SAURASHTRA UNIVERSITY

RAJKOT

(ACCREDITED GRADE "A" BY NAAC)

FACULTY OF SCIENCE

Syllabus for

MASTER OF SCIENCE IN ELECTRONICS

Choice Based Credit System

With Effect From: 2016-17

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

Master of Science: Two Year (Four Semesters)

Total Credits of the Course: 96

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 TeachingHours	Exam. Hrs.	Course Credits
1.	1	Fundamental of Electronics Technology	70+30=100	28+12=40	15x4=60	2.5	04
2.	2	Foundation of Communication Electronics	70+30=100	28+12=40	15x4=60	2.5	04
3.	3	Electromagnetics	70+30=100	28+12=40	15x4=60	2.5	04
4.	4	Computer Hardware	70+30=100	28+12=40	15x4=60	2.5	04
5.		Practicals*	200	20+20+20+20=80	15x08=120	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	The C Language	70+30=100	28+12=40	15x4=60	2.5	04
2.	6	The advance electromagnetics	70+30=100	28+12=40	15x4=60	2.5	04
3.	7	Digital Communication System	70+30=100	28+12=40	15x4=60	2.5	04
4.	8	Advance Digital Electronics	70+30=100	28+12=40	15x4=60	2.5	04
5.		Practicals*	200	20+20+20+20=80	15x08=120	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	Circuits and Network	70+30=100	28+12=40	15x4=60	2.5	04
2.	10	Control System Analysis	70+30=100	28+12=40	15x4=60	2.5	04
3.	11	Op-Amp and its Applications	70+30=100	28+12=40	15x4=60	2.5	04
4.	12	x86 Microprocessor system	70+30=100	28+12=40	15x4=60	2.5	04
5.		Practicals*	200	20+20+20+20=80	15x08=120	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 TeachingHours	Exam. Hrs.	Course Credits
1.	13	Automation with PLC and SCADA	70+30=100	28+12=40	15x4=60	2.5	04
2.	14	Embedded Programming using AVR	70+30=100	28+12=40	15x4=60	2.5	04
3.	15	Computer Aided Designing	70+30=100	28+12=40	15x4=60	2.5	04
4.	16	Optional 1. VHDL 2. Digital signal Processing 3. Radar and Navigation 4. Microwave Electronics	70+30=100	28+12=40	15x4=60	2.5	04
5.		Practicals*	200	20+20+20+20=80	15x08=120	3x4=12	08

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

Internal	Marks
Assignment	10
Seminar	10
Test	10

Local, Regional, National and Global relevance of the program

Development in electronics discipline has revolutionised the world in the 21st century. No country can afford to lag behind in this race. Since last few decades India also has progressed well in this field through industrial development and manpower creation to lead this field. To contribute the skilled manpower this program has adopted latest content. As and when needed the content of the syllabus is updated periodically. Thus to brace up with the global and national need the syllabus matches well. The student trained through this program have been placed in local industries, regional level industries and national level organisations. Few passed out students have also joined different countries contributing to the global need of the subject.

Program Outcome of M.Sc. (Electronics)

PO.1: Program covers 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: Also purpose is to disseminate understanding and applications of advance digital concepts and control system are aimed as part of training. The courses helpful for the employment in the industries are offered like PLC SCADA, embedded systems, 3D modelling, Radar and navigation, microwave electronics and digital signal processing.

PO.3: Thus the program is designed to get the thorough concepts of electronics and improve the employability of the learners.

Program Specific Outcome of M.Sc. (Electronics)

PSO.1: M.Sc. (Electronics) program has been thought of for specific goals through which the learners are expected to think critically, solve the problems themselves, create their own design and develop the skill useful to be employed directly in the industries.

PSO.2: Core courses like basic communication electronics, operational amplifiers and C-language worked as the basic building block of the program. The advance courses which make the learner employable are specifically included and which are PLC and SCADA, embedded programming, VHDL, 3D modelling software etc.

M.Sc. (Electronics)

Semester – I

Paper: 1- Fundamental of Electronics Technology

Course outcome:-

CO.1: To disseminate foundation of electronics principles and theories.
CO.2: To make students understand working of various passive and active electronic devices and their applications.
CO.3: Understanding fundamentals of digital electronics
CO.4: To learn about electronic measurements .

Unit 1: Basic concepts of circuit analysis:

Circuit fundamental: zero reference level, chassis ground, Ohm's law, formula variations of Ohm's law, graphical representation of Ohm's law, linear resistor, Non-linear resistor, cells in series and parallel--Resistive circuits: series circuit, characteristics of series circuit, the case of zero IRE drop, polarity of IR drops, total power, series aiding and series opposing voltages, proportional voltage formula in a series circuit, series voltage divider, opens in a series circuit, shorts in series circuit, parallel circuits, laws of parallel circuits, special case of equal resistances in all branches, special case of only two branches, any branch resistance, proportional current formula, opens in a parallel circuit, shorts in parallel circuits, series-parallel circuits, opens in series-parallel circuits, shorts in series-parallel circuits, voltage division in a complex series-parallel circuit--Kirchhoff's laws: Kirchhoff's current and voltage laws, determination of algebraic sign, assumed direction of current flow--Network theorems: superposition theorem, ideal constant-voltage source, ideal constant-current source, Thevenin's theorem, How to Thevenize a circuit, Norton's theorem, how to Nortonize a given circuit, maximum power transfer theorem

Unit 2: Basic electronic devices:

Resistors: definition, types, characteristic and color codes—capacitors: definition, types, charging and discharging of capacitor, testing of capacitor and color codes—inductors: definition, types, different parts of inductor, properties of core-need and type of shielding, testing--Diodes: definition, I-V characteristics, types of diodes, biasing of diodes--Transistors: definition, construction of transistor, biasing of transistors, different configuration of transistors, I-V characteristics--UJT: definition, construction of UJT, biasing of UJT, I-V characteristics--FET: definition, construction, biasing, I-V characteristic--SCR: definition, construction, biasing, I-V characteristics

