter – twelve pulse converter Series inverter – parallel inverter - single phase bridge inverter – commutation of single phase bridge inverter circuits – three phase bridge inverter – voltage and frequency control of single phase inverter – pulse width modulation – voltage control of 3 phase inverters – waveform control(Harmonic reduction) – waveform control using filters – current source inverter

Unit 3: choppers and AC regulators:

Chopper principle – control techniques – analysis of step-down chopper with resistance load – analysis of step-down chopper with RLE load – Fourier analysis of output voltage wave – classification of choppers – commutation methods for choppers – Jones chopper – Morgan chopper – multiphase chopper – step up chopper – AC chopper

Principle of integral cycle control – single phase half wave regulator – single phase full wave regulator(resistive load) – single phase full wave regulator with R-L load – three phase full wave regulator – static on-load tap changing of transformers – static multistage tap changer – industrial applications of AC regulators

Unit 4: cycloconverters and applications of thyristors:

Principle of operation – single phase cycloconverter using center tapped transformer – single phase bridge configuration – three phase to single phase bridge cycloconverter – three phase to three phase cycloconverter – blocked group operation – output voltage – circulating current mode of operation – reduction of harmonics in output of cycloconverters comparison of cycloconverter and DC link converter – difference between dual converter and cycloconverter Overvoltage protection using thyristor – crowbar circuit – circuit breakers – zero voltage switch – integral cycle triggering – soft start – time delay circuit – logic gates using thyristors - controlled electric heating – induction heating – induction cooking – dielectric heating – comparison of induction heating and dielectric heating – electric welding – electrical system of automobiles – battery charging – illumination control using TRIAC – space heating and air conditioning – high frequency fluorescent lighting – excitation systems for alternators – static VAR system – HVDC system – application of power electronics in solar energy utilization – application of power electronics in wind energy utilization

Recommended book:

1. Power electronics
   Dr. B.R.Gupta and Vandana Singhal
   S.K.Kataria & sons(Fifth edition- reprint 2007 – 2008)
   Delhi

Reference books:

1. Power electronics
   M D Singh and K B Khanchandani
   Tata McGraw Hill (Second edition)
   New Delhi
2. Power Electronics
   P.C. Sen,
   TMH Publication.
3. Power Electronics: Circuits, Devices and Application
   Rashid,
   Pearson Education

Paper 12: Circuit simulation and PCB designing tools

Course outcome:-

CO.1: After completing this course, students would be able to make any complex electronic circuits and before physical implementation of circuits, by using simulation software students can check that, how circuit will work.

CO.2: To make the students able to design and simulate their own circuits for their project work and also for making prototypes also.

Unit 1: Introduction, tutorial, general concepts, graphics, properties and object specifics:

A guided tour of the ISIS editor – picking, placing and wiring up components – labeling and moving part references – block editing functions – practice makes perfect – annotating the diagram – creating new devices – finishing touches – saving, priniting and plotting – more about creating devices – symbols and the symbol library – report generation – a larger design

Screen layout – coordinate system – filing commands – general editing dacilities – wiring up – the automatic annotator – miscellaneous – graphics tutorial — object properties – sheet properties – design properties – parameterized circuits – the property assignment tool – property definitions

Components – dots – wire labels – scripts – buses – sub-circuits – terminals pin objects – simulator gadgets – 2D graphics – markers

Unit 2: library facilities, multi-sheet designs, netlist generation, report generation, hard copy generation and ISIS and ARES

General points about libraries – symbol library – device libraries – multi-sheet flat designs – hierarchical designs – net names – duplicate pin names – hidden power pins – special net names syntaxes – bus connectivity rules – generating netlist file – netlist formats – bill of materials – ASCII data import – electric rules check – printer output – plotter output – clipboard and graphics file generation – packaging – net properties and routing strategies – forward annotation-engineering changes – pin-swap / gate swap – re-annotation – back-annotation with ISIS

Unit 3: Introduction to DIP trace, pattern library creation, component library creation, designing schematics:

Dip trace installation – programs and formats – Dip trace on the web – problems statements – basic keywords – introduction to pattern editor – creating new pattern library – designing single pattern – using pattern templates – more about pattern templates – polygonal pads – edge connectors – mounting holes – import pattern form DXF – practical lesson #1 – practical lesson #2 – introduction to component editor – creating new component library – building single component – attaching pattern – creating net port connection – multi-part components – using pin manager – additional features of component editor – spice settings – practical lesson #3 – practical #4 – practical #5 – introduction to schematic – setting up workspace – working with libraries – placing components- nets and buses – multi-sheet schematic – component properties –

design manager – hierarchical schematic – bill of material – spice settings – practical lesson #6 – practical lesion #7 – practical lesson #8

Unit 4: PCB layout:

Introduction to PCB layout – setting up workspace – components and nets – preparation to placement and routing – placement features – routing board – copper pours – post-routing features – design verification – manufacturing outputs

Recommended book:

1. Proteus tutorial manual
2. Dip Trace training manual

Reference books:

1. Printed circuit boards: design and technology
   Bosshart
   Tata McGraw Hill Education
2. Printed Circuit Board
   Dr. H. N. Pandya
   University Granth Nirman Board
   Gandhinagar
   Gujarat State
3. Understanding PCB Designing
   Dr. H. N. Pandya,
   Saurashtra University Publication

Semester: 4

Paper 13: Advance communication electronics

Course outcome:-

CO.1: To make the students understand able to understand the digitalisation of the analog signals, various multiplexing and de-multiplexing methods used in communication, coding-decoding, serial and parallel communication, framing concepts in communication.

Unit 1: Digital modulation and digital transmission:

Introduction – information capacity, bits, bit rate, baud, and M-ary encoding – amplitude shift-keying – frequency-shift keying – phase-shift keying – quadrature-amplitude modulation – bandwidth efficiency – carrier recovery – clock recovery – differential phase-shift keying – trellis code modulation – probability of error and bit error rate – error performance

Pulse modulation – PCM – PCM sampling – signal-to-quantization noise ratio – linear versus non-linear PCM codes – idle cannel noise – coding methods – companding – vocoders – PCM line speed – delta modulation PCM – adaptive delta modulation PCM – differential PCM – pulse transmission – signal power in binary digital signals

Unit 2: Digital T-carrier and multiplexing and telephone instruments and signals:

Time-division multiplexing – T1 digital carrier – north American digital hierarchy – digital carrier line encoding – T carrier system – European digital carrier system – digital carrier frame synchronization – bit versus word interleaving – statistical time-division multiplexing – codecs and combo chips – frequency-division multiplexing – At &T's FDM hierarchy – composite baseband signal – formation of a master group – wavelength-division multiplexing

- The subscriber loop – standard telephone set – basic telephone call procedures - call progress tones and signals – cordless telephones – caller ID – electronic telephones – paging System

Unit 3: The public telephone network and cellular telephone concepts:

Telephone transmission system environment – the public telephone network – instruments, local loops, trunk circuits and exchanges – local central office telephone exchanges – operator-assisted local exchanges – automated central office switches and exchanges – north American telephone numbering plan areas – telephone service – north American telephone switching hierarchy – common channel signaling system No. 7 (SS7) and the post divestiture north American switching hierarchy

Mobile telephone service – evolution of cellular telephone – cellular telephone – frequency reuse – interference – cell splitting, sectoring, segmentation and dualization – cellular system topology – roaming and handoffs – cellular telephone network components – cellular telephone call procedure

Unit 4: Cellular telephone systems and satellite communication:

First-generation analog cellular telephone – personal communication system – second-generation cellular telephone systems – N-AMPS – digital cellular telephone – interim standard 95 (IS-95) – north American cellular and PCS summary – global system for mobile communication – personal satellite communication system

History of satellites – Kepler's laws – satellite orbits – geosynchronous satellites – antenna look angles – satellite classifications, spacing and frequency allocation – satellite antenna radiation patterns: foot prints – satellite system link models – satellite system parameters – satellite system equations – link budget

Recommended books:

1. Electronic communication systems: Fundamentals through advanced
   Wayne Tomasi
   Pearson education (second impression)
   Delhi

Reference books:

1. Communication systems (Analog & digital)
   Sanjay Sharma
   Katson books (Fourth revised edition)
   New Delhi
2. Communication systems
   Simon Haykin
   Wiley (Fourth edition)
   New Delhi
3. Basics of electronic communications
   NIIT
   Prentice-Hall of India Pvt Ltd
   New Delhi

Paper 14: Op-Amp and its applications

Course outcome:-

CO.1: To make the students understand working of operational amplifier and its characteristics.

CO.2: Design the solution for linear & non-linear applications using IC741

CO.3: Elucidate, design and realize the active filters and oscillators.

CO.4: Identify the needs of voltage regulators and timers and design accordingly.

Unit 1: Introduction to Operational Amplifiers:

Introduction, The Operational Amplifier, Block Diagram Representation of a Typical Op-Amp, Analysis Of Typical Op-Amp Equivalent Circuit, Schematic Symbol, Integrated Circuits, Types of Integrated Circuits, Manufacturers' Designations for Integrated Circuits, Development of Integrated Circuits, Integrated Circuit Package Types, Pin Identification, and Temperature Ranges, Ordering Information, Device Identification, Power Supplies for Integrated Circuits. Introduction, Interpreting a Typical Set of Data Sheets, The Ideal Op-Amp, Equivalent Circuit of an Op-Amp, Ideal Voltage Transfer Curve, Open-Loop Op-Amp Configuration, PSpice Simulation, Introduction, Input Offset Voltage, Input Basic Current, Input Offset Current, Total Output Offset Voltage, Thermal Drift, Effect of Variation in Power Supply Voltages on Offset Voltage, Change in Input Offset Voltage and Input Offset Current with time, Other Temperature and supply Voltage Sensitive Parameters, Noise, Common-Mode Configuration and Common-Mode Rejection Ratio.

Unit 2: An Op-Amp with negative Feedback and Frequency Response of an Op-Amp:

Introduction, Block Diagram Representation of Feedback Configurations, Voltage-Series Feedback Amplifier, Voltage Shunt Feedback Amplifier, Differential Amplifiers, PSPICE Simulation.

Introduction, Frequency Response, Compensating Networks, Frequency Response of Internally Compensated Op-Amps, Frequency Response of Non-compensated Op-Amps, High Frequency op-Amp Equivalent Circuit, Open Loop Voltage Gain as a Function of Frequency, Closed Loop Frequency Response, Circuit Stability, Slew Rate

Unit 3: General Linear Applications, Active Filters and Oscillators:

Introduction, DC and AC Amplifiers, AC Amplifiers with a Single Supply Voltage, The Peaking Amplifier, Summing, Scaling, and Averaging Amplifier, Instrumental Amplifier, Differential Input and Differential Output Amplifier, Voltage to Current Convertor with Floating Load, Voltage to Current Convertor with Grounded Load, Current to Voltage

Convertor, Very High Input Impedance Circuit, The Integrator, The Differentiator, PSpice Simulation.

Introduction, Active Filters, First-Order Low-Pass Butterworth Filter, Second-Order Low Pass Butterworth Filter, First-Order High Pass Butterworth Filter, Second Order High Pass Butterworth Filter, Higher Order Filters, Band-Pass Filters, Band- Reject Filters, All-Pass Filters, Oscillators, Phase Shift oscillator, Wien Bridge Oscillator, Quadrature Oscillator, Square Wave Generator, Triangular Wave Generator, Sawtooth Wave Generator, Voltage Controlled Oscillator, PSpice Simulation.

Unit 4: Comparators, Convertors and Specialized IC Applications:

Introduction, Basic Comparator, Zero-Crossing Detector, Schmitt Trigger, Comparator Characteristics, Limitations of Op-Amp as Comparator, Voltage Limiters, High Speed and Precision Type Comparators, Window Detector, Voltage to Frequency and Frequency to Voltage Convertors, Analog to Digital and Digital to Analog Convertors, Clippers and Clampers, Absolute Value Output Circuit, Peak Detector, Sample And Hold Circuit, PSpice Simulation. Universal Active Filters, Switched capacitor Filter, The 555 Timer, Phase Locked loops, Power Amplifiers, Voltage Regulators, PSpice Simulation.

Recommended-Book:

1. "Op-Amps and Linear Integrated Circuits" by Gayakwad, Pearson Education.

Reference Book:

1. Electronics devices and circuits
   J.B. Gupta, S.K. Kataria and son's publication,
   New Delhi
2. Operational Amplifiers with Linear Integrated Circuits"
   Stanley,
   Pearson Education.

Paper 15: Elements of C language

Course outcome:-

Upon completion of this course, students will acquire knowledge about:

CO.1: Able to implement the algorithms and draw flowcharts for solving Mathematical and Engineering problems.

CO.2: Ability to design and develop Computer programs, analyzes, and interprets the concept of pointers, declarations, initialization, operations on pointers and their usage.

CO.3: Able to define data types and use them in simple data processing applications also he/she must be able to use the concept of array of structures. Student must be able to define union and enumeration user defined data types.

CO.4: Develop confidence for self-education and ability for life-long learning needed for Computer language.

