SCHEME & SYLLABUS

M.Sc. Electronics & Communication

BATCH 2021-2023

SCHOOL OF ELECTRONICS

(UNIVERSITY TEACHING DEPARTMENT)
DEVI AHILYA VISHWAVIDYALAYA,
TAKSHASHILA CAMPUS,
KHANDWA ROAD, INDORE-452001 (M. P.)

School of Electronics, Devi Ahilya University, Indore

M.Sc. Electronics & Communication, Batch 2021-23 (Scheme)

Semester I — 32 Credits

Sr. No.	Course Code	Course Name	Lecture (L) Hr	Tutorial (T) Hr	Practical (P) Hr	Credit
1	EL51101	Signals and Systems-Continuous	3	1	--	4
2	EL51102	Electromagnetic Theory	3	1	--	4
3	EL51103	C Programming	3	1	--	4
4	EL51104	Devices and Circuit Theory	3	1	--	4
5	EL51105	Digital Design	3	1	--	4
6	EL51203	C Programming Lab	0	0	4	2
7	EL51204/05	Devices and Circuit Lab/ Digital Design Lab	0	0	4+4	2+2
8	EL51301	Seminar	0	0	--	2
9	EL51401	Comprehensive Viva-Voce	--	--	--	4

Semester II — 32Credits

Sr. No.	Course Code	Course Name	Lecture (L) Hr	Tutorial (T) Hr	Practical (P) Hr	Credit
1	EL52101	Microprocessor & Interfacing	3	1	--	4
2	EL52102	Analog Communication Systems	3	1	--	4
3	EL52103	Computer Networks	3	1	--	4
4	EL52104	Signals and Systems-Discrete	3	1	--	4
5	EL52105	JAVA Programming	3	1	--	4
6	EL52202	Microprocessor & Interfacing Lab	0	0	4	2
6	EL52204/02	MATLAB Lab /Analog Comm. Lab	0	0	4+4	2+2
7	EL52205/	JAVA Programming Lab	0	0	4	2
8	EL52401	Comprehensive Viva-Voce	--	--	--	4

Semester III — 30 Credits

Sr. No.	Course Code	Course Name	Lecture (L) Hr	Tutorial (T) Hr	Practical (P) Hr	Credit
1	EL53101	Control Systems	3	1	--	4
2	EL53102	Microwave Communication	3	1	--	4
3	EL53103	Microcontroller & Interfacing	3	1	--	4
4	EL53104	Wireless Communication.	3	1	--	4
5	EL53105	VHDL	3	1	--	4
6	EL53204	Wireless Communication Laboratory	0	0	4	2
7	EL53205	VHDL Laboratory	0	0	4	2
8	EL53203	Microcontroller & Interfacing Lab.	0	0	4	2
9	EL53401	Comprehensive Viva-Voce	--	--	--	4

Semester IV — 12 Credits

Sr. No.	Course Code	Course Name	Lecture (L) Hr	Tutorial (T) Hr	Practical (P) Hr	Credit
1	EL54501	Major Project Viva-Voce	-	-	-	12

Total — 106 credits

School of Electronics, DAVV
M.Sc. Electronics & Communication, Batch 2021-23 (Syllabus)
SEMESTER - I

COURSE TITLE	COURSE CODE	CREDIT-4			THEORY PAPER
Signals and Systems-Continuous	**E51101**	L	T	P	Max.Marks-100
		3	1	--	

Course Learning Objectives

- Understanding the fundamental characteristics of signals and systems.
- Understanding the concepts of vector space, inner product space and orthogonal series.
- Understanding signals and systems in terms of both the time and transform domains, taking advantage of the complementary insights and tools that these different perspectives provide.
- Development of the mathematical skills to solve problems involving convolution, filtering, modulation and sampling.

An introduction to signals and systems: Signals and systems as seen in everyday life. Continuous time signal: energy and power signals, signal properties: periodicity, absolute integrability, determinism and stochastic character. Some special signals of importance: the unit step, the unit impulse, the sinusoid, the complex exponential, ramp, raised, cosine, sine etc.
Continuous Time Systems: system properties: linearity: time-invariance, causality, stability, realizability. Examples.
Continuous time LTI systems: the impulse response and step response, convolution, correlation, input-output behavior with aperiodic convergent inputs, cascade interconnections. Characterization of causality and stability of linear time invariant systems. System representation through differential equations.
Fourier series, Fourier Transform, properties of Fourier series and Fourier Transform, Parsevals theorem.
Laplace Transform : the notion of Eigen functions of LSI systems, a basis of Eigen functions, region of convergence, system functions, poles and zeros of system functions and signals. System analysis using Laplace Transform.
Sampling theorem and its implications.