Unit 3: Basic digital electronics:

Number system: Number of systems—the decimal system—binary system—binary-to-decimal conversion—binary fractions—double-dadd method—decimal-to-binary conversion—shifting the place point—binary operations—binary addition—binary subtraction—complement of a number—1's complemental subtraction—2's complemental subtraction—binary multiplication—binary division—shifting a number to left or right—representation of binary numbers as electrical

signals—octal number system—octal-to-decimal conversion—decimal-to-octal conversion—binary-to-octal conversion--octal-to-binary conversion—advantages of octal number system—hexadecimal number system—how to count beyond F in Hex number system—binary-to-hexadecimal conversion—hexadecimal-to-binary
conversion--Logic gates: positive and negative logic—the OR gate—equivalent relay circuit of an OR gate—diode OR gate—transistor OR gate—OR gate symbolizes logic addition—three input OR gate—exclusive OR gate—the AND gate—equivalent relay circuit of an AND gate—diode AND gate—transistor AND gate—AND gate symbolizes logic multiplication—the NOT gate—equivalent circuit of NOT gate—the NOT operation—bubbled gates—The NOR gate—NOR gate is universal gate—the NAND gate—the NAND gate is universal gate—the XNOR gate—logic gates at a glance—adders and subtractors—half adder—full adder—parallel binary adder—half subtractor—full subtractor--Boolean
algebra: unique features of Boolean algebra—laws of Boolean algebra—equivalent switching circuits—De-Morgan's theorems—duals

Unit 4: Electronics instruments:

Analog and digital instruments—functions of instruments—electronics versus electrical instruments—essentials of an electronic instrument—measurement standards—the basic meter movement—characteristics of moving coil meter movement—variations of basic meter movement—converting basic meter to DC ammeter—multi-range meter—measurement of current—converting basic meter to DC voltmeter—multi-range DC voltmeter—loading effect of voltmeter—ohmmeter—the multimeter—rectifier type ac meter—electronic voltmeter—the direct current VTVM—comparison of VOM and VTVM—direct current FET VM—electronic voltmeter for alternating currents—the digital voltmeter—cathode ray oscilloscope(CRO)—cathode ray tube(CRT)—deflection sensitivity of a CRT—normal operation of CRO—triggered and non-triggered scopes—dual trace CRO—dual beam CRO—storage oscilloscope—sampling CRO—digital readout CRO—Lissajous figures—frequency determination with Lissajous figures—applications of a CRO—the Q-meter

Recommended books:

1. Basic electronics: Solid state
   B.L. Thereja
   S. Chand & CO.

Reference books:

1. Electronic devices and circuit theory
   Robert L. Boylestad and Louis Nashelsky, Pearson (Xth edition)
2. Electronics devices and circuits
   J.B. Gupta
   Katson Education series, S.K. Kataria & sons, New Delhi
3. Digital Electronics: Principles & Integrated Circuits by Anil K. Maini
   Wiley India Pvt. Ltd. 1st Edition
4. Fundamentals of digital electronics by Prof. Barry Paton
   Delhousie University March 1998 Edition, National Instruments Corporation

Paper: 2- Foundation of Communication Electronics

Course Outcomes:

CO.1: To make the students understand concept on Communication principles.
CO.2: To introduce students with the essential approaches, fundamental concepts and design issues in communication science and make them understand and design various circuits for communication using Amplitude Modulation like DSBFC, DSBSC, SSB, SSBSC.
CO.3: To imbibe concepts of frequency modulation (FM) and Phase modulation (PM).
CO.4: To familiarize students with various techniques for FM demodulation with the operation of the tuned-circuit FM demodulators like slope detectors, balanced slope detector, Foster-Seeley discriminator and ratio detector.
CO.5: To study various types of receivers like AM, FM and its characteristics.

Unit 1: Amplitude modulation, methods of amplitude modulation, SSB transmission, generation of SSBSC waves :

What is modulation?-- other necessity of modulation—basic methods of analog modulation—Means of message carriers— Major factor affecting modulation—modulation of techniques—An expression and waveforms for AM DSBFC wave—Expression for modulation index for measurement—non-linear AM process—Frequency spectrum in AM wave—vector representation of AM wave—limitations of AM--Linear modulation—Non-linear modulation—Mixer—Basic requirement of AM wave generation—Base modulation: Van Der Bijl modulation—emitter modulation and voltage gain—collector modulation—balanced modulator(DSBFC)—double side band suppress carrier balanced modulator—balanced bridge modulator—balanced ring modulator(balanced lattice modulator)--AM signal spectra—pilot carrier—frequency spectrum—fading and selecting fading—advantages—AM independent sideband (ISB)--Generation of SSB-SC waves—phase shift method/phase discrimination method—third method—comparison of three systems

Unit 2: AM VSB transmission, frequency modulation, phase modulation, generation of FM waves:

A.M. vestigial sideband(VSB) and frequency spectra—SSB-SC transmission of voice frequency—VSB TV signal transmission—comparison of various AM systems—quadrature amplitude modulation—quadrature amplitude demodulation--General FM wave equation—modulation index—deviation ratio(δ)—ideal FM modulator characteristics—frequency spectrum of FM wave—percentage modulation—spectrograms of FM wave—significance of B.W., f_m , and f_d – observations :from Bessel coefficients—Carson's rule for B.W. calculation—B.W. using universal curve method—wideband FM—narrow band FM—comparison between FM and AM method--General expression for phase deviation—standard and equivalent FM method—Bessel function equation for PM wave—carrier behavior in PM method—frequency deviation in PM wave—measurement of frequency deviation and phase deviation--Generation of FM—Armstrong method—pre-emphasis and De-emphasis—comparison of PM and FM