Unit 1: Overview of C, constants, variables, data types, operators and expressions:

History of C – importance of C – sample program 1: printing a message – sample program 2: adding two numbers – sample program 3: interest calculation – sample program 4: use of subroutines – sample program 5: use of math functions – basic structure of C programs – programming style – unix system – MS-DOS system

Character set – C tokens – keywords and identifiers – constants – variables – data types – declaration of variables – declaration of storage class – assigning values to variables – defining symbolic constants – declaring a variable as constant – declaring a variable as volatile – overflow and underflow of data

Arithmetic operators – relational operators – logical operators – assignment operators – increment and decrement operators – conditional operators – bitwise operators – special operators – arithmetic expressions – evaluation of expressions – precedence of arithmetic operators – some computational problems – type conversions in expressions – operator precedence and associativity – mathematical functions

Unit 2: Managing input, output operations, decision making and branching, decision making and looping:

Reading a character – writing a character – formatted input – formatted output
Decision making with if statement – simple if statement – the if…else statements - nesting of if…else statements – the else if ladder – the switch statemen – the ?: operator – the goto statement – the while statement – the do statement – the for statement – jumps in loops – concise test expressions

Unit 3: Arrays, character arrays, strings, and user defined functions:

One-dimensional arrays – declaration of one-dimensional arrays – initialization of pne-dimensional arrays – two-dimensional arrays – initialing two-dimensional arrays – dynamic arrays – more about arrays
Declaring and initializing string variables – reading strings from terminal – writing strings to screen – arithmetic operations on characters – putting strings together – comparison of two strings – string-handling functions – table of strings – other features of strings
Need for use defined functions – a multi-function program – elements of user-defined functions – definition of functions - return values and their types – function calls – function declaration – category of function – no arguments and no return values – arguments but no return values – arguments with return values – no arguments but returns a value – functions that return multiple values – nesting of functions – recursion – passing arrays to functions – passing arrays to functions – passing strings to functions – the scope, visibility and lifetime of variables – multifile programs

Unit 4: structures, unions, pointers and file management in C:

Defining a structure – declaring structure variables – accessing structure members – structure initialization – copying and comparing structure variables – operations on individual members – arrays of structures – arrays within structures – structures within structures – structures and functions – unions – size of structures – bit fields
Understanding pointers – accessing the address of a variable – declaring pointer variables – initialization of pointer variables – accessing a variable through its pointer – chain of pointers – pointer expression – pointer increments and scale factor – pointers and arrays – pointers and character strings – array of pointers – pointers as function arguments – functions returning pointers – pointers to functions – pointers to structures – troubles with pointers
Defining and opening a file – closing a file – input/output operations on files – error handling during I/O operations – random access to files – command line arguments

Recommended book:

1. Programming in ANSI C

E Balagurusami
Tata McGraw Hill (Sixth edition)
New Delhi

Reference books:

1. Let us C
   Yashvant Kanitkar
   BPB publication
   New Delhi
2. C and data structures
   Prof. P.S.Deshpande and Prof. O.G.Kakde
   Dreamtech Press

Paper 16: Basic instrumentation

Course outcome:-

CO.1: Students can learn various measurements techniques of frequency measurements, characteristic analysis. Students can also be handy with Different types of voltmeters, ammeters, multimeters, oscilloscopes and signal generators used in various circuit to measure the different behaviour of V and I.

Unit 1: Qualities of Measurements:

Introduction, Performance Characteristics, Static Characteristics, Types of Static Error, Sources Of Errors, Dynamic Characteristic, Statistical Analysis, Standard, Automatic Frequency And Time Standards, Electrical Standards, Graphical Representation Of Measurements As Distribution.
Indicators and Display Devices: Basic Meter Movement, Taut band instrument, Electrodynamometer, Moving Iron Types Instruments, Concentric Vane Repulsion Instrument, Digital Display System and Indicators, classification of Displays, Display Devices, LED, LCD, Other Displays

Unit 2: Ammeters, Voltmeters and Multimeters:

DC Ammeter, Multirange Ammeter, The Aryton
Shunt or Universal Shunt, Requirements of a Shunt, Extending of Ammeter Ranges, Effect of Frequency on Calibration, Measurement of Very Large Currents by Thermocouples.
Basic meter as a DC Voltmeter, DC Voltmeter, Multirange Voltmeter, Extending Voltmeter Ranges, Loading, Transistor Voltmeter, Chopper Type DC Amplifier Voltmeter, Solid State Voltmeter, AC Voltmeter using Rectifiers, AC Voltmeter Using Half Wave Rectifiers, AC

Voltmeter Using Full Wave Rectifier, Multirange AC Voltmeter, Peak Responding Voltmeter, True RMS Voltmeter, True RMS Meter, Considerations in Choosing an Analog Voltmeter.
Ohmmeter, Shunt Type Ohmmeter, Calibration of DC Instrument, Calibration of Ohmmeter. Multimeter, Multimeter Operating Instructions.

Unit 3: Digital Voltmeters and Digital Instruments:

Ramp Technique, Dual Slope, Integrating Type DVM, Integrating Type DVM, Most Commonly Used Principles of ADC, Successive Approximation, 3½ Digit, Resolution And Sensitivity of a DVM, General Specification of a DVM, Microprocessor Based Ramp Type DVM.
Digital Multimeters, Digital Frequency meter, Digital Measurement of time, Universal Counter, Decade Counter, Electronic Counter, Digital Measurement of frequency, Digital Tachometer, Digital Phase meter, Digital capacitance meter, microprocessor based instruments, The IEEE 488 Bus.

Unit 4: Oscilloscope and Signal Generators:

CRT Features, Basic Principle of Signal Display, Block Diagram of Oscilloscope, Simple CRO, Vertical Amplifier, Horizontal Deflecting System, Triggered Sweep CRO, Trigger pulse Circuit, Delay Line in Triggered Sweep, Sync Selector for Continuous Sweep CRO, Typical CRT Connections, High Frequency CRT, Dual Beam CRO, Dual Trace Oscilloscope, sampling Oscilloscope, Storage Oscilloscope, Measurement of Frequency by Lissajous Method, Spot Wheel Method, Gear Wheel Method, Checking of Diodes, Basic Measurement of Capacitance and inductance, Use of Lissajous Figures For Phase
Measurement, Probes for CRO, Attenuators, Applications of Oscilloscope, Delayed Sweep, Digital Storage Oscilloscope,
Fixed Frequency AF Oscillator, Basic Standard Signal Generator, Standard Signal Generator, Modern Laboratory signal Generator, AF sine and square wave generator, Function Generator, Square and pulse Generator, Random Noise Generator, Sweep Marker Generator,
Wobbluscope

Recommended books:

1. Electronic Instrumentation
   H S Kalsi, Second Edition,
   Tata McGraw-Hill Companies.

Reference-Books:

1. Electrical and Electronic Measurements and Instrumentation
   A K Sawhney.
   Dhanpat Rai & Sons publications.
2. Electronic Instruments and Instrumentation Technology
   M.M.S. Anand,
   PHI.
3. Electronic Instrumentation and Measurements
   Bell,
   PHI.

4. Modern Electronic Instrumentation and Measurement Techniques
   Albert Helfric & William Cooper;
   PHI
5. Industrial Instrumentation & Control
   S.K.Singh
   Tata McGraw-Hill Companies
6. Instrumentation, Measurement and Analysis
   Nakra B. C. and Chaudhary K. K.
   Tata McGraw-Hill Companies

Semester: 5

Paper 17: Basic concepts of control system

Course outcome:-

CO.1: Students can understand the gist of control systems and the response of the control system used in industries. Students also gain the knowledge of mathematical modelling of various control system, which is useful to design a better control system.

Unit 1: Introduction to Control Systems and the Laplace Transform

Introduction, Examples of Control Systems, Closed-Loop Control Versus Open-Loop Control, Design of Control Systems.

Review of Complex Variables and Complex Functions, Laplace Transformation, Laplace Transform Theorems, Inverse Laplace Transformation, Partial-Fraction Expansion with MATLAB, Solving Linear, Time-Invariant, Differential Equations, Example Problems and Solutions

Unit 2: Mathematical Modeling of Dynamic Systems

Introduction, Transfer Function and Impulse-Response Function, Block Diagrams, Modeling in State Space, State-Space Representation of Dynamic Systems, Mechanical Systems, Electrical

Systems, Liquid-Level Systems, Thermal Systems, Linearization of Nonlinear Mathematical Models, Example Problems and Solutions

Unit 3: Transient-Response Analysis

Introduction, First-Order Systems, Second-Order Systems, Transient-Response Analysis with MATLAB, An Example Problem Solved with MATLAB, Example Problems and Solutions, Problems

Unit 4: Basic Control Actions and Response of Control Systems

Introduction, Basic control actions, Effects of integral and derivative control actions on system performance, Higher order systems, Routh's stability criterion, Pneumatic controllers, Hydraulic controllers, Electronic controllers, Phase lead and phase lag in sinusoidal response, Steady state errors in unity feedback control systems, Example problems and solutions

Recommended-Book:

1. "Modern Control Engineering (3rd Edition)" by Katsuhiko Ogata.
   Publication: Prentice-Hall India.

Reference-Book:

1. "Control System Engineering" by Bhattacharya, Pearson Education.
2. "Control Systems: Principles and Design" by Madan Gopal, TMH.
3. "Automatic Control Systems" by Kuo, PHI Publication.
4. "Control Engineering: Theory and Practice" by Bandopadhaya, PHI.
5. "Control System Design" by Goodwin, Salgado, PHI Publication

Paper 18: Fundamental of Computer Hardware

Course outcome:-

After finishing this course students will have ability to:

CO.1: Indicate the names and functions of hardware ports and the parts of the motherboard.

CO.2: Identify the names and distinguishing features of different kinds of input and output devices.

CO.3: Describe how the CPU processes data and instructions and controls the operation of all other devices.

CO.4: Identify the names, distinguishing features, and units for measuring different kinds of memory and storage devices.

Unit 1: The Visible PC and microprocessor

The Visible PC

How the PC Works: Input, Processing, Output, Storage, The Art of the PC Technician
Essential Tools of the Trade and ESD Avoidance: Tools of the Trade, Avoiding Electrostatic Discharge, Results of Electrostatic Discharge, Anti-static Tools
Recognize the Major Components of a PC: CPU, RAM, Motherboard, Case, Power Supply, Floppy Drive, Hard Drive, and CD-ROM Drive
Connectors: DB Connectors, DIN Connectors, Centronics Connectors, RJ Connectors, BNC Connectors, Audio Connectors, USB Connectors, Fire Wire Connectors

All Kinds of Connectors: Sound Cards, Video Cards, Network Cards, Keyboard, Mouse, Modem, Printer, Joystick

Microprocessors

CPU Core Components: The Man in the Box, External Data Bus, Registers, Clock, Back to theExternal Data Bus

Memory: Memory Storage Options, RAM: Random Access Memory, Address Bus

Modern CPUs: Manufacturers, CPU Packages, The Pentium CPU: The Early Years, Pentium Pro, Later Pentium-Class CPUs, Pentium II, Pentium III, Early AMD Athlon CPUs, AMD "Thunderbird" Athlon CPUs, AMD Duron, Intel Pentium 4, AMD Athlon XP

Specialty Processors: Intel Xeon Processors, 64-Bit Processing, Mobile Processors

Installing CPUs: Why Replace a CPU?, Determining the Right CPU, Buying a CPU, Preparing to Install, Inserting a Slot 1/Slot A CPU, Inserting a PGA-Type CPU, Testing Your New CPU, The Art of Cooling, Know Your CPUs, Overclocking

Unit 2: RAM, BIOS and CMOS RAM

DRAM: Organizing DRAM, You Are a Byte Victim!

RAM Sticks, Part I: DIPPs, 30-Pin SIPPs, 30-Pin SIMMs, SIMM Sticks and Parity, Access Speed, RAM Sticks, Part II: 72-Pin SIMMs, Banking, Part I-Filling the Bus, DIMM

Improvements in DRAM Technology: EDO, SDRAM, PC100/133 Standards, ECC, Double Pumping, RDRAM, DDR SDRAM, Banking Part II-Dual-Channel, Architecture, Double-Sided SIMMs/DIMMs

Installing RAM: Do You Need RAM?, Getting the Right RAM, Installing SIMMs, Installing DIMMs and RIMMs, Installing SO DIMMs in Laptops, The RAM Count

Troubleshooting RAM: Testing RAM, MRAM

BIOS and CMOS

The Function of BIOS: Talking of the Keyboard, BIOS and Its Relation to Memory Addressing, All Hardware Needs BIOS

CMOS Setup Utilities: Updating CMOS: The Setup Program, A Quick Tour Through a Typical CMOS Setup Program, And the Rest of the CMOS Settings, Modern CMOS BIOS and Device Drivers: Option ROM, Device Drivers, BIOS, BIOS, Everywhere!

Power-On Self Test (POST): Before and During the Video Test: The Beep Codes, Text Errors, POST Cards, The Boot Process, Boot Configuration

Unit 3: Expansion Bus and motherboard

Expansion Bus

Structure and Function of the Expansion Bus: PC Bus, 16-Bit ISA

System Resources, I/O Addresses, Interrupt Requests, Direct Memory Access (DMA), Memory Addresses

Modern Expansion Bus: False Starts, PCI

Installing Expansion Cards: Step 1: Knowledge, Step 2: Physical Installation, Step3: Assigning Resources to the Card, Step 4: Device Drivers, Step 5: Verify

Troubleshooting Expansion Cards: Device Manager

PCI-X and PCI-Express

Motherboards

How Motherboards Work

Types of Motherboards: AT Motherboards, The Need for a New Form Factor, Enter ATX

Chipset Varieties: Functions, Features, and Expandability
Upgrading and Installing Motherboards: Choosing the Motherboard and Case, Installing the Motherboard, Wires
Troubleshooting Motherboards: Symptoms, Techniques, Options

Unit 4: Power Supplies and floppy drives

Power Supplies
Understanding Electricity
Powering the PC: Securing AC, Supplying DC, Cooling
Troubleshooting Power: When Power Supplies Die, Fuses and Fire, It Glows!, Server Systems and the EPS12V Standard, Active PFC
Floppy Drives
Floppy Drive Basics: Formatting, Types of Disks, Drive Size
Installing Floppy Drives: Inserting Ribbon Cables, Determining Drive Letters, Connectors, Power, CMOS
Floppy Drive Maintenance and Troubleshooting: Repairing Floppy Drives, Other CMOS Options, Radial Misalignment, USB Floppy Drives, USB Flash Memory Drives

Recommended-Book:

1. "PC Hardware" by Michael Meyers, Scott Jernigan. TMH Edition.

