SYLLABUS FOR

M.Sc. (ELECTRONICS)

(Effective from June 2016)

DEPARTMENT OF ELECTRONICS

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M.Sc. (Electronics) Semester III

Paper 9: Circuits and Networks

Pape 10: Control system Analysis

Paper 11: OpAmp and its applications

Paper 12: 8086 Microprocessor

M.Sc.(Electronics) SEMESTER IV

Paper 13: Automation with PLC and SCADA

Paper 14: Embedded programming using AVR

Paper 15: Computer aided designing

Paper 16: Optional:

1. VHDL
2. Digital Signal Processing
3. RADAR and Navigation
4. Microwave electronics

SEMESTER III

Paper 9: Circuits and networks

Credit: 04

Total Marks: 100 (70 External+30 Internal)

Total Hours requires: 60 Hrs.

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 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- LipikaDatta 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

Credit: 04

Total Marks: 100 (70 External+30 Internal)

Total Hours requires: 60 Hrs.

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: OpAmp and its applications

Credit: 04

Total Marks: 100 (70 External+30 Internal)

Total Hours requires: 60 Hrs.

Unit1: IntroductiontoOperationalAmplifiers:
Introduction,TheOperationalAmplifier,Block Diagram Representation of a Typical Op-Amp, Analysis Of Typical Op-Amp Equivalent Circuit,SchematicSymbol,IntegratedCircuits,TypesofIntegratedCircuits,Manufacturers' Designationsfor Integrated Circuits,DevelopmentofIntegratedCircuits,IntegratedCircuit PackageTypes,PinIdentification, andTemperatureRanges,OrderingInformation,Device Identification,PowerSuppliesforIntegratedCircuits.Introduction,InterpretingaTypicalSet ofDataSheets,TheIdealOp-Amp,EquivalentCircuitofanOp-Amp,IdealVoltageTransfer Curve, Open-Loop Op-Amp Configuration, PSpiceSimulation, Introduction, Input Offset Voltage,InputBasicCurrent,InputOffsetCurrent,TotalOutputOffsetVoltage,Thermal Drift,EffectofVariationinPowerSupplyVoltagesonOffsetVoltage,ChangeinInputOffset VoltageandInputOffsetCurrentwithtime,OtherTemperatureandsupplyVoltageSensitive Parameters,Noise,Common-ModeConfiguration and Common-ModeRejection Ratio.

Unit2: An Op-Amp with negative Feedback and Frequency Response of an Op-Amp:
Introduction, BlockDiagram Representation of Feedback Configurations, Voltage-Series Feedback Amplifier, Voltage Shunt Feedback Amplifier, Differential Amplifiers, PSPICE Simulation.
Introduction, Frequency Response, Compensating Networks,FrequencyResponseofInternallyCompensatedOp-Amps,FrequencyResponseof Non-compensatedOp-Amps,HighFrequencyop-AmpEquivalentCircuit,OpenLoopVoltage GainasaFunctionofFrequency,Closed Loop FrequencyResponse,CircuitStability,Slew Rate

Unit3: GeneralLinearApplications, ActiveFilters andOscillators:
Introduction,DCandACAmplifiers,ACAmplifierswitha SingleSupplyVoltage,ThePeakingAmplifier,Summing,Scaling,andAveragingAmplifier, Instrumental Amplifier, Differential Input and Differential Output Amplifier, Voltage to CurrentConvertorwith Floating Load,VoltagetoCurrentConvertorwithGroundedLoad, Current to Voltage Convertor, Very High Input Impedance Circuit, The Integrator, The Differentiator, PSpiceSimulation.
Introduction, Active Filters,First-OrderLow-Pass Butterworth Filter,Second-OrderLowPassButterworthFilter,First-OrderHighPassButterworthFilter, SecondOrder HighPassButterworthFilter,HigherOrderFilters,Band-PassFilters,Band- RejectFilters,All-PassFilters, Oscillators,PhaseShiftoscillator,WienBridgeOscillator, QuadratureOscillator,SquareWaveGenerator, TriangularWaveGenerator,SawtoothWave Generator, VoltageControlled Oscillator, PSpiceSimulation.

Unit 4: Comparators, Convertors and Specialized IC Applications:
Introduction, Basic Comparator,Zero-Crossing Detector,SchmittTrigger,Comparator Characteristics,Limitations ofOp-Ampas Comparator,VoltageLimiters,HighSpeedandPrecisionTypeComparators, WindowDetector,Voltageto FrequencyandFrequencytoVoltageConvertors,Analogto DigitalandDigitaltoAnalogConvertors, ClippersandClampers,AbsoluteValueOutput Circuit,PeakDetector,SampleAndHoldCircuit,PSpiceSimulation.UniversalActiveFilters,

SwitchedcapacitorFilter,The555Timer,PhaseLockedloops,Power Amplifiers,Voltage Regulators, PSpiceSimulation.

Recommended-Book:

1. "Op-Amps andLinearIntegrated Circuits"
   Gayakwad,
   Pearson Education.

Reference-Book:

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

Paper 12: 8086 Microprocessor

Credit: 04

Total Marks: 100 (70 External+30 Internal)

Total Hours requires: 60 Hrs.

Unit 1: Introduction to microprocessor and microcomputers, Software architecture of the 8088 and 8086 microprocessors

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

Microarchitecture of the 8088/8086 microprocessor, Software model of the 8088/8086 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, Machine language coding and the debug software development program of the PC

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

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

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.

Unit 3: 8088/8086 instruction and computation, 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

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.

Unit 4: Interrupt Processing, 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 Avtarsingh
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

Credit: 04

Total Marks: 100 (70 External+30 Internal)

Total Hours requires: 60 Hrs.

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

Alarmin – 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
   MadhuchhandaMitra 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

Credit: 04

Total Marks: 100 (70 External+30 Internal)

Total Hours requires: 60 Hrs.

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 alimazidi, SharmadNaimi, and SepehrNaimi
   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

Credit: 04

Total Marks: 100 (70 External+30 Internal)

Total Hours requires: 60 Hrs.

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 paper 1: VHDL

Credit: 04

Total Marks: 100 (70 External+30 Internal)

Total Hours requires: 60 Hrs.

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
3. Stefan Sjoholm & Lennart Lindh VHDL for logic synthesis
   AndrowRustoton
   John Wiley & Sons
4. VHDL starter's guide
   Sudhakar Yalamanchili(Prentic Hall)

Paper 16: Optional paper 2: Digital signal processing

Credit: 04

Total Marks: 100 (70 External+30 Internal)

Total Hours requires: 60 Hrs.

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)

Paper 16: Optional paper 3: RADAR and navigation

Credit: 04

Total Marks: 100 (70 External+30 Internal)

Total Hours requires: 60 Hrs.

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

Paper 16: Optional paper 4: Microwave electronics

Credit: 04

Total Marks: 100 (70 External+30 Internal)

Total Hours requires: 60 Hrs.

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 klytron 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 measurments.

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