Unit 3: Amplitude demodulators, FM detectors or discriminators, AM transmitters and FM transmitter:

Demodulation-introduction—principle of AM detection—classification of AM—shunt diode detector—square law detector—synchronous detector—principle of demodulation of SSB—VSB demodulator--Amplitude-frequency characteristic or tuned circuit characteristic—principle of an FM demodulator—FM detectors--Transmitter-introduction—general block diagram of transmitter—AM broadcast transmitter—transmitter requirements—modulation techniques—frequency converter—SSB transmitter using Filter method—independent sideband transmitter--FM transmitter block diagram and working of each stage—indirect FM transmitter—FM stereo transmitter

Unit 4: AM receivers, FM receivers, receiver characteristics:

Receivers—tuner—delayed AGC—tone compensated volume control—tuning control—band-spread tuning—diversity reception--Block diagram and working of each stage—SNR and bandwidth of FM—automatic frequency control system—devices employed in RF amplifier—FM broadcasting systems—FM stereo receiver--Sensitivity—selectivity—fidelity—double spotting—image signal—choice of IF—automatic frequency control(AFC)—choice of local oscillator frequency—tracking error—channel selectivity—double superheterodyne receiver—a SSB HF receiver—SSB pilot carrier radio transmitter—SSB pilot carrier radio receiver—independent side band(ISB)—SSB receiver for pilot carrier—independent SB (ISB) receiver—AM receiver using phase locked loop(PLL)

Recommended Books:

1. Fundamentals of basic analog(CW) communication systems
   K.K. Shah
   Dhanpat Rai publishing company
   New Delhi

Reference books:

1. Electronic communication: analog, digital and wireless
   Sanjeeva Gupta
   Khanna publishers, New Delhi
2. Basics of electronic communications
   NIIT
   Prenice-Hall of India, New Delhi
3. Modern digital and analog communication systems
   B.P. Lathi
   Oxford Uinversity press, New Delhi
4. Electronic communication systems
   Blake
   Thomson-Delmar

Paper-3: Electromagnetics

Course Outcome:

CO.1: To make students learn various principles and theorems of electromagnetics.
CO.2: To learn all basic electrostatic theorems and behaviour of electric field in various mediums.
CO.3: To study behaviour of motion of charges in time varying fields into various mediums
CO.4: To make students digest Critical concepts and be ready for problem solving

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)—Decibel 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's 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.

Paper-4: Computer Hardware

Course outcome:

After studying this course, student should be able to:

CO.1: Understand the fundamental hardware components that make up a computer's hardware and the role of each of these components.

CO.2: Understand the difference between an operating system and an application program, and what each is used for in a computer.

CO.3: Student will be able to assemble and/or troubleshoot a personal computer.

CO.4: Understand the capabilities and limits of the personal computer and Operating System.

CO.5: Understand computer architecture at the operating level - including expansion buses, operating speed, and memory addressing capability, address bus, Data bus etc.

Unit 1: The Visible PC and microprocessor

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 the External 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, Step 3: 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, Wires, Wires-
Troubleshooting: Motherboards: Symptoms, Techniques, Options

Unit 4: Hard drive technology, CD and DVD media:

How hard drives work: data encoding—moving the arms—geometry, hard drive interfaces: parallel ATA—serial ATA, BIOS support: configuring CMOS and installing drives: CMOS—device drivers—protecting data with RAID, troubleshooting hard drive installation—partitioning and formatting hard drives: partitioning—formatting, Beyond A^+: spindle (or rotational) speed—S.M.A.R.T.-
CD media: How CD ROM works—CD-ROM formats—CD-ROM speeds—CD-R—CD-RW—music CDs, DVD Media: DVD video—DVD players—DVD ROM—Recordable DVD, Installing CD and DVD media drives: connections—device drivers—device manager—auto insert notification—applications—booting to CD-ROMs, troubleshooting: installing issues—burning issues—firmware updates—color books

Recommended-Book:

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

Reference books:

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.

Semester – II

Paper-5: The C Language

Course outcome:

CO.1: To make students able to develop algorithms, which will help them to create programs, applications in C.

CO.2: Learning basic structure of C program, various components like data types, variables, constants, strings, tokens, conditional statements, loops, arrays, structures, subroutines, memory management, pointers, pre-processor programming, macros etc.

Unit 1

Introduction to C programming

History of C-Importance of C-Sample Program 1: Printing a Message-Sample Program-Adding Two Numbers-Sample Program Interest Calculation-Sample Program-Use of Subroutines-Sample Program-Use of Math Functions-Basic Structure of C Programs-Programming Style-Executing a 'C' Program-Unix System-MsDos System

Constants- Variables- and Data Types

Introduction-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

Operators and Expressions

Introduction-Arithmetic Operators-Relational Operators-Logical Operators-Assignment Operators-Increment and Decrement Operators-Conditional Operator-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 and Output Operations- Decision Making and Branching and looping

Introduction to Managing Input and Output Operations -Reading a Character-Writing a Character-Formatted Input-Formatted Output Introduction to Decision Making and Branching-Decision Making with IF Statement-Simple IF Statement-The IF ..... ELSE Statement-Nesting of IF .... ELSE Statements-The ELSE IF Ladder-The Switch Statement-The ? : Operator-The GOTO Statement-Introduction to loop instruction-The WHILE Statement-The DO Statement-The FOR Statement-Jumps in Loops-Concise Test Expressions