Reference-Book:

1. "Troubleshooting, Maintaining and Repairing PCs" by Stephen J. Bigelow, TMH
2. "PC Upgrade and Maintenance Guide", Minasi, BPB publication.
3. "Upgrading and Repairing PCs" by Mueller, PHI
4. "Hardware Bible" by W. L. Rosch, Techmedia Publication.

Paper 19: Advance Instrumentation

Course outcome:-

CO.1: Students would be able to use the various instruments like wave analyser, harmonic distortion measuring instrument, different types of bridges, recorders, transducers. They will be able to make the various measurement setups by learning this course.

Unit 1: WAVE ANALYZERS, HARMONIC DISTORTION AND MEASURING INSTRUMENTS

INTRODUCTION – Basic wave analyzer – Frequency selective wave analyzer –
spectrum analyzer – Heterodyne wave analyzer – harmonic distortion analyzer – spectrum analyzer – digital Fourier analyzer, practical FFT spectrum analysis using a waveform processing software (ss-36)
Output power meter – Field strength meter – strobosane – phase meter – vector impedance meter

(direct reading) – Q meter – LCR Bridge – RX meters – Automatic Bridges – transistor testing – megger – analog PH meter

Unit 2: Bridges and recorders

Wheastone's bridge – Kelvin's bridge – practical Kelvin's Double bridge – bridge controlled circuits – digital readout bridges –capacitance comparison bridge – inductance comparison bridge – Maxwell's bridge – Hay's bridge – Schering's bridge – Wier's bridge wagher's earth connection – resonance bridge – types of defeaters – precautions to be taken when using a bridge

Strip chart recorder – Gahano meter type recorder – Null type recorder circular chart recorder – X-Y recorder – recording – digital date recording objective and requirements of recording data – recorder specification – potentiometric recorder – digital memory waveform recorder – application of strip chart recorder

Unit 3: Transducers and signal conditioning

Electrical transducer – resistive position transducer – strain ganger – resistance thermometer – thermistor – inductive transducer – differential output transducer – LVDT – pressure inductive transducer – capacitive transducer – Load cell – piezo electric transducer – photo electric transducer – photo –voltaic cell – semi conductor photo diode – the photo transistor – temperature transducers – frequency generating transducers – Reluctance pulse pick-ups – Flow measurement – mechanic flow meter – magnetic flow meter – turbine flow meter – measurement of thickness using Beth Gouge

Operational amplifier – basic instrumentation amplifier – Application of instrumentation amplifiers – chopped and modulated DC amplifier – modulators

Unit 4: Measurement set up and measurement of power

Measurement of microwave frequencies – resonant co-axial lines – cavity wavemeters – RF/UHF field strength meter – measurement of sensitivity – measurement of selectivity – intermodulation method of measuring non-linear distortion – measuring frequency response in audio amplifier – modulation – measuring frequency modulation – measuring frequency deviation with a radio receiver – measuring amplitude modulation using CRO

Requirements of dummy local – Bolometer – bolometer method for power measurement – Bolometer element – measurement of power by means of a bolometer bridge – unbalanced Bolometer Bridge – sly balancing Bolometer bridge - measurement of larse amount of RF power – measurement of power on a transmission line – standing wave ratio measurement – measurement of standing wave ratio using directical comp.

Recommended Book

1. Electronic instrumentation

By: H.S.Kalsi, Tata mecrow Hill

Reference Book

1. Electronic instrumentation and measurement

By: Anand,PHI

2. Instrumentation, measurement and analysis
By: Nikrs B C and Chaudhary K.K., TMN

Paper 20: Microprocessor and Microcontroller

Course outcome:-

Students will be able to

CO.1: Know the importance of microcontroller and AVR processors in designing embedded systems.

CO.2: Develop interfacing with real devices.

CO.3: Design microcontroller based system for various applications.

Unit 1:

8085 Microprocessor block diagram and instruction set

Functional Description – Interrupts – Serial Input and Output – Pin Description – Data transfer group – Arithmetic group – Branch group – Logic group – Stack operations, I/O and Machine control instructions

Unit 2:

The AVR Microcontroller: History and Features

Microcontrollers and Embedded Processors – Overview of the AVR Family

AVR Architecture and Assembly Language Programming

The General Purpose Registers In The AVR – The AVR Data Memory – Using Instructions With The Data Memory – AVR Status Register – AVR Data Format And Directives – Introduction To AVR Assembly Programming – Assembling An AVR Program – The program counter and program ROM space in the AVR – RISC architecture in the AVR – Viewing Registers and Memory with AVR studio IDE

Unit 3:

AVR Programming in C

Data types and time delays in C – I/O programming in C – Logic operations in C – Data conversation programs in C – Data serialization in C Memory allocation in C

AVR Hardware connection, Hex file, and Flash Loaders

ATmega32 pin connection – AVR fuse bits – Explaining the Hex file for AVR – AVR programming and trainer board

AVR Timer programming in C

Programming timer 0, 1, and 2 – Counter programming – Programming timer in C

AVR Interrupt programming in C

AVR interrupts – Programming timer interrupts – Programming external hardware interrupts – Interrupt priority in the AVR – Interrupt programming in C

AVR serial port programming in C

Basics of serial communication – Atmega32 connection to RS232 – AVR serial port programming in C – AVR serial port programming in C using interrupts

Unit 4:

LCD and Key-Board Interfacing

LCD interfacing – Key-Board interfacing

ADC, DAC and sensor interfacing

ADC characteristics – ADC programming in the AVR – Sensor interfacing in signal conditioning – DAC interfacing

Relay, Optoisolator and Stepper motor interfacing with AVR

Relay and Optoisolator – Stepper motor interfacing

Recommended Books:

1. 0000 – 8085 Introduction to Microprocessors for Engineers and Scientists
   P. K. Ghosh and P. R. Sridhar
   PHI publication
2. The AVR Microcontroller and Embedded System Using Assembly and C
   Muhammad Ali Mazidi
   Sarmad Naimi
   Sepehr Naimi
   Pearson Publication

Reference Books:

1. "Microprocessor Architecture, Programming and Application with 8085"
   R S Gaonker.
   Whiley Easter ltd. (Unit 3, 4)
2. "Microprocessors: Theory and Application – Intel and Motorola"
   Rafiquzzaman,
   PHI.
3. AVR Programming
   Elliot Williams
   Make publication
4. Programming and customizing the AVR microcontroller
   Dhananjay V. Gadre
   McGrow Hill Publication

Semester: 6

Paper 21: Fiber Optics

Course outcomes:-

After completion of the course, the student is able to

CO.1: Distinguish Step Index, Graded index fibers and compute mode volume.

CO.2: Explain the Transmission Characteristics of fiber and Manufacturing techniques of fiber/cable.

CO.3: Demonstrate an understanding of optical fiber communication link, structure, propagation and transmission properties of an optical fiber.

CO.4: Estimate the losses and analyze the propagation characteristics optical signal in different types of fibers.

UNIT 1

Overview of Optical Communication Systems

This Unit provides an overview of the fiber optical system, and the lightning review of optics will cover the basics of and overview of the distinctive characteristics of the propagation of light in conducting and dielectric waveguides.

UNIT 2

Fiber Material and Fabrication

This unit covers propagation in multimode and single-mode fibers, coupling into and out of fibers, fiber material and various fabrication methods.

Coupling into and out of fibers: Fiber to Fiber Joints, Fiber Splicing, Optical Fiber Connectors**, Fiber material and fabrication:** Various types of Fiber Materials, Various methods of Fiber Fabrication

UNIT 3

Optical Source and Detectors

This Unit covers the physics and technology of light emission and amplification in semiconductors, light-emitting diodes, semiconductor lasers (including both edge-emitting and surface-emitting lasers). Also, covers the physics and technology of the detection and demodulation of light, including photodiodes and APDs.

Optical Source: Review of Semiconducting Physics, Energy Bands, Intrinsic and Extrinsic Material, The pn Junctions, Band-gaps, Light-Emitting Diodes, Modulation capability, Transient response, Semiconductor Losses, **LASER Diodes:** Structure and Threshold conditions, Temperature Effects, Source Linearity and Reliability and Quantum Efficiency, **Optical Detectors**: PIN photo detector, Avalanche photodiode, Noise consideration, Response time, Depletion layer photocurrent, Avalanche multiplication noise, materials used in APDs.

UNIT 4

Optical Fiber Measurements

This Unit covers the various measurement techniques which covers the measurement of Attenuation as well as loss occurred in fiber.

Attenuation Measurement: Cutback method, Optical Time Domain Reflectometer, Fiber fault location, Time Domain Dispersion Measurements, Frequency Domain Measurements. **Refractive Index Profile Measurement:** End reflection technique, Transmitted near field scanning method, Refracted near filed technique, Interferometer of optical source characteristics, Response time, Distortions.

Recommended Book

l. Optical Fiber Communications by Gerd Keiser, McGraw-Hill Publication.

2. Optical Fiber Communications: Principles and Practice by John M. Senior, Pearson Education Publication

Reference Book:

1. Fiber Optic Communication by D. C. Agarwal, S. Chand Publication

2. Fiber Optics and Optoelectronics by R. P. Khare, Oxford Publication.

3. Fiber Optics through Experiments by Shenoy, Khijwania, Ghatak and Pal, Viva Publication.

Paper 22: Advance concepts of Control System

Course outcomes:-

CO.1: Students can learn the concepts of root locus analysis and design, frequency response analysis and design to make better control system for industry.

Unit 1: Root-Locus Analysis & Design

Introduction, Root-Locus plots, Summary of general rules for constructing root loci, Root-Locus plots with MatLab. Special cases, Root-Locus analysis of control systems, Root-Loci for systems with transparent lag, Root-Contour plots, Example problems and solutions
Control Systems Design by the Root-Locus Method: Introduction, Preliminary design considerations, Lead compensation, Lag compensation, Example problems and solutions

Unit 2: Frequency Response Analysis & Design

Introduction, Bode diagrams, Plotting bode diagrams with MatLab, Polar plots, Drawing Nyquist plots with MatLab, Log-Magnitude versus Phase plots, Nyquist stability criterion, Stability Analysis, Relative Stability, Closed loop frequency response, Experimental determination of transfer functions, Example problems and solutions

Unit 3: Control Systems Design by Frequency Response

Introduction, Lead Compensation, lag Compensation, Lag-Lead Compensation, Concluding Comments, Example problems and solutions

Unit 4: PID Controls and Introduction to Robust Control

Introduction, Tuning rules for PID controllers, Modifications of PID control schemes, Two-Degrees-of-Freedom control, Design considerations for robust control, Example problems and solutions

Recommended-Book:

1. "Modern Control Engineering (3rd Edition)" by Katsuhiko Ogata.
Publication: Prentice-Hall India.

Reference-Book:

1. "Industrial Instrumentation and Control" by Singh, TMH
"Control Systems: Theory and Application" by Ghosh, Pearson Education.
2. "Control System Engineering" by Ghosh, Pearson Education.
3. "Industrial Electronics and Control:" by Bishwanath Paul, PHI.

Paper 23: Basic programmable controllers

Course outcome:-

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

CO.1: Program Programmable Logic Controllers

CO.2: Will understand different types of Devices to which PLC input and output modules are connected

CO.3: Identify various types of PLCs applicable to specific process/project.

CO.4: Able to create ladder diagrams from process control descriptions.

CO.5: Use various industrial motor drives for the Industrial Automation.

Unit 1: Ladder diagram fundamentals, the programmable logic controller and fundamental PLC programming.

Basic components and their symbols – fundamentals of ladder diagrams – machine control terminology. A brief history – PLC configurations – system block diagram – update – solve the ladder update – update – solve the ladder. Physical components versus program components – Example problem (lighting control) – internal relays – disagreement circuit – majority circuit – oscillator – Holding contacts—Always ON and always OFF contacts-- ladder diagram having more than one rung.

Unit 2: Advance programming techniques, mnemonic programming code, wiring techniques.

Ladder program execution sequence – Flip flaps – R-S Flip flop – one shot – D flip-flop – T-flip-flop – J-K flip-flop – counters - sequencers – timers – master control relays and control zones. AND ladder rung – entering normally closed contacts – OR ladder rung – simple branches – complex branches.PLC power connection – input wiring – input having a single common – isolated inputs – output wiring – relay outputs –solid state outputs.

Unit 3: Analog I/o, discrete position sensors and encoders, transducer, and advanced sensors.

Analog input – Analog output, Analog data handling – analog input potential problems. Sensor output classification – connecting discrete sensor to PLC inputs – proximity sensors – inductive proximity sensors-- capacitive proximity sensors-- ultrasonic proximity sensors – optical

proximity sensors. Temperature – liquid level – force – pressure/vacuum – flow – inclination – acceleration – angle position sensors – linear displacements.

Unit 4: Closed loop and PID control, motor control and system integrity and safety.