Some Suggested Textbooks:

1. *B.P. Lathi, "Signal Processing and Linear Systems", Oxford University Press, 1998.*
2. *Ashok Ambardar, "Analog and Digital Signal Processing", Second Edition, Brooks/ Cole Publishing Company (An international Thomson Publishing Company), 1999.*

Reference books

1. Hwei P. Hsu, Signals and Systems,Schaums Series, Tata McGraw Hill Publication.

Course outcomes

On completion of this course the students will be,

1. Apply the knowledge of linear algebra topics like vector space, basis, dimension, inner product, norm and orthogonal basis to signals.
2. Analyses the spectral characteristics of continuous-time periodic and a periodic signals using Fourier analysis.
3. Classify systems based on their properties and determine the response of LSI system using convolution.
4. Analyze system properties based on impulse response and Fourier analysis.
5. Apply the Laplace transform for analyze of continuous-time and discrete-time signals and systems.
6. Understand the process of sampling and the effects of under sampling.

COURSE TITLE	COURSE CODE	CREDIT-4			THEORY PAPER
Electromagnetic Theory	**EL51102**	L	T	P	Max.Marks-100
		3	1	--	

Course Learning Objectives

- To expose the students to the rudiments of Electromagnetic theory and wave propagation essential for subsequent courses on microwave engineering, antennas and wireless communication

Elements of vector calculus: gradient, divergence and curl. Gauss' and stokes' theorems. Maxwell's equations : differential and integral forms. Application to wave propagation in bounded & unbounded media, Wave equation. Poynting vector. Plane waves : propagation through various media, reflection and refraction, phase and group velocity; skin depth. Analysis of electrostatic and magneto static fields; Laplace's and poisson's equations; Boundary value problems and their solutions.

Referred Books:

1. Electromagnetic waves and Radiating Systems : Jordan and Balmain.
2. Elements of Electromagnetics 3rd Ed: Mathew N. O. Sadiku, Publisher: Oxford Press.
3. Schaum's Outlines Electromagnetics 2nd Ed. : J. A. Edminister, Publisher : McGraw Hill.
4. Introduction to Electrodynamics: Griffiths
5. Engineering Electromagnetics : Hayt.
6. Electromagnetics : Kraus.

Course outcomes

On completion of this course the students will be,

1. Recognize and classify the basic Electrostatic theorems and laws and to derive them.
2. Discuss the behavior of Electric fields in matter and Polarization concepts.
3. Classify the basic Magneto static theorems and laws and infer the magnetic properties of matter.
4. Summarize the concepts of electrodynamics &to derive and discuss the Maxwell's equations.
5. Students are expected to be familiar with Electromagnetic wave propagation and wave polarization.

COURSE TITLE	COURSE CODE	CREDIT-4			THEORY PAPER
C Programming	**EL51103**	L	T	P	Max.Marks-100
		3	1	--	

Course Learning Objectives

- The course is designed to provide complete knowledge of C language. Students will be able to develop logics which will help them to create programs, applications in C. Also by learning the basic programming constructs they can easily switch over to any other language in future.

Introduction: Introduction to Computer Programming, Types of Programming Languages.
Introduction to C Language, Advantages and Limitations of C Language.
C Fundamentals: Identifiers, Data Types, Keywords, Variables, Expression and Statement, Constants, Operators: Logical, Bitwise, Arithmetic, Unary, Relational, Logical, Assignment etc, Library Functions, Control Statement: if-else, while, do-while, for, switch-case etc, break, goto, continue etc.
Function: Building user defined functions, Passing arguments to function, Call by value, Call by Reference, Recursion.
Array & Pointer: Defining an array, Processing an array, Passing an array to function,
Multidimensional Array, Pointer Fundamental, Pointer declaration, Passing Pointer to Functions,
Array of Pointers. Structure & Union: Defining Structure, Processing of Structures, Passing an structure to function,
Defining Union, Difference between Structure and Union.