Arrays- Character Arrays and Strings

Introduction to Arrays -One-dimensional Arrays-Declaration of One-dimensional Arrays-Initialization of One-dimensional Arrays-Two-dimensional Arrays-Initializing Two-dimensional Arrays-Multi-Dimensional Arrays-Dynamic Arrays-More about Arrays -Introduction to Character Arrays and Strings-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

Unit 3

User-defined Functions

Introduction-Need for User-defined Functions-A Multi-Function Program-Elements of User-defined Functions-Definition of Functions-Return Values and their Types-Function Calls -Function Declaration-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 Strings to Functions-The Scope- Visibility and Lifetime of Variables Multi-file Programs

Structures and Unions

Introduction-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

Unit 4

Pointers

Introduction-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 Expressions-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 and Structures-Troubles with Pointers

File Management in C- Dynamic Memory Allocation and Linked Lists

Introduction File Management in C -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-Introduction to Dynamic Memory Allocation and Linked Lists- Dynamic Memory Allocation-Allocating a Block of Memory: MALLOC-Allocating Multiple Blocks of Memory: CALLOC-Releasing the Used Space: Free-Altering the Size of a Block: REALLOC-Concepts of Linked Lists-Advantages of Linked Lists-Types of Linked Lists-Pointers Revisited-Creating a Linked List-Inserting an Item-Deleting an Item-Application of Linked Lists

The Pre-processor

Introduction-Macro Substitution-File Inclusion-Compiler Control Directives-ANSI Additions

Recommended Books:

1. Programming in ANSI C by Balagurusamy
Mcgraw Hill publication

Recommended Books:

1. Let us C by Yashawant Kanetkar
BPB publication

2. C- The complete reference by Herbert Schilat
4th edition, Mcgraw Hill pblication

3. Programming in C by Stephen G. Kochan
3rd edition, Pearson publication

4. Schaum's outline of Programming with C by Byron Gottfried, 2nd edition Mcgraw Hill publication

Paper-6: The advance electromagnetics

Course outcome :

CO.1: To disseminate advanced concepts of electromagnetics
CO.2: To make students apply the learned concepts.

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- $\delta(m)$ – 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

Paper-7: Digital Communication System

Course outcome :

CO.1: To introduce students with conventional digital communication.
CO.2: To explain concepts of digital modulation using ASK, FSK, PSK, QAM, and DPSK.
CO.3: Studying digital transmission and multiplexing of PCM encoded signals and comprehensive description of telephone instruments, signals and wireline systems used in the public telephone network.
CO.4: To study telephone instruments and the technology of public telephone exchanges.
CO.5: Learning the concepts of wireless telephone systems, including cellular and PCs.

Unit 1

Digital Modulation

Introduction- Information Capacity- Bits- Bit Rate- Baud- and M-array 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.

Digital Transmission

Introduction- Pulse Modulation- PCM- PCM Sampling- Signal-to-Quantization Noise Ratio- Linear versus Nonlinear PCM Codes- Idle Channel 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-Carriers and Multiplexing

1 Introduction- Time-Division Multiplexing- T1 Digital Carrier- North American Digital Hierarchy- Digital Carrier Line Encoding- T Carrier Systems- 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

Telephone instruments- Signals and Telephone Circuit

Introduction Telephone instruments and Signals- the subscriber Loop- Standard Telephone set- Basic Telephone call procedure- Call Process Tones and Signals- Cordless Telephones- Caller ID- electronic Telephone- Paging System

Unit 3

Telephone Circuit

Introduction to telephone circuit- The local subscriber loop- Telephone message-channel noise and noise weighting- units of power measurement- transmission parameters and private line circuit- voice frequency circuit arrangements- crosstalk

The public Telephone Concept

Introduction- telephone transmission system environment- the public telephone network- instruments- local loops- trunk circuit- and exchanges- local central office telephone exchange-

operator-assisted local exchange- automated central office switches and exchange- north American telephone numbering plan areas- telephone services- north American telephone switching hierarchy- common channel signalling system no. 7 and the postdiverstiture north American switching hierarchy

Unit4

Cellular telephone concepts and systems

Introduction to cellular telephone concept- mobile telephone service- evolution of cellular telephone- cellular telephone- frequency reuse- interference- cell splitting- sectoring- segmentation and dualization- cellular system topology- roaming and handoff- cellular telephone network component- cellular telephone call processing- introduction to cellular telephone systems- first generation analog cellular telephone- personal communication system- second generation cellular telephone system- n-amps- digital cellular telephone- interim standard 95- north American cellular and PCs summary- Global system for mobile communication- Personal satellite communication system-

Recommended Book:

1. Electronics communication systems fundamental through advanced by Wayne Tomasi

Reference Books:

1. Electronic Communications
Dennis Roddy, Joh Coolen 4th edition
Prentice Hall publication

2. Communication Systems: Analog and Digital
Sanjay Sharma
S.K. Kataria and sons (KATSON)

3. Electronics communications: Modulation and Transmission
Robert J. Schoenbeck 2nd edition
Prentice Hall publication

4. Communication Systems
Simon Haykin
Wiley Publication

Paper-8: Advance Digital Electronics

Course outcome :

CO.1: Learning various digital electronic circuits, programmable logic devices, flip flops, multiplexers and de multiplexers, counters and registers. Learners would be able to design different types of digital devises themselves.

CO.2: To give concepts of 8 bit microprocessor programming.

Unit 1

Arithmetic Circuits:

Combinational Circuits- Implementing Combinational Logic- Arithmetic Circuits – Basic Building Blocks- Half-Adder- Full Adder- Half-Subtractor- Full Subtractor- Controlled Inverter- Adder–Subtractor- BCD Adder- Carry Propagation–Look-Ahead Carry Generator- Arithmetic Logic Unit (ALU)- Multipliers- Magnitude Comparator- Cascading Magnitude Comparators- Application- Relevant Information.