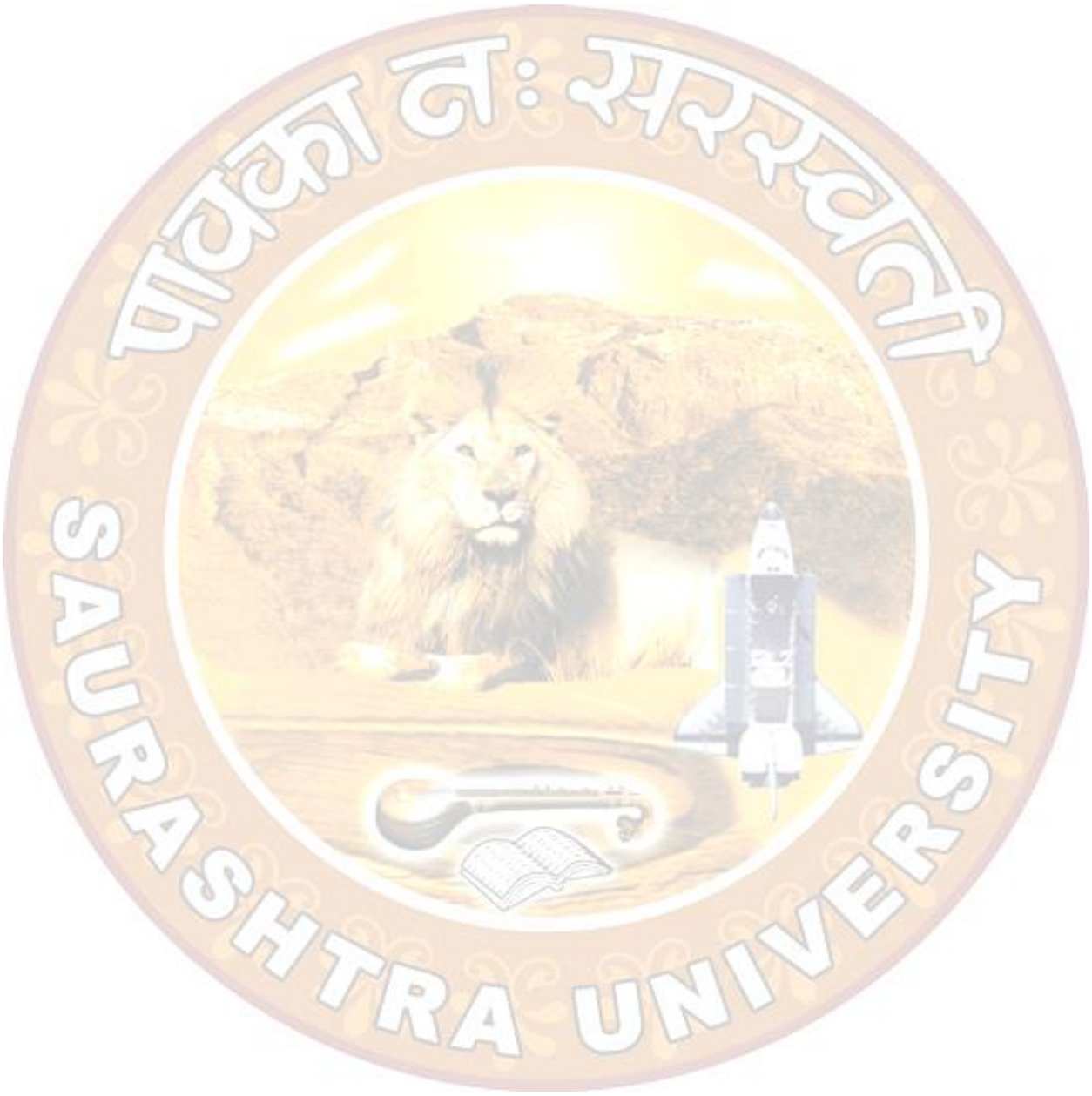
Simple closed loop systems – problems with simple closed loop systems – closed loop systems using proportional, integral and derivative (PID), Derivative function , integral function – The PID in programmable logic controller – tuning the PID – The "adjust and observe" tuning method – The Ziegler – Nichols tuning method – auto tuning PID systems.Ac motor starter – Ac motor overload protection – specifying a motor starter – DC motor controller – variable speed Ac motor drive. System integrity – Equipment temperature considerations – Fail safe wiring and programming –safety interlocks.

Recommended Book:

1. Programmable logic controllers: programming methods and applications
By : John R .Hackworth and Frederick D.Hackworth
Pub : pearson

Reference Book:

1. Programmable logic controllers
By : W.Bolton
Pub : Newnes
2. PLC Programming for industrial automation
By : Kevin collins
Pub : Liskeard,cornwall


पावका नः सरस्वती
SAURASHTRA UNIVERSITY

Paper 24: Computer Aided Designing

Course outcome:-

CO.1: This is demanding field of present scenario, with help of this paper students able to make any type of 3d model in NX software with proper and accurate dimensions. Students also able to make prototype. This will lead to inculcate the entrepreneurship in young minds.

Unit 1: Introduction to NX 10.0, Drawing sketches For Solid Models:

Introduction to NX 10.0 – System Requirements – Getting Started with NX – Important terms and Definitions – Understanding the Functions of the Mouse buttons – Quick access toolbar – Ribbon – Status bar – Hot keys – Color scheme – Dialog boxes in NX – Selecting objects – Deselecting objects – Selecting objects using the quick pick dialog box

Introduction – Starting NX – Starting a New document in NX – Invoking different NX environments – Creating three fixed datum planes (XC-YC, YC-ZC, XC-ZC) – Displaying the WCS (Work coordinate System) – Creating Sketches: Creating Sketches in the modeling environment, Creating Sketches in the Sketching environment – Sketching tools: Drawing Sketches using the Profile tool, Using Help lines to locate points, Drawing individuals lines, Drawing Arcs, Drawing Circles, Drawing Rectangles, Placing Points, Drawing Ellipses or Elliptical Arcs, Drawing Conics, Drawing Studio Splines, Filleting Sketches entities – The Drawing Display Tools: Fitting entities in the current display, Zooming an Area, Panning Drawings, Fitting View to selection, Restoring the original orientation of the Sketching Plane – Setting selection filters in the Sketch in Task environment – Selecting Objects – Deselecting objects – Using Snap Points options While Sketching – Deleting Sketched entities – Exiting the Sketch environment

Unit 2: Adding Geometric and Dimensional Constraints to Sketches, Editing, Extruding and Revolving Sketches, Working with Datum Planes, Coordinate Systems, and Datum Axes:

Constraining Sketches – Concept of constrained Sketches: Under-Constrain, Fully-constrain, Over-constrain – Degree of Freedom Arrows – Dimensioning Sketches: Locking the Automatically applied dimensions, Applying dimensions by using the rapid dimension tool, Applying linear dimensions, Applying Angular dimensions, Applying perimeter dimensions, Editing the dimension value and other parameters, Animating a fully-constrained Sketches – Measuring the distance value between objects in a sketch: Measuring the distance between two objects in a sketch, Measuring the projected distance between two objects, measuring the screen distance between two objects – measuring the length of an Arc or a Line – Measuring the angle between entities: Measuring the Angle value using the by object option, Measuring the Angle value using the by 3 points option, Measuring the Angle value using the by Screen point option – Geometric constraints: Applying additional constraints individually, Applying symmetry constrain, Applying Automatic constraints to a Sketch, Controlling inferred constraints settings, Showing all constraints in a sketch, Showing/ Removing constraints, Converting a sketch entity or dimension into a reference entity or reference dimension

Editing Sketches: Trimming Sketched Entities, Extending Sketched Entities, Creating a Corner between Sketched Entities, Moving Sketched Entities by using the move curve tool, Offsetting Sketched Entities by using Offset Move Curve, Modifying Entities by using the Resize curve

tool, Modifying chamfer in Sketched entities by using resize chamfer curve tool, Deleting Sketched entities by using delete curve tool, Offsetting Sketched entities, Mirroring Sketched entities, Creating a linear sketch pattern, Creating a Circular sketch pattern, Creating a general sketch pattern, Transforming sketched entities, Editing sketched entities by dragging – Exiting the sketch environment – Changing the view of the sketch – Creating base features by extruding: Extrude dialog box options – Creating solid revolved bodies – Copying, moving and rotating objects – Hiding entities – Showing hidden entities – Hiding all entities using a single tool – Rotating the view of a model in 3D space – Setting display modes

Additional Sketching and Reference Planes – Types of Datum Planes: Creating Three Fixed (Principle) Datum Planes, Creating Relative Datum Planes – Creating Datum Coordinate Systems – Creating Fixed and Relative Datum Axes – Other Extrusion Options: Specifying the Boolean Operation, Specifying Other Extrusion Termination Options – Projecting External Elements

Unit 3: Advanced Modeling Tools – I, Advanced Modeling Tools – II:

Advanced Modeling Tools – Creating Holes by using the Hole Tool: Creating General Holes, Creating Drill Size Hole, Creating Screw Clearance Hole, Creating Threaded Hole, Creating Hole Series – Creating Grooves: Creating Rectangular Grooves, Creating Ball End Grooves, Creating U Grooves – Creating Slots: Creating Rectangular Slots, Creating Ball-End Slots, Creating U-Slots, Creating T-Slots, Creating Dove-Tail Slots – Creating Ribs – Creating Chamfers: Creating a Chamfer Feature Using the Symmetric Method, Creating a Chamfer Feature Using the Asymmetric Method, Creating a Chamfer Feature Using the Offset and Angle Method – Creating an Edge Blend

Advanced Modeling Tools – Pattern Feature Tool: Creating a Linear Pattern, Creating a Circular pattern, Creating a Polygon Pattern, Creating a Spiral Pattern, Creating a Pattern Along a Curve, Creating a General Pattern, Creating a Reference Pattern, Creating a Helix Pattern, Creating a Fill Pattern – Mirror Feature Tool – Mirror Face Tool – Mirror Geometry Tool – Sweeping Sketches Along the Guide Curves – Creating Swept Features – Creating Tubes or Cables – Creating Threads: Creating Symbolic Threads, Creating Detailed Threads – Creating Shell Features: Shelling the Entire Solid Body

Unit 4: Editing Features and Advanced Modeling Tools – III, Assembly Modeling – I, Assembly Modelling – II:

Editing Features: Editing a Hole Feature, Editing the Positioning of a Groove Feature, Editing the Positioning of a Slot Feature, Editing the Parameters of Features, Editing the Parameters of Features with Rollback, Editing Sketches of the Sketched-based Features – Reordering Features – Advanced Modeling Tools: Creating Boss Features, Creating Pocket Features, Creating Pad Features, Creating Drafts

The Assembly Environment – Invoking the Assembly Environment: Invoking the Assembly Environment Using the new Dialog Box, Invoking the Assembly Environment in the Current Part File, Types of Assembly Design Approaches – Creating Bottom-up Assemblies: Placing Components in the Assembly Environment, Changing the Reference Set of a Component, Applying Assembly Constraints to Components, Points to remember while Assembling Components, Creating a Pattern Component in an Assembly, Replacing a Component in an Assembly, Moving a Component in an Assembly, Mirroring a Component in an Assembly, Modifying a Component in the Assembly File

The Top-Down Assembly Design Approach: Creating Components using the Top-Down Assembly Design Approach – Creating Subassemblies – Editing Assembly Constraints – Checking the Interference between the Components of an Assembly: Checking Interference using the simple interference tool, Checking Interference between the Assembly Components, Checking Interference and Clearance and Analyzing cross-sections of components using the View-Section Tool – Creating Exploded Views of an Assembly: Exploding Views automatically, Exploding Views Manually

Recommended Book:

1. NX-10.0: For Engineers and Designers, 9th Edition by
   Prof. Sham Tickoo, Purdue University Calumet, USA
   Published by DreamTech Press

Reference Books:

1. Siemens Nx 10 Design Fundamentals
   Jaecheol Koh
   Onsia
2. Parametric modelling with NX 9
   Randi Shih
   SDC Ppublication

Semester: 7

Paper 25: Introduction to MATLAB

Course outcome:-

On successful completion of the course, the students should be able to

CO.1: Understand the need for simulation/implementation for the verification of mathematical functions.

CO.2: Understand the main features of the MATLAB program development environment to enable their usage in the higher learning.

CO.3: Implement simple mathematical functions/equations in numerical computing environment such as MATLAB.

CO.4: Interpret and visualize simple mathematical functions and operations there on using plots/display.

CO.5: Analyze the program for correctness and determine/estimate/predict the output and verify it under simulation environment using MATLAB tools.

Unit 1: Getting started, MATLAB Basic and interacting with MATLAB.

Platforms and versions – Installation and Location – starting MATLAB – Typing in the command window – online help – interrupting calculations – MATLAB windows – Ending a session.

Input and Output – Arithmetic – Algebra – managing variables – Errors in input – online help – variable and assignments – solving equation – vectors and matrices – suppressing output – functions – Graphics.

The MATLAB interface – M-files – Loops – presenting your results – Fine-tuning your M-Files.

Unit 2: Beyond the basics, MATLAB graphics and M-books.

Suppressing output – Data classes – functions and expressions – more about M-files – complex arithmetic – more on matrices – Doing calculations with MATLAB – Default variables

Two-dimensional plots – three dimensional plots – special effects – customizing and manipulating graphics – sound.

Enabling M-books – starting M-books – working with M-books M-books – A warning

Unit 3: MATALAB programming, SIMULINK and GUIs and applications

Branching – more about loops – other programming commands – interfacing with the operating system

Graphical user interface(GUIs) – Illuminating a room – mortgage payments – Monte Carlo simulation – population Dynamics – Linear economic models – linear programming – the 360^0 pendulum

Unit 4: MATLAB and internet, troubleshooting

MATLAB help on the internet – posting MATLAB programs and output – configuring your web browser.
Common problems – the most common mistakes – debugging techniques

Recommended Book

1. A Guide to MATLAB for beginners and experienced users
   By: Brian R.Hunt, Ronald L. Lipsman and Jonathan M.Rosenberg.
   Cambridge University Press

Reference Book

Programming in MATLAB
By: Marc E.Herniter
Books/Cole, Thomson Learning

Paper 26: Automobile and Automotive Electronics

Course outcome:-

CO.1: Student should able to understand basic of steering mechanism, break system, driving mechanism, tyres and wheel terminology, electrical system and basics of suspension system.

CO.2: Student should able to understand basics of servicing of various components and system.

CO.3: Student should able to understand history and basics of automobile and frame chassis and body construction.

Unit 1 : Introduction, chassis frame and body, transmission system :clutch, Gear box

Development of automobile – Classification of automobile – Main parts of automobile – Vehicle assemblies – Specifying an automobile – Concept of various road resistance to the vehicle –Power required for propulation of the vehicle – Power required for acceleration – stability of vehicle on slope – stability of vehicle taking a turn.

Design feature – types of frame – Engine location – comparison of front and rear mounting engine – arrangement of clutch assembly, gear box, propeller shaft with universal joint and live axle – types of automobiles according to drive – types of chasis – pre-requirement of body – Types of bodies and their construction – Vehicle body construction aspects – vehicle body design considerations – Vehicle body construction – Car body construction – material for frame body construction – aerodynamic shape in body profile – ergonomic consideration – Defects in frame and body.

Purpose of a transmission system – automobile clutch – single plate clutch – multiple clutch – multiple clutch - diaphragm clutch –semi centrifugal clutch – centrifugal clutch

– Coue clutch – dog and spline clutch – wet clutch – hydraulic clutch – electromagnetic clutches – calculation of surface area and number of driving and driven plate.

Nature of wear and tear of each component – effect of misalignment and mis-adjustment of components – clutch adjustment – fluid coupling – trouble shooting in clutch system.

Need of gear box – types of gear box, gear ratio – design of gear box – design consideration of gear box – transfer case.

Unit 2 : Auto transmission, propeller shaft, differential final drive and rear axle.

Basic device used in automobile transmission – principle of epicyclic gearing – torque converter – free wheel – overdrive – semi automatic transmission – automatic transmission – continually variable transmission.

Function of the propeller shaft- construction and working- types of propeller shaft – fluid drive and fluid flywheel – universal joint – classification of universal joint – real axle drive – whirling of propeller shaft.

Definition of differential – need of differential – function of the differential – principle of differential – types of gears used in differential – looking differential – limited – slip differential.

Final drive and it's type – final drive classification – function of final drive – construction and working – spiral bevel – hypoid gear – worm and wheel drive – bevel drive adjustment – pre loading of bearing – pinion adjustment – crown wheel adjustment – crown wheel preload – rear axle – rear axle drive – rear axle shaft supporting – rear axle casting – axle breather – oil retention – difference between live rear axle and dead rear axle.

Unit 3 : Front axle , Suspension system, steering system, brakes.

Dead front axle – component of the front axle – stub axle – difference between live rear axle and dead rear axle.

Need of suspension system – types of suspension systems – leaf spring – helical coil spring – air suspension spring – rubber spring – front axle independent suspension – types of front wheel independent suspension – rear axle suspensions – shock absorber – torsion bar – air suspension * sprung and unsprung masses – basic suspension movements.

Steering system – types of steering gears – steering linkages – steering mechanism – wheel geometry - measurement and adjustment of various steering layout – wheel alignment – wheel alignment equipment – wheel alignment and balancing procedure – wheel balancing – steering ratio – under steering and over steering - power assisted steering – center point steering – dynamic wheel alignment and balancing procedure – steering trouble shooting – factors affecting steering system.

Principle of breaking – classification of brakes – requirement of brake – brake efficiency –wheel skidding – weight transfer during braking – type adhesion – mechanical brake, self energization and servo action of brake – hydraulic brake – pneumatic or brake air system – antilock break system – Difference between mechanical and pneumatic brake system - power brake – power assisted brake – braking ratio – diagnosis of faults, adjustment and maintenance of brakes.

Unit 4 : wheel and tyre, battery lighting system, accessories and safety system, automobile garage for maintenance and repair.

Function of wheel – requirements of wheel – types of automobile wheels – wheel designation – types of rims, their construction and working – tyres – types of tyres – difference between redial ply and cross ply types – tyre material – consideration in tread design – tyre section – specification of tyre – tyre wear indication – nitrogen in tyre – factors affecting tyre life – wheel and tyre trouble shooting.

Function of battery – lead acid battery –working methods of rating of battery – capacity or specification of battery – battery efficiency - charging procedure of battery – recharging of battery – battery overcharging and its effects – maintenance of batteries - battery problems – electrical system – starting system – stating system trouble shooting – generation – regulator – alternator – cutout – difference between alternator and dynamo – lighting system – wind screen wiper – wind screen washer – central locking system – power window – vehicle tracking system – seat belt – airbag.

Scope of garage – Equipments for garage – tools for garage – necessity and type of servicing – engine decoking – battery service – repair of automobile component –testing.

* system – hydroelastic suspension -

Recommended Book:

1 Automobile engineering
By: S.D. Ambatkar, Tech-max publication.

Reference Books :

1 Automotive Technology : Electricity and electronics
By: AI Santini
Cengage learning (Indian edition)

2. Body repair technology for 4-wheelers
By: Jamer E.Duffy
Cengage learning (Indian edition)

3. A system approach to automotive technology
By: Jack Erjavec
Cengage learning

Paper 27: Robotics

Course outcome:-

CO.1: Students will demonstrate knowledge of the relationship between mechanical structures of industrial robots and their operational workspace characteristics.

CO.2: Students will demonstrate an ability to apply spatial transformation to obtain forward kinematics equation of robot manipulators.

CO.3: Students will demonstrate an ability to solve inverse kinematics of simple robot manipulators.

CO.4: Students will demonstrate an ability to generate joint trajectory for motion planning.

Unit 1: Introduction to robots, robotic manipulation and basics of kinematics:

Automation-Automation and robots – History of robots – Definition of robotics – artificial intelligence and robotics – Definition of a robot – Robotic manipulators – Robot motion – Representation of robot – Robot anatomy – Robot programming – Classification of robots – Specification of the robot – Notations – Symbols – coordinate transformation Dot and cross products – coordinate frames-rotations – Rotation about an arbitrary axis– Homogeneous coordinates – screen transformations.

Unit 2: Kinematics: Direct and inverse

Introduction – types of robot arm kinematics – Kinematic parameters – Tool/hand/ wrist coordinate system – arm matrix and arm equation – joint type parameters – solutions of the Direct Kinematics problem – computation of arm matrix/CHCTM – Denavit – Hartemberg (D-H) Representation – Direct Kinematics of a two axis planar articulated robot arm (mini Drafter with the scale fixed) – Direct arm kinematic analysis of three axis planar articulated arm(Mini Drafter) – Direct kinematic analysis of a four axis Adept-1 SCARA robot.

Introduction of inverse kinematics – Definition of inverse kinematics – why inverse kinematics is not unique – configuration of tool – Relation between DK and IK
I.K.P. Solutions – tool configuration vector, W- tool configuration of four axis SCARA robot – tool configuration of five axis articulated robot – Inverse Kinematics of: two axis planar articulated robot, three axis planar articulated robot – four axis adept-1 SCARA robot.

Unit 3: Work space analysis and trajectory planning.

Robot work space – work space envelope – work space analysis/work envelope of a four axis adept-1 SCARA robot – work space fixtures

Path and trajectories – Types of robot motions/paths/trajectory – pick and place trajectory – continuous path motion/trajectory – controlled motion path/Trajectary – straight line motion/straight line trajectory – interpolated motion.

Unit 4: Robotics vision and robot task planning:

Introduction to robotic vision – image representation and analysis – template matching – polyhedral objects – shape analysis – segmentation – iterative processing of images – perspective transformation – camera calibration – structured illumination – image compression techniques.

Introduction to robot task planning – task planners – robot programming – uncertainty – robot motion planning techniques – Gross motion planning techniques – CS using rotation – General Voromoi Diagram(GVD) – motion Hevristics – Grasp planning – fine motion planning – compliant motion – Simulation of planner motion – polygon penetration algorithm – a task planning simulation problem.

Recommended Book

1. Fundamental of robotics
   By: T.C.Manjunath
   Nandu Printers and Publishers PVT LTD.

Reference Book

1. Industrial robotics: Technology, programming and applications
   By: Mikell P. Groover, Mitchell Weiss,
   Roger N Nagel and Nicholas G.Odrey Mc
   Grow –Hill international Editions

2. Foundations of robotics: Analysis and control
By: Tsuneo Yoshi Kawg

3. Applied Robotics: An introduction Book I and II By:
Edwin wise
Cengase learning (Indian edition)

4. Fundamentals of robotics: Analysis & control
By: Robert J. Schilliny. Prentice-
Hall of India (EEE)

Paper 28: Electromagnetics

Course outcome:-

CO.1: Inculcating the basic concepts of electromagnetics and all the coordinate systems. Students also able to understand the concepts of the electromagnetic field, vectors and its various mathematical treatments. These all lead to understand the advance electromagnetic field theory.

Unit 1: Vector analysis and mathematical preliminaries:

Vector algebra(vector operations—vector algebra: component form—triple products—position, displacement and separation vectors—how vectors transform)—differential calculus(ordinary derivatives—gradient—the operator ∇ --the divergence—the curl—product rules—second derivatives)—integral calculus(line, surface and volume integrals—the fundamental theorem of calculus—the fundamental theorem for gradients—the fundamental theorem for divergences—the

fundamental theorem for curls—integration by parts)—curvilinear coordinates(spherical polar coordinates—cylindrical coordinates)—the Dirac-Delta function(the divergence of $\hat{\boldsymbol{r}}/r^2$—the one dimensional Dirac-Delta function—the three dimensional Dirac-Delta function)—the theory of vector fields(the Helmholtz fields—potentials)—Decible and Neper concepts—complex numbers—logarithmic series and identities—quadratic equations—cubic equations—determinants—matirces—factorials—permutatins—combinations—basic series—exponential series—sine and cosine series—sinh and cosh series—hyperbolic functions—sine, cosine, tan and cot functions—radian and steradian integral theorems

Unit 2: Electrostatic fields:

Applications of electrostatic fields—different types of charge distributions—Coulomb's low—applications of Coulomb's low—limitation of Coulomb's law—electric strength due to point charge—salient features of electric intensity—electric field due to line charge density—electric field strength due to infinite line charge—field due to surface charge density, ρ_s $(\frac{C}{m^2})$—field due to volume charge density, ρ_v $(\frac{C}{m^3})$—potential—potential at a point—potential difference—salient features of potential difference—potential gradient—salient features of potential gradient—equipotential surface—potential due to electric dipole—electric flux—salient features of electric flux—Faraday's experiment to define flux—electric flux density—salient features of electric flux density, D—Gauss's law and applications—proof of Gauss's law (on arbitrary surface)—Gauss's law in point form—divergence of a vector, electric flux density-applications of Gauss's law—limitations of Gauss's law—salient features of Gauss'a law—Poisson's and Laplace's equations—applications of Poisson's and Laplace's equations—uniqueness theorem—boundary conditions on E and D—proof of boundary conditions—conductors in electric field—properties of conductors—electric current—current densities—equation of continuity—relaxation time (T_r)—relation between current density and volume charge density—dielectric materials in electric field—properties of dielectric materials—dipole moment, P—polarization, P—capacitance of different configurations—energy stored in electrostatic field—energy in a capacitor

Unit 3: Steady magnetic fields:

Applications of magnetostatic fields—fundamental of steady magnetic fields—Faraday's law of induction—magnetic flux density, B (wb/m^2)—Ampere's law for current element or Biot-Savart law—field due to infinitely long current element—field due to a finite current element—Ampere's work law or Ampere's circuit law—Stoke's theorem—force on a moving charge due to electric and magnetic fields—applications of Lorentz force equation—force on a current element in a magnetic field—Ampere's force law—boundary conditions on H and B—scalar magnetic potential—vector magnetic potential—force on a loop or a coil—materials in magnetic fields—magnetism in materials—inductances—standard inductance configurations—energy density in a magnetic field—energy stored
in an inductor—expression for inductance, L, in terms of fundamental parameters—mutual inductance—comparison between electric and magnetic fields/circuits/parameters

Unit 4: Maxwell's equations:

Equation on continuity for time varying fields—Maxwell's equations for time varying fields—meaning of Maxwell's equations—conversion of differential form of Maxwell's equation to integral form—Maxwell's equations for static fields—characteristics of free space—Maxwell's equations for static fields in free space—proof of Maxwell's equations—sinusoidal time varying field—Maxwell's equations in phasor form—influence of medium on the fields—types of media—summary of Maxwell's equations for different cases—conditions at a boundary surface—proof of boundary conditions on E, D, H and B—complete boundary conditions in vector form—time varying potentials—retarded potentials—Maxwell's equations approach to relate potentials, fields and their sources—Helmholtz theorem—Lorentz Gauge condition

Recommended books:

1. Introduction to electrodynamics
   David J. Griffiths
   Prentice-Hall of India
2. Electromagnetic field theory and transmission lines
   G.S.N.Raju
   Pearson

Reference books:

1. Elements of Electromagnetics
   Matthew N. O. Sadiku
   Oxford Publication (3rd edition)
2. Electromagnetic Field Theory Fundamentals
   Bhag Guru
   Cambridge Publication.
3. Electromagnetics Fields
   T.V.S. Arun Murthy
   S.Chand Publications.

Semester: 8

Paper 29: Military applications of electronics and technology

Course outcome:-

CO.1: By learning this paper, students can understand the various electronic defence systems used in military, sensors and their functions used in various weapons, different types of weapon systems, electronic intercept systems.

Unit-1 Electronic Defense

Introduction—Systems in use in the armed forces—the air force—The navy—The army—The main weapon system—The objectives of electronic defense—The organization of electronics defense—Electronic defense systems and their operational objective—Information—Information operation (IO)—Information warfare (IW)—Need for the study of weapon systems

Unit-2 Sensors

Introduction—Radar sensors—Review of electromagnetic signal transmission—The radar equation—Radar equation in the operational environment—Radar techniques—Search radar—Synthetic aperture radar (SAR)—Tracking radars—Airborne radars (Interceptors)—Infrared sensors—Review of radiant energy—Infrared radiation produced by targets of interest—IR range equation—Suppression of background effects—IR systems

Unit-3 Weapon Systems

Introduction—Artillery systems—Firing accuracy—Susceptibility to jamming of an artillery system—Missile systems—Command missiles—Beam-Riding missiles—Semiactive homing missiles—Active homing missiles—Track-Via-Missiles (TVM) systems—Passive IR-Guided missiles—Sea-Skimming missiles—Passive antiradiation missiles—Laser weapon systems—The Laser—The Laser equation—Laser applications—Stealth aircraft—Communications systems—Networks—Types of transmission (Links)—The message—Examples of communications systems—Information operations (IO)—Information cycle: The OODA loop—Information processes and tools—Information contents (on subjects or events)—Parameters defining information value—Information in war operations

Unit-4 Electronic Intercept Systems

Introduction—The equation of a passive system—Radar warning receivers—RWR sensitivity—Electronic support measures—Omnidirectional antennas—Antennas for direction finding—Frequency measurement receiver—Channelized receivers—Direction of arrival (DOA) measurement—Pulsewidth measurement—MOP measurements—Automatic detection—Identification and data processing—Presentation—Problem areas in ESM—Typical characteristics of a Naval ESM system—Range advance factor in the operational environment—Electronic intelligence (ELINT) systems—ELINT sensors—Surveillance network—The ELINT processing center (EWAC)—Advanced passive location techniques—Doppler shift—LBI—PRI shift—Infrared intercept systems—Missile launch warner/missile approach warner—Forward-Looking infrared systems—Communications ESM and communication intelligence—Communications ESM—COMINT

Recommended Book:

1. Introduction to Electronic Defense Systems, 2nd Edition
   Filippo Neri
   New Age International Publishers

Paper 30: ARDUINO: Fundamentals & Practice

Course outcome:-

CO.1: After the completion of the course, the students will be specialized in Embedded System Design using Arduino.