Multiplexers and Demultiplexers:

Multiplexer- Inside the Multiplexer- Implementing Boolean Functions with Multiplexers- Multiplexers for Parallel-to-Serial Data Conversion- Cascading Multiplexer Circuits- Encoders- Priority Encoder- Demultiplexers and Decoders- Implementing Boolean Functions with Decoders- Cascading Decoder Circuits- Application- Relevant Information

Unit 2

Programmable Logic Devices

Fixed Logic Versus 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 ROMs- Programmable Logic Array- Programmable Array Logic- PAL Architecture- PAL Numbering System- Generic Array Logic- Complex Programmable Logic Devices- Internal Architecture- Applications- Field-Programmable Gate Arrays- Internal Architecture- Applications- Programmable Interconnect Technologies- Fuse- Floating-Gate Transistor Switch- Static RAM Controlled Programmable Switches- Antifuse- Design and Development of Programmable Logic Hardware-

Flip-Flops and Related Devices:

Multivibrator- Bistable Multivibrator- Schmitt Trigger- Monostable Multivibrator- Astable Multivibrator- Integrated Circuit (IC) Multivibrators- Digital IC-Based Monostable Multivibrator- IC Timer-Based Multivibrators- R-S Flip-Flop- RS Flip-Flop with Active LOW Inputs- R-S Flip-Flop with Active HIGH Inputs- Clocked R-S Flip-Flop- Level-Triggered and Edge-Triggered Flip-Flops- J-K Flip-Flop- 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 3

Counters and Registers:

Ripple (Asynchronous) Counter- Propagation Delay in Ripple Counters- Synchronous Counter- Modulus of a Counter- Binary Ripple Counter – Operational Basics- Binary Ripple Counters with a Modulus of Less than 2N- 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- IEEE/ANSI Symbology for Registers and Counters- Counters- Registers- Application-Relevant Information

Unit 4

Basics of 8085

The 8085 CPU- Functional description- pin description- 8085A timing processes- addressing modes 8085A Instruction Set-Data transfer group- Arithmetic group- Branch group- Logic group- Stack operations- I/O and- machine control instructions.

Memory- interrupt and programming techniques

Looping- Counting and Indexing- Counter and time delays- Stack and subroutines- Code conversion- BCD arithmetic- and 16-bit data operators. The 8085 interrupts- Restart as software instruction- Additional I/O concern and processor. Memory- Bussed architecture- and examples.

Recommended Books:

1. Digital Electronics: Principles and Integrated Circuits by Anil K Maini- Wiley Precise Text Book

2. "0000 to 8085: Introduction to Microprocessor for Engineers and Scientists" by P R Shridhar & P. K. Ghosh. PHI

Reference Books:

1. "Microprocessor Architecture- Programming and Application with 8085" by R S Gaonker. Wiley Easter ltd.

2. Digital Design by M. Moris Mano 3rd edition
PHI publication

3. Digital system principles and Applications by Ronald J. Tocci
Neal S. Wildmer and Gregorg L. Moss 10th edition
Pearson publication

Semester – III

Paper-9: Circuits and Network

Course Outcome :

CO.1: Learning different types of electronic circuits.
CO.2: To make students able to analyse the electronic circuits and solve the complex networks for analytical purpose.

Unit 1: Circuit elements, Kirchhoff's laws and Fundamental Theorems:

Voltage – current - power and energy - the circuit – resistance parameter – inductance parameter – capacitance parameter – energy sources – Kirchhoff's voltage law – voltage division – power in series circuit – Kirchhoff's current law – parallel resistance – current division - power in parallel circuit

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 resonance – 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-10: Control System Analysis

Course outcome

CO.1: To make students learn concept of control, process, its analysis and control strategy
CO.2: To prepare students to learn various control mechanisms and understand their consequences on the process.

Unit 1: Introduction to Control Systems, Mathematical Modeling of Dynamic Systems and Transient-Response Analysis

Introduction, Examples of Control Systems, Closed-Loop Control Versus Open-Loop Control, Design of Control Systems. Review of Complex Variables and Complex Functions
Introduction Mathematical Modeling of Dynamic Systems, Transfer Function and Impulse-Response Function, Block Diagrams, Modeling in State Space, State-Space Representation of Dynamic Systems, Mechanical Systems, Electrical Systems, Introduction Transient-Response Analysis, First-Order Systems, Second-Order Systems.

Unit 2: 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, Electronic controllers, Phase lead and phase lag in sinusoidal response, Steady state errors in unity feedback control systems,

Unit 3: 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

Unit 4: Frequency Response Analysis & Design, Control Systems Design by Frequency Response

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
Introduction, Lead Compensation, lag Compensation, Lag-Lead Compensation, Concluding Comments

Recommended Books:

1. Modern Control Engineering (3rd Edition)
   Katsuhiko Ogata
   Prentice-Hall India
2. Control Systems Engineering

I. J. Nagrath and Madan Gopal
New age international publication.

3. Control System Engineering
   Norman Nise,
   wiley
4. Modern Control Systems
   Richard C Dorf and Robert H Bishop
   Pearson New International Edition

Paper-11: Op-Amp and its Applications

Course outcome:

This course distributed into four units are as below.

CO.1: 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 to 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"
   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-12: x86 Microprocessor system

Course outcome:

CO.1: Making students understand basic architecture of 8086, interfacing of 8086 with memory and peripheral chips involving system design and techniques for programming 8086 microprocessor.
CO.2: To make the students able to write programs for 8086 microprocessor.
CO.3: To inculcate the deep understanding of the microprocessor architecture, its instruction set and hardware interfacing around it.

Unit 1:Introduction to microprocessor and microcomputers

General architecture of microcomputer system, Evolution of the Intel microprocessor architecture.