CO.2: Learn how to make prototype using Arduino.

CO.3: Learn the Arduino programming language and IDE.

CO.4: Program the Arduino microcontroller to make the circuits work.

CO.5: Connect the Arduino microcontroller to a serial terminal to understand communication and stand-alone use.

Unit-1

Getting Up and Blinking with the Arduino

Exploring the Arduino Ecosystem—Arduino Functionality—Arduino Boards—Creating Your First program

Digital Inputs, Outputs and Pulse-Width Modulation

Digital Outputs—Wiring Up an LED and Using Breadboards—Programming Digital Outputs—Pulse-Width Modulation with analogWrite()—Reading Digital Inputs—Building a Controllable RGB LED Nightlight

Reading Analog Sensors

Understanding Analog and Digital Signals—Reading Analog Sensors with the Arduino:analogRead()—Using Variable Resistors to Make Your Own Analog Sensors

Using Transistors and Driving Motors

Driving DC Motors—Handling High-Current Inductive Loads—Controlling Motor Speed with PWM—Using an H-Bridge to Control DC Motor Direction—Driving Servo Motors—Building a Sweeping Distance Sensor

Unit-2

Making Sounds

Understanding How Speakers Work—Using tone() to Make Sounds—Understanding the Limitations of the tone() Function—Building a Micro Piano

USB and Serial Communication

Understanding the Arduino's Serial Communication—Capabilities—Listening to the Arduino—Talking to the Arduino—Talking to a Desktop App—Learning Special Tricks with the Arduino Leonanrdo (and Other 32U4-Based Arduinos)

Shift Registers

Understanding Shift Registers—Controlling Light Animations with a Shift Register

The I^2C Bus

History of the I^2C Bus-- I^2C Hardware Design—Communicating with an I^2C Temperature Probe—Combining Shift Registers, Serial Communication, and I^2C Communications

Unit-3

The SPI Bus

Overview of the SPI Bus—SPI Hardware and Communication Design—Comparing SPI to I^2C—Communicating with an SPI Digital Potentiometer—Creating an Audiovisual Display Using SPI Digital Potentiometers

Interfacing with Liquid Crystal Displays

Setting Up the LCD—Using the LiquidCrystal Library to Write to the LCD—Building a Personal Thermostat

Wireless Communication with XBee Radios

Understanding XBee Wireless Communication—Xbee Radios—The XBee Radio Shield and Serial Connections—Configuring Your XBees—Talking with Your Computer Wirelessly—Talking with Another Arduino: Building a Wireless Doorbell

Unit-4

Hardware and Timer Interrupts

Using Hardware Interrupts—Knowing the Tradeoffs Between Polling and Interrupting—Understanding the Arduino's Hardware—Building and Testing a Hardware-Debounced Button Interrupt Circuit—Using Timer Interrupts—Building an Interrupt-Driven Sound Machine

Data Logging with SD Cards

Getting Ready for Data Logging—Interfacing the Arduino with an SD Card—Using a Real-Time Clock—Building an Entrance Logger

Connecting Your Arduino to the Internet

The Web, The Arduino and You—Networking Lingo—Controlling Your Arduino from the Web—Sending Live Data to a Graphing Service

Recommended Book:

1. Exploring ARDUINO, Tools and Techniques for Engineering Wizardry
   By: Jeremy Blum
   John Wiley & Sons, Inc. Publication

Reference Book:

1. Programming Arduino Getting Started with Sketches
   By: Simon Monk
   The McGraw-Hill Companies Publication
2. Arduino Cookbook
   By: Michael Margolis
   O'Reilly Publication
3. Arduino Programming in 24 Hours, Sams Teach Yourself 1st Edition
   By: Richard Blum
   Pearson Publication
4. Learning C for Arduino
   By: Syed Omar Faruk Towaha
   Packt Publication

Paper 31: JAVA: Fundamentals and practice

Course outcome:-

CO.1: An ability to apply knowledge of computing and mathematics appropriate to the discipline.

CO.2: An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution.

CO.3: An ability to design, implement and evaluate a computer-based system, process, component, or program to meet desired needs.

CO.4: An ability to use current techniques, skills, and tools necessary for computing practices.

Unit 1: Overview of Java Language and constants, Variables data type, operation and expressions

Introduction - Simple Java program - More of java - An application with two classes - Java program structure - Java to kens-Java statements - Implementing a Java program - Java Virtual Machine - Command line arguments - programming style

Constant – Variable –Data types – Declaration of Variables – giving values to variables – Scope of Variables – Symbolic constants – Type Casting – getting values of variables – standard default values

Arithmetic operators – Relational operator – Logical operator – Assignment operator – Increment and Decrement operator – Conditional operator – Bitwise operator – Special operator – Arithmetic expression – evaluation of expressions – precedence of arithmetic operator – Type conversion in arithmetic operators – operator precedence and associativity, mathematical functions.

Unit 2: Decision making: branching and looping, classes, objects and methods, Arrays, Strings and vectors.

Decision making with If Statement – Simple If Statement – The If…Else statement – Nesting of If…Else statement – The else If Ladder – The Switch Statement – The ?: operator – The While statement – The Do Statement – The for statement – Jumps in Loops – Labeled loops.

Defining a class – Fields declaration – Method declaration – creating object – Accessing class members – constructers – method overloading – static members – Nesting of methods – Inheritance: Extending a class – overriding methods – Final variables and methods – Find classes – Finalize method – Abstract methods and classes – methods with arrays – Visibility control

One-dimensional arrays – Creating an array – Two-dimensional arrays – strings – vectors – wrappers classes – Enumerated Types – Annotations

Unit 3: Interface : Multiple inheritance; Pacages: putting classes Tosether and multithreaded programming

Java API packages – using system packages – Naming convention – Creating packages – accessing package – using a package – Adding a class to a package – Hiding classes – static import

Defining interface – Extending interfaces – Implementing interfaces – Accessing Interface variables

Creating threads – Extending the thread class – stopping and Blocking a Thread – Life cycle of a thread – Using thread methods – Thread exceptions – Thread priority – synchronization – Implementing the "Runnable" interface

Unit 4: Managing Errors and exception, Applet programming, Grphics programming and managing I/O files in Java.

Types of errors – Exceptions – syntax of exception handling code – Multiple catch statements – using finally statement – Throwing our own Exception – using exceptions for debugging

Local and remote applets – how applets differ from application – preparing to write applets – Building applet code – Applet life cycle – creating an executable applet – Designing a web page – Applet tag – Displaying numerical values – getting input from the user

The graphics class – Liner and Rectangles – circles and Ellipses – Drawing Arcs – Drawing polygons – Line graphs – using control Loops in Applets – Drawing Bar charts.

Concept of streams – stream classes – Using classes – Byte stream classes – Character stream classes – using stream – other useful I/O classes – Using the file class – Input/Output exceptions – creation of files Reading/Writing characters – Reading/Writing bytes – Handing primitive data types – concatenating and Buffering Files – Random Access files – Interactive Input and Output – other stream classes.

Recommended Book

1. Programming with Java – A primer
   By : E. Balaguruswamy
   Third Edition
   Publisher : Mc Grav Hill publishing company Ltd New Delhi

Reference Book

1. The complete Reference - Java
   Second Edition
   By : Herbert Schildt
   Publisher : Tata Mc Grant hill Edition Pvt Ltd. New Delhi

2. The class of JAVA
   By : Pravin M.Jani
   Publisher : Pearson

Paper 32: Advance Electromagnetics

Course outcome:-

CO.1: To provide insight to understand the advance concepts of electromagnetics.

Unit 1: Electromagnetic Fields and Waves

Introduction – Application of EM waves – Wave equation in free space – Wave equation for a conducting medium – uniform plane wave equation – General solution of uniform plane wave equation – Relation between E and H in uniform plane wave – Proof of E and H of EM wave being perpendicular to each other - Wave equation in Phaser form – Wave propagation in lossless medium – propagation characteristics of EM wave in free space - propagation characteristics of EM wave in conducting medium – Summary of propagation characteristics of EM waves in a conducting medium – Conductors and dielectrics – Wave propagation characteristics in good dielectrics – Summary of the propagation characteristics of EM waves in good dielectrics – Wave propagation characteristics in good conductors – Summary of characteristics of wave propagation in good conductors – Depth of penetration- δ(m) – Polarization of wave – Source of Different polarized EM waves – Direction cosines of a vector field – wave on a perfect conductor – normal incidence – Wave on dielectric – Normal incidence – oblique incidence of a plane wave on a boundary plane – oblique incidence of wave on perfect conductor – Oblique incidence of a plane wave on dielectric – Brewster angle – Total internal Reflection – Surface impedance – Poynting vector and flow of power – Complex poynting vector.

Unit 2: Guided waves

Introduction – Wave between parallel plates – Derivation of field equations between parallel plates and propagation parameters – Field components for TE waves ($E_z = 0$) – Field components of TM waves ($H_z = 0$) – Propagation parameters of TE and TM waves – Guide wavelength – Transverse electromagnetic wave (TEM wave) – Velocities of propagations – Attenuation in parallel plate guides – Wave impedances – Wave in rectangular waveguides – Derivation of field equations in rectangular hollow waveguides – Propagation parameters of TE and TM waves in rectangular wave guides – TEM wave does not exist in hollow waveguides – Excitation methods for different TE and TM waves/Modes – Evanescent wave or mode – Wave impedance in wave guide – Power transmitted in a lossless waveguide – Waveguide resonators – Salient features of cavity resonators – Circular waveguides – Salient features of circular waveguides

Unit 3: Transmission Lines

Transmission lines – Types of transmission lines – Applications of transmission lines – Equivalent circuit of a pair of transmission lines – Primary constants – Transmission line equations – Input impedance of a transmission line – Secondary constants – Lossless

transmission lines – Distortion less line – Phase and group velocities – Loading of lines – Input impedance of Lossless transmission line – RF lines – Relation between reflection coefficient- Load and characteristic impedances – Relation between reflection coefficient and voltage standing wave ratio (VSWR) – Lines of different length- $\frac{\lambda}{8} - \frac{\lambda}{4} - \frac{\lambda}{2}$ lines – Losses in transmission lines – Smith chart and applications – Stubs – Double Stubs

Unit 4: Radiation and Antennas

General solution of Maxwell's equations – Expression of E and H in terms of potentials – Retarded potentials – Antenna definitions – Functions of an Antenna – Properties of an Antenna – Antenna parameters – Basic Antenna elements – Radiation mechanism – Radiation fields of an alternating current element (or Oscillating electric dipole) – Radiated power and radiation resistance of a current element – Radiation- induction and electrostatic fields –Hertzian dipole – Different current Distributions in linear antennas – Radiation from half wave dipole – Radiation from quarter wave monopole – Radiation characteristics of dipole.

Recommended Book:

1. Electromagnetic Field Theory and Transmission Lines
G. S. N. Raju
Pearson Education in South Asia

Reference Books:

1. Elements of Electromagnetics
Matthew N. O. Sadiku
Oxford Publication (3rd Edition)
2. Electromagnetic Field theory Fundamentals
Bhag Guru
Cambridge Publication
3. Electromagnetic Fields
T.V.S. Arun Murthy
S. Chand Publications

Semester: 9

Paper 33: LAB-VIEW: an Introduction

Course outcome:-

CO.1: Lab-View software and its vast applications in the field of electronics make students creative to develop various types of data logging applications and devises. Students would be able to make various types of simulation circuits in this software for prototype making.

Unit-1: Graphical System design, Introduction to Labview and modular programming.

Graphical system design model – Design flow with GSD – Virtual instrumentation – Virtual instrument and traditional instrument – Hardware and software in virtual instrumentation – Virtual instrumentation for test, virtual and design – Virtual instrumentation in the engineering process – Virtual instruments -Graphical system design using Labview – Graphical programming and textnal programming.

Advantages of Labview – Software instrument – Creating and -Front panel tool bar – Block diagram toolbar – Palettes –shortcut menus – property dialog boxes – Front panel controls and indicators – Block diagram – Data types –Data flow diagram – Labview documentation resources – Keyboard shortcuts.

Modular programming in Labview – build a VI front panel and block diagram – IWN and connector panel – Creating an IWN – Building a connector panel – Displaying sub Vis and express VIs as icon or expandable modes – creating sub VIs – planning sub VIs on block diagrams – Saving sub VIs – Creating a stand-alone application.

Unit-2: Repetition and loops ,arrays, Clusters and plotting data

For loops – While loops – Structure tunnels – terminals inside or outside loops – Shift registers – feedback nodes – control - Communicating array multiple loops – Local variables – Global variables.

Arrays in Labview – Creating one dimensional array controls, indicators and constants – Creating two dimensional arrays – Creating multidimensional array – Initializing arrays – deleting elements, rows, columns and pages within arrays – Inserting elements, rows, columns and pages into array – Replacing elements, rows, columns and pages within arrays – array functions – Auto indexing – Creating two dimensional arrays using loops – Identification of data structure (scalar and array) using wires – Using auto indexing to set the FOR Loop count – Matrix operations with arrays – Polymorphism.