Software architecture of the 8088 and 8086 micrprocessors

Microarchitecture of the 888/8086 microprocessor, Software model of the 888/8086 microprocessor, Memory Address space and data organization, Data types, Segment Registers and Memory segmentation, Dedicated, Reserve and General-use Memory, Instruction pointer, Data register, Pointer and Indexed register, Status Register, Generating Memory Address, The Stack, Input/Output Address Space

Unit 2
Assembly Language Programming

Software: The microprocessor program, Assembly language program development on the PC, the instruction set, The MOV instruction, Addressing modes

Machine language coding and the debug software development program of the PC

Converting Assembly language instruction to machine code, encoding a complete program in machine code, the PC and its DEBUG program, examining and modifying the contents of memory, Input and output of data, Hexadecimal Addition and subtraction, Loading, verifying, and saving machine language program, assembling instruction with the assembly command, executing instruction and programs with the Trace and GO command, Debugging a Program

Unit 3
8088/8086 instruction and computation

DATA transfer instruction, Arithmetic instructions, Logic instructions, Shift Instructions, Rotate Instructions, Flag control instructions, compare instruction, Control flow and Jump instructions, Subroutine and Subroutine handling instructions, Loops and Loop handling instructions, String and String Handling Instructions.

Assembly language program development

Statement syntax for source program, assembler directive, creating a source file with an editor, assembling and linking program, loading and executing a run module, Macro

Unit 4
Interrupt Processing

Introduction, Hardware and software interrupts, the interrupt vector table, the interrupt processing sequence, multiple interrupts, special interrupts, interrupt service routine, working

with interrupt vectors, Multitasking, Memory management, Using the mouse, Writing a memory resident program.

Advanced Programming Application

The 8088 and 8086 pin configuration and their memory and Input/output interfaces,8088 and 8086 Microprocessor, Minimum and Maximum Mode systems, Minimum Mode interface signals, Maximum Mode interfacing signals, Electrical Characteristics, System clocks, bus cycle and time states, hardware organization of the memory address space, Address bus status codes, Memory control signals, Read and write bus cycles, Memory interface circuits, Programmable logic array, types of input and output, isolated input/output interface, input/output data transfer, input/output instructions, input/output bus cycle.

Recommended Books:

1. The 8088 and 8086 programming, interfacing, software, hardware and application
   walter A. Triebel and Avtar singh
2. The intel microprocessor family: Hardware and software principles and applications
   James l. Antonakos
   Pearson Education

Reference Books:

1. Microprocessors and interfacing: 8086, 8051, and advanced processors
   N. Senthil Kumar, M. Saravanan, S. Jeevananthan and S.K. Shah
   Oxford University press
2. Microprocessors theory and applications: INTEL and MOTOROLA
   M. Rafiquzzaman
   Preitice-Hall of India
   New Delhi
3. The Intel microprocessors 8086/8085, 80186, 80286, 80386 and 80486 Architecture, programming and interfacing
   Barry B. Brey ,
   Prentice-Hall of India
4. Programming the 80286, 80386, 80486 and Pentium based personal computers
   Barry B. Brey,
   Prentice-Hall India

Semester – IV

Paper-13: Automation with PLC and SCADA

Course outcome :

At the end of the course student will be:

CO.1: Able to understand different types of Devices to which PLC input and output modules are connected
CO.2: Able to create ladder diagrams from process control descriptions.
CO.3: Able to use different types PLCs for particular application
CO.4: Able to develop a coil and contact control system and control motor drives for the Industrial Automation.

Unit 1: programmable logic controllers, introduction to ladder logic, file structure and addressing formats:

Introduction – programmable logic controllers – basic operation – PLC architecture and components – programming languages – PLC applications and manufactures
Basic components and their symbols – fundamentals of ladder diagrams – ladder logic functions – Boolean logic and relay logic
Output and input data files (Files O0: and I1) – status files (File S2:) – bit data file(B:) – timer data file (T4:) – counter data file elements (C5:) – control data file (R6:) – integer data file (N7:) – float data file (F8:)

Unit 2: PLC project development, instruction set I and II and PLC applications:

Introduction – software installation – driver configuration – project development – LadSim based instructions
Data handling instructions – comparison instructions – sequencer instructions
Switching ON-OFF lignt – liquid level control – process control – main door control – vehicle parking control bottling plant – drink dispenser -traffic light control

Unit 3: PLC & SCADA interface, SCADA animations:

SCADA software installation – SCADA project development
Animation dialog box – project creation using memory tags – visibility animation – text animation -numeric display and numeric input – string display and string input – fill animation – label – arrow – vertical – slider – horizontal slider – horizontal position animation – vertical position animation – width animation – height animation touch animation

Unit 4: Alarming and data logging, SCADA supplements

Alarming – alarm configuration – alarm setup – alarm startup and display – alarm summary – data logging – event detection – derived tags – macros – key definitions – trends – OLE – security

Recommended book:

1. PLCs & SCADA: theory and practice
   Prof. Rajesh Mehra and Er. Vikrant Vij

Reference books:

1. Programmable logic controllers (3 Edition)
   Frank Petruzella
   Tata McGraw Hill
2. Programmable logic controller (5^{th} Edition)
   W. Bolton
   Elsevier Newnes
3. Programmable logic controllers and industrial automation: an introduction
   Madhuchhanda Mitra and Samarjit Sen Gupta
   Penram international publishing (India) Pvt. Ltd.
   Mumbai
4. Programmable logic controllers: Principles and applications
   John W. Webb and Ronald A. Reis
   Prentice Hall of India
   New Delhi
5. Process control: Automation, instrumentation and SCADA
   IDC Technology
6. SCADA: Supervisory control and data acquisition
   Stuart A. Boyer
   ISA
7. SCADA: Beginner's guide
   Francis G.L.