Creating cluster controls and indicators – creating cluster constant – order of cluster elements – cluster operations – assembling clusters – disassembling clusters – conversion between arrays and clusters – error handling – error cluster

Types of waveforms – waveform graphs – waveform charts – waveform data types – xy graphs – intensity graphs and charts – digital waveform graphs – customizing graphs and charts – customizing graphs – customizing 3D graphs – customizing charts – dynamically formatting waveform graphs – configuring a graph or chart – displaying special planes on the xy graph

Unit-3: Structures, strings and file I/O and instrument control

Case structure – sequence structures – customizing structures – timed structuresd – formula nodes – event structure – LabVIEW MathScript

Creating string controls and indicators – string functions – editing, formatting and parsing strings – formatting strings – configuring string controls and indicators – basics of file I/O – choosing a file I/O format – LabVIEW data directory – file I/OVIs – creating a relative path

GPIB communication – hardware specifications – software architecture – instrument I/O assistant – VISA – instrument drivers – serial port communications – using other interfaces

Unit-4: Data acquisition and motion control

Components of a motion control system – software for configuration, prototyping and development – motion controller – move types – motor amplifiers and drives – motor fundamentals – feedback devices and motion I/O – motion I/O

Recommended Book:

1. Virtual instrumentation using LabVIEW
   By: Jovitha Jerome
   PHI publication EEE edition 2010

Paper 34: Website development using Mysql, PhP and HTML

Course outcome:-

CO.1: Students would be able to make different kinds of websites with interactive and attractive menus and images of relevant products. Students also able to develop informative and good websites, pages etc. by learning this course.

Unit-1: Configuring your installation, creating PHP pages using PHP6 and PHP and MySQL

A brief introduction to Apache, MySqL, PHP and open source – then the Tmp pieces work together – Installing Apache, MySqL and PHP on Windaus – where to go for help and other valuable resources. Overview of PHP structure and syntax – Creating your program – Using HTML to spice up your pages – Using constants and variables to add functionality – Passing variables between pages – Using if/else arguments – Using includes for efficient code – Using functions for efficient code – All about array – While you are here – alternate syntax for PHP – OOP dreams. Overview of MySqL structure and syntax - then PHP fits with MySqL – connectivity to the MySql server – Looking at a ready – Made database – Querying the database – help the tips and suggestions.

Unit-2: Using tables to display data, Form elements :Letting the user work with data

Creating a table – wait a minuet – who's the master? – A lasting relationship. Your first form – Droving the user input – Linking forms together.

Unit-3: Letting the user edit the database , manipulating and creating images with PHP.

Preparing the battle field – Inserting a record in a relational database – deleting a record – editing data in a record.--Working with GD library – Allowing users to upload images – Converting image file types – special effects – Adding captions – Adding water marks and merging images – Creating thumbnails.

Unit-4: Validating user input ,handling and overriding errors.

Users are Users are Users…incorporating validation into the movie site – Forget something? – Un checking for error handling.

Recommended Book

1. Beginning PHP6 , Apache , MySql web development
   By : Timothy boronezyk , Elizabeth Naramure ,Jason Gerner , Yann Le Sconarnel, Jeremy stolz and Michael K . Glass

Reference Book

1. Web Technologies
   By : M . Srinivasan
   Pearson publication
2. Web Technologies
   By : Uttam Roy

Paper 35: Emerging technology: 3D printer

Course outcome:-

CO.1: Students can develop their own physical 3D models using this technology. The study of 3D scanner makes students interactive in case of physical model to virtual model.

Unit 1: 3D printing technologies

History and development of 3D printing, Introduction to 3D Printers, Materials used in different printers, Different types of Extrusion/FDM/FFF printers, General anatomy of FDM printer, Detailed hardware of FDM printer, Types of extruders, Special types of Extrusion printers, Object quality, Limitations of FDM printers

Selective Deposition Lamination (SDL), Ink-jet 3D printing, Stereolithography (SLA), Digital Light Processing (DLP), Electron Beam Melting/Laser Sintering or Laser Melting

Unit 2: Working with 3D printer

3D Modelling, Printer, 3D model and computer interface, Hardware and Software used, Preparing printer, Post Printing Finishing Techniques, Printer Maintenance Guidance

Unit 3: Applications of 3D printer

Crafts and Ornaments, Automobile, Die Making, Thinggivers Community, Architecture, Medical, Food, Drones, Energy

Unit 4: How to make your own FDM 3D printer

DIY kits, Names and identifying the parts used, technical details of stepper motors, timing belts, pulleys, lead screw, build platform, extruder, temperature sensors, frame, petty accessories, tools etc., assembling the parts, testing the printer

Recommended books:

1. The 3D printing handbook: technology, design and applications
   By: Ben Redwood and Filemon Schoffer and Brian Garret
   Publication: 3D Hubs B.V., Netherlands, 2017
2. Designing 3D printers: Essential knowledge
   By: Neil Rosenberg
   Publication: Independently published
   ISBN 1082381861, 9781082381867

Reference books

1. The practical 3D printers: The science and art of 3D printing
   By: Brian Evans, Publication: Technology in Action

Paper 36: Radar and Navigation

Course outcome:-

CO.1: Students would be able to understand the concepts of radar technology used in various applications in the field of communication. Students also understand the concepts of navigation field by learning this technology.

Unit 1 : Antennas for Radar and radio navigational aids – principles of Radar.

Antenna parameters – Current distributions – Half wave dipole – Antennas of length greater than half wave length – Parasitic elements to increase directivity – Folded dipole – Parabolic reflector – Receiving antenna – microwave antenna – horn antenna – antenna as an aperture – one dimension aperture distribution – circular aperture – parabolic reflector antenna – lens antenna – pattern synthesis – Fourier integral synthesis – errors on radiation pattern – Coseant squared antenna pattern – stabilization of antenna as – Design of parabolic reflector radar antennas – radiation pattern of parabolic reflector type antenna – design of parabolic reflector antenna – tolerance of reflectors – phase error due to tolerance and its effect on directivity – Design of feeds of parabolic reflector antennas – different types of feeds – dipole feed – Waveguide feeding method for dipole feed – Cutler dual aperture feed – Waveguide horn feeds – monopulse feeds.

Radar equation – radar frequencies – radar set – radar applications – receiver noise – signal-to-noise ratio – transmitter power – pulse repetition frequency – pulse duration – propagation effects – scanning radars – tracking radar – Lobe switching – conical scan – monopulse tracking – accuracy of radar measurements in presence of noise.

Unit 2 : Radar targets – radar transmitters and receivers.

Radar cross section – back scatter cross section – polarization scattering matrix – complex target – cross section fluctuations – Frequency agility effects on target detection and tracking – Radar cross section measurements – RCS measurements systems – problems in RCS measurements – sensitivity of RCS measurement – Compact range RCS measurements – instrumentation radars for RCS measurements – types of instrumentation radars.

The magnetron oscillator – klystron amplifiers – travelling wave tube amplifier – crossed field amplifiers – modulators – solid state transmitters – Noise figure of a receiver – mixers – displays – duplexers – matched filter receiver – correlation detection – constant false alarm rate receiver – receiver protector and sensitivity time control.

Unit 3 : Modern radars – navigational and remote sensing radars.

Introduction to pulse – Doppler radar – block diagram – Detection of multiple target moving with different velocities – coherent integration – applications – advantages of pulse doppler radar –

introduction to frequency coded radars – block diagrams – discrete frequency waveform coding – side lobe reduction by weighted amplitude of the frequency coded waveform – matched filter realization for pulse compression - Matched filter realization for pulse compression.

Waveform analysis of a linear stepped frequency pulse – application of frequency coded radars – introduction to phase coded radars - phase coding and decoding – block diagram of phase coded cw radar – decoders – cross correlator and tracker – range trackers – comparision of phase code and linear FM pulse compressions – introduction to millimeters wave radars – propagation of millimeters wave radars – military radars – antair- craft weapons systems – missile guidance and seeker systems – beam rider – missile seeker – configurations of missile seeker sensors – FM CW sensor – radiometric sensor – power sources for millimeter wave radars – jamming and anti jamming techniques – electronic counter measures – electronic counter measures – repeater jamming and ECCM.

Airpot radars –meteorlogical radar –airborne radars – doppler navigation - doppler navigation equipment – distance measuring equipment – Navy radar – remote sensing radars – pattern synthesis – phased array – remote sensing of the earth and its atmosphere at microwaves – cw radar – monopules radar imaging – multifunction array radar.

Unit 4 : Aircraft homing system and instrument landing system – satellite navigation – vessel traffic management system.

Switching cardiod homing system – Four course radio range – unidirectional ranges – Tactical air navigation – instrument landing aids – ground controlled approach – Radio altimeter – microwave landing system – advantage of MLS.

Doppler navigation – global positioning system – principles of operation of Gps navigation – Gps segments – Format of Gps navigation message – Gps data sub frame – sources of errors in GPS – differential global positioning system (DGPS).

Recommended book :

Radar system and radio aids to navigation
BY : Dr. A.k. sen and
Dr. A.B. Bhattacharya
Pub : Khanna publisners

Semester: 10

Paper 37: Internet of things

Course outcome:-

CO.1: Students can understand the basic concepts of IoT, Home automation, M2M and system management, IoT design methodology and logical design using python and IoT physical devices and end points and physical servers and cloud offerings. Students also can make their own IoT system by learning this course.

Unit 1: Introduction and domain specific IoTs

Introduction-physical design of IoT-Logical design of IoT-IoT enabling technologies-IoT levels and deployment templates-Home Automation-Cities-environment-Energy-Retail-Logistics-Agriculture-Industry-Health and lifestyle

Unit 2: IoT and M2M and system management with NETCONF-YANG

Introduction-M2M-Difference between IoT and M2M-SDN and NFV for IoT-Need for IoT systems management-Simple Network Management Protocol (SNMP)-Network operator requirements-NETCONF-YANG-IoT systems management with NETCONF-YANG

Unit 3: IoT design methodology and logical design using Python

IoT design methodology-Case study on IoT system for weather monitoring-Motivation for using Python-Installing Python-Python data types and data structures-Control flow-Functions-Modules-Packages-file handling-Date/time operation-Python packages of interest for IoT

Unit 4: IoT physical devices and end points and physical servers and cloud offerings

What is an IoT device? – Exemplary device :Raspberry Pi-About the board-Linus on Raspberry Pi-Raspberry Pi interface-Programming Raspberry Pi with Python-Other IoT devices-Introduction to cloud storage models and communication APIs-WAMP-AutoBahn for IoT-Xively cloud for IoT-Python web application framework-Django-Designing a RESTful web API-Amazon web services for IoT-Skynet IoT messaging platform

Recommended books:

1. Internet of things: A hands-on approach

By: Arshdeep Bahga and Vijay Madisetti
Universities Press, Hyderabad

Reference books

1. Internet of things
   By: Jeeva Jose
   Khanna Publishing, New Delhi

Paper 38: Fundamentals of Drone Technology

Course outcome:-

CO.1: Students learn the basic concepts of drone making and flying technology and the science behind the drone flying, electronics parts like motors, controller board, remote control, GPS technology. After completing this, students can make their own drone.

Unit-1

Things to know before you build a Drone
Drone—Types of motors used for Drones-Radio transmitter and receiver battery—Battery adapters/chargers—Connectors—Some modules to make the drone smarter—Assembling your Drone

Assembling your Drone
Assembling the frame—Connecting the RC receiver and transmitter—Connecting the battery—Binding transmitter to the receiver—Know the aerodynamics needed for flying a drone—Saving your Drone from crashing—Check things before flying—Check the security protocols for flying a Drone outside.

Unit-2

Preparing your Drone for Flying
What is ESp8266—Downloading and installing APM planner of mission planner—Configuring the quadcopter

Building a follow me Drone
What is a follow me drone—Using a smartphone to enable the follow me feature of ArduPilot—Building an Arduino-based follow me Drone—GPS tracker using ESP8266

Building a mission control Drone
Surveying with a Drone—Using Drones and delivery man—Some other tweaks with the flight plan screen.

Unit-3

Building a Drone to take selfies and record videos
Photography drones—Requirements—Assembling the photography Drone—Controlling the camera—Flying and taking shots—Controlling the camera gimbal using ESP8266

Building prototype Drones-Gliding Drones
What is glider—How a glider glides—Let's build our own glider drone

Unit-4

Building prototype Drones-Racing Drones
Racing Drones—Avoiding obstacles using ESP8266

Maintaining and troubleshooting your Drone
Safety of the drone—Be careful about the battery—Storage of the Drone—Carrying a Drone—Before and after flight safety—Respect the law and privacy—Troubleshooting your Drone—Diagnosing problems using logs—Radio control calibration problem.

Recommended Book:

1. Building Smart Drones with ESP8266 and Arduino
   (Build exciting drones by leveraging the capabilities of Arduino and ESP8266)
   By: Syed Omar Faruk Towaha
   Packt, Birmingham-Mumbai

Reference Book:

1. Make: Getting Started with Drones
   (Build and Customize Your Own Quadcopter)
   By: Terry Kilby and Belinda Kilby
   Shroff Publisher & Distributors PVT. LTD.

2. Designing Purpose-Built Drones for Ardupilot Pixhawk 2.1
   By: Ty Audronis
   Packt, Birmingham-Mumbai

Paper 39: Matlab and Simulink for electronics

Course outcome:-

CO.1: Students can understand the fundamentals of Simulink, Basic Electrical engineering applications, Simulation of rectifiers and inverters, and various applications of this Simulink in the field of electronics.