Paper-14: Embedded Programming using AVR

Course outcome :

CO.1: Understand the architecture, software model and interfacing of AVR microcontroller.
CO.2: Learning programming of AVR microcontroller based systems for various embedded applications.
CO.3: Learning various tools for programming and debugging.

Unit 1: The AVR Microcontroller: History and Features, AVR Architecture, AVR Programming in C, AVR hardware connection, Hex file and Flash Loaders

Microcontrollers and Embedded Processors – Overview of the AVR family
The general purpose registers in the AVR – The AVR data memory – AVR status registers - Data types and time delays in C – I/O programming in C – Logic operations in C – Data conversion programs in C – Data serialization in C – Memory Allocation in C
ATMEGA32 pin connection – AVR fuse bits – Explaining the Hex file for AVR – AVR programming and Trainer board

Unit 2: AVR Timer Programming in C, AVR Interrupt programming in C, AVR Serial port programming in C

Programming Timers 0, 1 and 2 – Counter programming – Programming Timers in C
AVR interrupts – Programming Timer Interrupts – Programming external hardware interrupts – Interrupt priority in the AVR – Interrupt 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 3: LCD and Keyboard interfacing, ADC, DAC and Sensor interfacing, Relay, Optoisolator and Stepper motor interfacing with AVR

LCD interfacing – Keyboard interfacing
ADC characteristics – ADC programming in the AVR – Sensor interfacing and signal conditioning – DAC interfacing
Relays and Optoisolators – Stepper motor interfacing

Unit 4: PWM programming and DC motor control in AVR, SPI protocol and MAX7221 display interfacing, I2C protocol

DC motor interfacing and PWM – PWM modes in 8-bit Timers – PWM modes in Timer 1 – DC motor control using PWM
SPI bus protocol – SPI programming in AVR – MAX7221 interfacing and programming
I2C bus protocol – TWI (I2C) in the AVR

Recommended Book:

1. The avr microcontroller and Embedded system using assembly and c.
Muhammad ali mazidi, Sharmad Naimi, and Sepehr Naimi
PEARSON(www.pearsonhighered.com)

Reference Book:

1. Embedded c programming and the Atmel AVR, 2nd Edition
Richard H. Barnett, Sarah cox, Larry O'Cull.

Cengage publication
2. Programming and interfacing Atmel's AVR.
Kevin Schults, Thomas G. Grace
Cengage Learning

Paper-15: Computer Aided Designing

Course outcome:

CO.1: To train to the students to develop the different kinds of 3D models using Siemens software NX 1.

CO.2: To disseminate fundamental knowledge required for creation of such models.

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

Paper-16: Optional

1. VHDL

Course outcome :

CO.1: Learning the concepts of Verilog Hardware Description Language
CO.2: To make students would be able to program FPGA and CPLD ICs for numerous types of applications of embedded system world.

Unit1: Introduction code structure and data type:

About VHDL, design flow, EDA tools, translation of VHDL code into a circuit, design Example fundamental VHDL units, LIBRARY declarations, ENTITY, ARCHITECTURE, introductory example, pre-defined data type, user data type, subtypes, arrays, port arrays, records, signed and unsigned data type, data conversion

Unit2: Operators, attributes, concurrent code and sequential code:

Operators, attributes, user defined attribute, operators over loading, GENERIC, concurrent versus sequential, using operators, WHEN(simple and selected),GENERATE, BLOCK, PROCESS, SIGNALS AND VARIABLES,IF, WAIT,CASE,LOOP,CASE VERSUS IF,CASE VERSUS WHEN bad clocking, using sequential code to design combinational circuits

Unit3: signal, variable, state machines, additional circuit design:

CONSTANT, SIGNAL, VARIABLE, SIGNAL VERSUS VARIABLE, number of registers, design style #1, Design style #2(stored output), encoding style: from binary to onet, barrel shifter, signed and unsigned comparators, carry ripple and carry look ahead adders, fixed point division, vending-machine, controller, serial data receiver, parallel to serial converter, playing with a seven segment display, signal generator, memory design

Unit4: packages, components, function, procedure, and additional system Design:

PACKAGE, COMPONENT, PORT MAP, GENERIC MAP, FUNCTIO, FUNCTION LOCATION, PROCEDURE, procedure location, function versus procedure summary, assert, serial parallel multiplier, parallel multiplier, multiply-accumulate circuit, digital filters, nenral networks

Recommended Book:

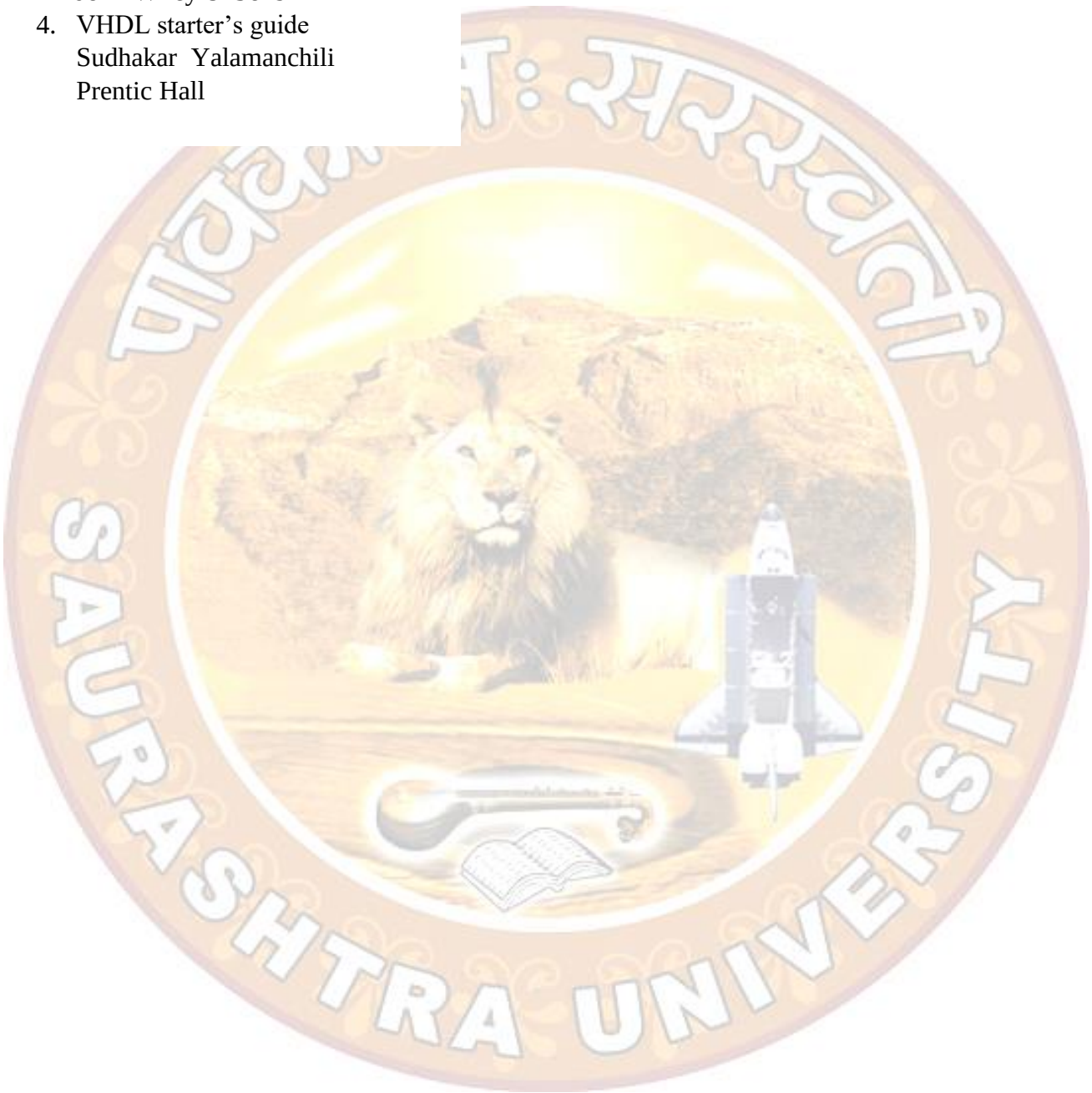
1. CIRCUIT DESIGN WITH VHDL
   Volnei A. Pedroni,
   MIT press combridge
   Massachusetts londen

R**eference Books:**

1. VHDL
   Douglas L. Perry

McGrow Hill
2. VHDL for designer
Stefan Sjoholm & Lennart Lindh

3. VHDL for logic synthesis
Androw Rustoton
John Wiley & Sons
4. VHDL starter's guide
Sudhakar Yalamanchili
Prentic Hall



2. Digital signal Processing

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:

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

Reference Book :

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

3. Radar and Navigation

Course outcome :

After studying this course, student should be able to:

CO.1: Acquire knowledge in the topic such as fundamental of RADAR.
CO.2: To become familiar with fundamentals of different types of RADAR.
CO.3: To gain in depth knowledge about the different types of RADAR and their operation.
CO.4: Understand signal detection in RADAR and various detection techniques.
CO.5: Understand navigational aids and modern Navigation.

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:

1. Radar system and radio aids to navigation
   Dr. A.K. Sen and Dr. A.B. Bhattacharya
   Khanna publishers

Reference books:

1. Fundamentals of Radar, Sonar and navigation Engineering (With guidance)
   K K Sharma
   Katson publication
2. Radar and Electronic navigation
   Gerrit Jacobus Sonnenberg
   Butterworth publication
3. Radar Systems – A comprehensive approach
   V S Bhagad
   Technical Publication

4. Microwave Electronics

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 l: Characteristics features, applications and generation of microwave

Introduction, definition of microwave, characteristic features, application of microwave
Generation of microwave by vacuum tube - limitation of conventional tubes klystron amplifier-reflex
klystron oscillator, magnetrons-traveling wave tubes

UNIT 2: Generation of microwave by solid state devices

Generation of microwave by solid state devices, bipolar transistor field effect transistors, gunn oscillator, avalanche diode, oscillator, IMPATT & TRPATT mode of operation parametric amplifiers.

UNIT 3: Microwave integrated circuit design

Microwave integrated circuit design, introduction, hybrid microwave integrated circuits (HMIC),
monolithic microwave integrated circuit (MMIC), MIC materials, substrate material, conductor material, dielectric materials, resistive films, types of mics, microwave monolithic integrated circuits
(MMIC'S).

UNIT 4: Wave guide, wave guide components and microwave measurement techniques

Waveguide and waveguide component, concept of waveguide, advantage of hollow wave guide, reflection from a metal surface, field pattern obtained by oblique reflection, higher order modes, waveguide dimensions, impedance matching elements, waveguide short circuit, tees and magic tee, phase shiftless, attenuators, matched terminators, waveguide slotted section, PIN diodes, PIN diode, switches, Microwave measurement techniques, standing wave measurements, impedance measurement, cavity resonator, cavity σ. frequency measurements and calibration techniques, dielectric measurements.

Recommended Books:

l. Microwave Devices And Circuits
S. Y. Liao, Phi

2. Introduction To Microwave Theory And Measurments
L.A. Lance Tmh

3. Radio Frequecy And Microwave Electronics
M.M. Radmanesh Pearson