Unit 1: Fundamentals of Simulink

Introduction-commonly used blocks-application:: Bus selector, bus creator, and Scope Blocks and configuration parameters-Data type conversion, constant, and display blocks- Ground, terminator, in-port, and out-port blocks-Gain, product, sum and Unit delay blocks-Mux and Demux blocks-integrator and discrete time integrator blocks-Logical operator and relational operator blocks-switch and saturation blocks:: Application block set:: Power system tool box-Sim mechanics:: User defined functions:: F_{CN} block-MATLAB F_{CN} block-Embedded MATLAB function block-S function block-Level 2 M file S function block-S function builder block-S function examples block-

Unit 2: Basic Electrical engineering applications

Introduction-Elementary definitions-Basic waveforms-Average, RMS and Peak value-Ohm's law-Kirchhoff's law-Independent and dependent DC sources-Series and parallel circuits:: RL series circuit-RC series circuit-series-parallel circuit:: Resonance phenomenon:: Series resonance-parallel resonance:: Network theorems:: superposition theorem-reciprocity theorem-Thevenin's theorem-Norton's theorem-Maximum power transfer theorem:: Apparent, active and reactive powers-Three phase sources and load simulation-Transformers: single phase and three phase

Unit 3: Simulation of rectifiers and inverters

Introduction-performance parameters of rectifier-power electronic switches-uncontrolled rectifies:: Single phase half wave rectifier-single phase full wave rectifier-three phase half wave rectifier-three phase full wave rectifier:: Controlled rectifiers:: Single phase half wave rectifier-single wave full wave rectifier-three phase rectifiers::

Unit 4: Miscellaneous applications

Introduction to communication system-Modulation and demodulation techniques:: Amplitude modulation and demodulation-Frequency modulation and demodulation-Phase modulation and demodulation-Digital modulation techniques:: Introduction to computer science-Applications in computer science:: Animation-artificial intelligence:: Mechanical engineering applications

Recommended books:

1. Matlab and Simulink for engineers
   By: Agam Kumar Tyagi
   Publication: Oxford University Press, New Delhi

Reference Books

1. Matlab and its applications in engineering
   By: Raj Kumar Bansal, Ashok Kumar Goel and Manoj Kumar Sharma
   Publication: Pearson

Paper 40: Microwave Electronics (Elective-1)

Course outcome:-

CO.1: To study generation of microwaves.

CO.2: To study design of microwave integrated circuits.

CO.3: To study basics of waveguide and its components.

Unit 1 : Introduction – Transmission structure and resonators – generation of microwaves by vacuum tubes.

What is microwave – characteristic feature of micro waves – applications of microwaves.

Transmission lines – waveguides – resonators - limitation of conventional tubes – klystron amplifiers – reflex klystron oscillator – magnetron – travelling waveguide tubes(TWT).

Unit 2 : Microwave solid state sources – microwave network representation – microwave measurements.

Bipolar transistors – Field effect transistors – transferred electron oscillators – Avalanche diode oscillators. Kirchhoff's Laws and Maxwell's equation – voltage and currents – waveguide impedance – scattering matrix representation – scattering matrices for some typical networks. Detection of microwaves – microwave power measurement – impedance measurement – measurement of scattering parameters – frequency measurement.

Unit 3 : Passing circuit components – ferrite devices – microwave control and logic components.

Impedance transformers – microwave filter – directional coupler, Ferrite and tensor permeability – wave propagation in a ferrite medium – Faraday rotation in ferrite - isolator – circulators. Faraday rotation switch and modulator – 3-port circulators – resonance absorption in ferriter – YIG resonators. PIN diodes – PIN Diode switches – phase shifters – PIN attenuators, modulator and limiters – logic circuits using transferred electron devices – Logic circuits using GaAs MESFETs.

Unit 4 : Microwave integrated circuits – lumped elements at microwave frequencies – industrial applications.

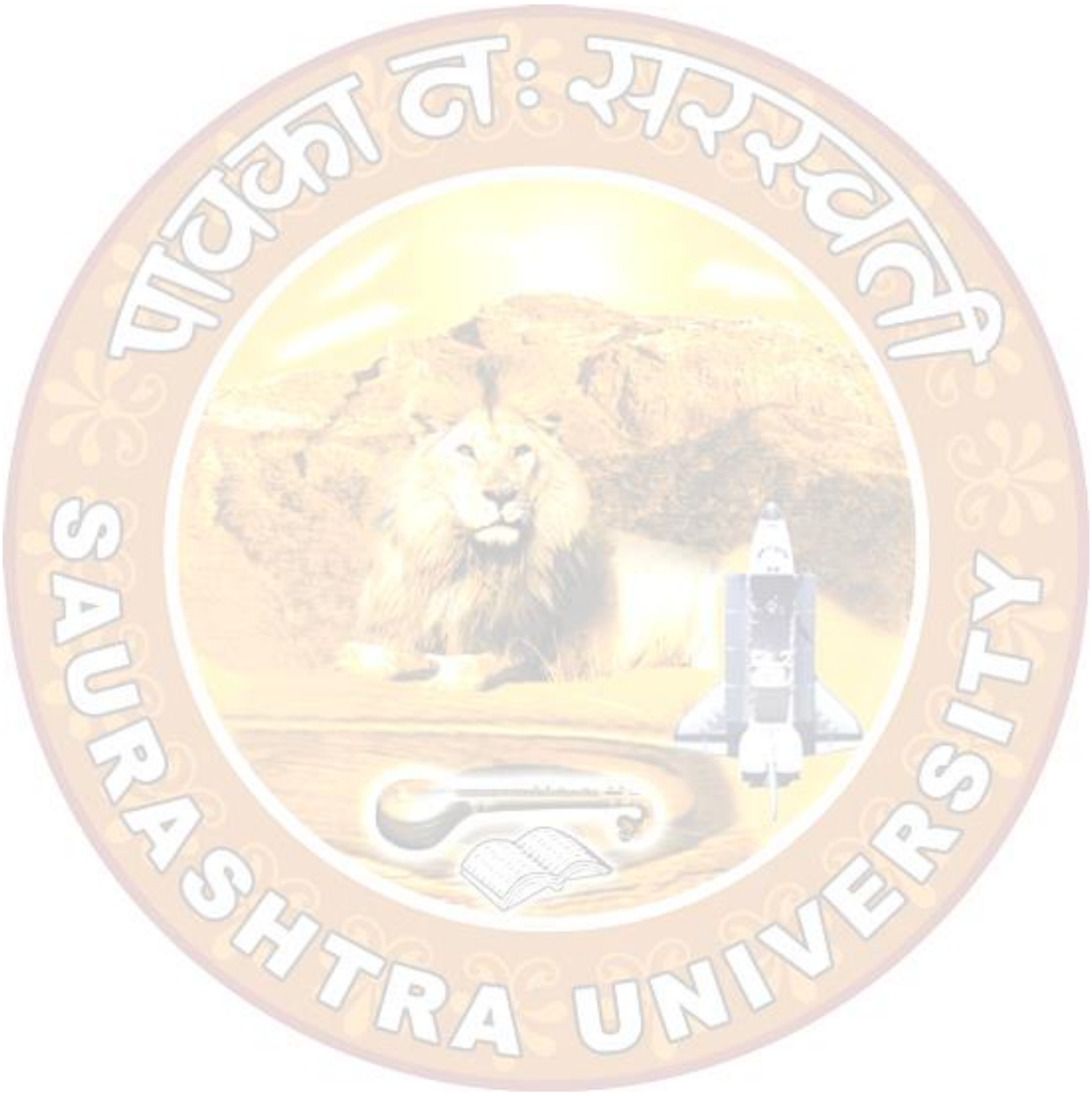
Planar transmission lines – technology of hybrid MICs – advantages of MICs – difficulties with MICs. Design of lumped elements – fabrication of lumped elements – measurements on lumped elements – circuits using lumped element. Industrial control and measurements – Doppler motion sensors – application based on microwave heating.

Recommended Book:

1. Microwaves
   By : K.C. Gupta
   Pub : willey Eastern Ltd.

Reference Book:

1) Microwave devices and circuits
   By: Samud y. Liao Prentice-Hall of India
2) Introduction to microwave theory and measurements
   By: Algie L.Lance, McGraw HillRadio
3) frequency and microwave electronics illustratedBy: Mathew M.Radmanesh, Pearson Education Asia.


पावका नः सरस्वती
SAURASHTRA UNIVERSITY

Paper 40: Fundamentals of Industrial Automation (Elective-2)

Course outcome:-

CO.1: Students can get the knowledge of Basic (fluid) laws and principles, Basic pneumatic and hydraulic system, pumps and compressors, Fluid accessories, cylinders and motors, control valves, Circuits, Pneumatic logic circuits, Fluidics, Transfer devices and feeders.

Unit 1: Basic (fluid) laws and principles, Basic pneumatic and hydraulic system, pumps and compressors

Introduction to fluid power-advantages and disadvantages of fluid power-fluid properties-hydraulics versus pneumatics-advantages and disadvantages of hydraulics-advantages and disadvantages of pneumatics-applications of hydraulics-applications of pneumatics-basic pneumatic system-basic hydraulic system-hydraulic system design-fluids used in hydraulics-rules for working with hydraulics-pumps versus compressors-positive versus non-positive displacement devices-classification of hydraulic pumps-rotary pumps-reciprocating pumps-metering pumps-dynamic/non-positive displacement pumps-pump selection parameters-air compressor-compressor layout-types of air compressors-rotary compressors-reciprocating compressors-dynamic compressors-comparison of different compressors-sizing air compressor-specifications of compressors

Unit 2: Fluid accessories, cylinders and motors, control valves

Pneumatic accessories-hydraulic accessories-cylinders-classification of cylinders on the basis of construction-classification of cylinders on the basis of working medium-other types of cylinders-applications of cylinders-cylinder cushioning-working of cushions-cylinder mountings-cylinder sizing-cylinder specification-seals-introduction to motors-hydraulic and pneumatic motors-classification of fluid motors-important formulae's for sizing of fluid cylinders and motors-classification of valves-direction control valves-flow control valves-pressure control valves-check valve-pneumatic logic valves-servo valves-hydraulic and pneumatic symbols

Unit 3: Circuits, Pneumatic logic circuits, Fluidics

Designation of components in a circuit diagram-pneumatic circuits-hydraulic circuits-control systems-circuit design methods-motion sequence representation-cascade design-problems on circuit design- origin and development of fluidics-Coanda's effect-fluidic devices-fluidic logic devices-fluidic sensors-fluidic amplifier-advantages and disadvantage of fluidics

Unit 4: Transfer devices and feeders

Introduction-fundamentals of production line-types of assemble lines-transfer systems-transfer mechanisms-transfer devices/machines-types of transfer devices-transfer devices used on transfer machines-advantages and disadvantages of transfer machines-feeders-classification of feeders-criteria for material selection of feeder-parts feeding devices-types of feeders

Recommended books:

1. Industrial automation and robotics
   By: A.K. Gupta and S.K. Arora

Laxmi publication (P) Lts.

Paper 40: Digital Signal Processing (Elective-3)

Course outcome:-

CO.1: To provide comprehensive treatment of the important issues in design, implementation and applications of digital signal processing theory and algorithms as well as architectures and design techniques for digital filters.

CO.2: To disseminate basic understanding of signals, Fourier transform and its application.

CO.3: Student can Identify the signals and systems and apply the principles of discrete-time signal analysis to perform various signal operations as well as apply the principles of Fourier transform analysis to describe the frequency characteristics of discrete- time signals and systems. Perform Fourier transform and inverse Fourier transform

CO.4: The students will able to acquire basic knowledge of Laplace and z-transforms and can apply the same for various applications.

CO.5: To disseminate the theory of basic discrete-time signal and system types, convolution sum, impulse and frequency response concepts for linear, time- invariant (LTI) systems, difference equation realization of LTI systems and discrete-time Fourier transform and basic properties of these and make students able to plot and interpret magnitude and phase of LTI system frequency responses.

CO.6: To make students able to design digital filter using various design methods and types.

Unit 1 : Classification of signals and system – Fourier analysis of periodic and aperiodic continuous time signal and systems.

Introduction – classification of signals – singularity function – amplitude and phase spectra – classification of systems – simple manipulations of discrete time signals – representations of systems – analog to digital conversion of signals.

Trigonometric Fourier series – Complex or exponential form of Fourier series – parseval's identity for Fourier series – Power spectrum of a periodic function – Fourier transform – properties of Fourier transform – Fourier transform of some important signals – Fourier transform of power and energy signals.

Unit 2 : Applications of Laplace transform to system analysis – Z-transforms.

Definition – region of convergence (ROC) – Laplace transforms of some important – initial and final value theorem – convolution integral – table of Laplace transforms – partial fraction expansions – network transfer function – s-plane poles and zeros – Laplace transform of periodic function – Application of Laplace transformation in analyzing networks.

Definition of z-transform – properties of z-transform – evaluation of the inverse z transform.

Unit 3 : Linear time invariant systems – discrete and fast Fourier transforms.

Properties of a DSP system – difference equation and its relationship with system function, impulse response and frequency response – Frequency response.

Discrete convolution – Discrete time Fourier transform (DTFT) – Fast Fourier transform(FFT) – computing an inverse DFT by doing a direct DFT – Composite – radix FFT – Fast (sectioned) convolution – correlation.

Unit 4 : Finite impulse response (FIR) filters – infinite impulse response (IIR) filters.

Magnitude response and phase response of digital filters – Frequency response of linear phase FIR filters – Design techniques for FIR filters – design of optimal linear phase FIR filters.

IIR filter design by approximation of derivatives – IIR filter design by Impulse invariant method - IIR filter design by the Bilinear transformation – Butterworth filters – Chebyshev filters inverse Chebyshev filters – elliptic filter – frequency transformation.

Recommended Book:

Digital signal processing
By : S. Salivahanan, A.Vallavaras and C.Gnanapriya

Reference Book:

Digital signal processing : principles, algorithms and applications.
By : John G. Proakis and Dimitris G. Manolakis
Pub : Prentice Hall of India Pvt. Ltd,
New Delhi 2003.