Referred Books

1. Programming with C: Schuam Series by GOTTFRIED. (Text)
2. Let us C by YASHWANT KANITKAR
3. The Complete Reference by HERBERT SCHILDT

Course outcomes

On completion of this course the students will be,

1. Able to implement the algorithms and draw flowcharts for solving Mathematical and Engineering problems.
2. Demonstrate an understanding of computer programming language concepts.
3. Ability to design and develop Computer programs, analyzes, and interprets the concept of pointers, declarations, initialization, operations on pointers and their usage.
4. Able to define data types and use them in simple data processing applications also he/she must be able to use the concept of array of structures.
5. Student must be able to define union and enumeration user defined data types.
6. Develop confidence for self education and ability for life-long learning needed for Computer language.

COURSE TITLE	COURSE CODE	CREDIT-4			THEORY PAPER
Devices and Circuit Theory	**EL51104**	L	T	P	Max.Marks-100
		3	1	--	

Course Learning Objectives

- To introduce and impart problem solving techniques, through linear passive electrical circuits, useful for other core and elective courses.
- To make the students capable of analyzing any given electrical network.
- To make the students understand the fundamentals of electronic devices.
- To train them to apply these devices in mostly used and important applications.
- To introduce the theoretical & circuit aspects of an Op-amp.

Basic Network Solution methods: KVL and KCL, nodal and mesh analysis, Source Conversion

Network theorems: Superposition, Thevenin, Norton and Maximum Power transfer, Reciprocity theorem, Tellegen's theorem, Wye-Delta transformation

Semiconductor theory :- Energy bands in semiconductor material , intrinsic and extrinsic semiconductor ,carrier transportation , diffusion current , drift current , mobility, resistivity , generation and recombination of carriers ,Hall effect.

Semiconductor Devices PN Junction diode characteristics & its application ,zener diode, LED ,LDR, tunnel diode, Varactor diode , Schottkey diode , BJT, JFETs, MOSFETs.

Operational Amplifier – Block diagram of OP- AMP , its parameters, frequency response , ,concept of ideal op-amp , specification of standard op-amp like IC 741,LM 324,μA 741.

Linear application of op- amp: - voltage amplifier, summing amplifier, averaging amplifier, current source, differential amplifier, instrumentation amplifier.

Refereed Books :

1. Electronics Principle: A.P. Malvino
2. Engineering circuit analysis Hayt
3. Electronic Devices & Circuits: Boylstead

At the end of the course student will be able

1. Analyze the electric circuit using network theorems.
2. Apply the knowledge of basic semiconductor material physics.
3. Analyze the characteristics of various electronic devices like diode, transistor etc.
4. Classify and analyze the various circuit configurations of Transistor and MOSFETs.
5. Infer the DC and AC characteristics of operational amplifiers and its effect on output and their compensation techniques.
6. Elucidate and design the linear and non linear applications of an opamp and special application Ics

COURSE TITLE	COURSE CODE	CREDIT-4			THEORY PAPER
Digital Design	**EL51105**	L	T	P	Max.Marks-100
		3	1	--	

Course Learning Objectives

- To impart the essential knowledge on the fundamentals and applications of digital circuits and digital computing principles.
- To provide an overview on the design principles of digital computing systems.

UNIT - I

Analog Vs. Digital Signals and Circuit. Basics of Digital Circuits. Number System, Transformation in different number system. r's and (r-1)'s Complement, Binary Arithmetic & Codes: Binary Addition, Binary Subtraction, Binary Multiplication, Binary Division, BCD Codes, BCD Subtraction, BCD Addition, ASCII (American Standard Code for Information Interchange), EBCDIC = Extended Binary Coded Decimal Interchange Code, Excess-3 (XS3), Gray Code

UNIT – II

Boolean Algebra; postulates and theorems useful for two-valued Boolean algebra, Two valued Boolean Algebra, Principle of Duality, DeMorgan's Theorem, Simplification of Boolean Expression, Canonical and Standard forms: Canonical Sum of Product Expression, Canonical Product of Sum Expression, Conversion between Canonical Forms

Boolean Algebra: The OR Operation & Gate, The AND Operation & AND Gate, The NOT Operation & Inverter, The NAND Gate, The NOR Gate, Extension to Multiple Inputs, Universal Gates, Positive and Negative Logic

UNIT – III

Minimization of Boolean functions, Karnaugh Map and Applications, Two variable K-map, Three variable K-map, Four variable K-map, Five variable K-map, Don't care combinations.

UNIT – IV

Combinational logic circuits: Arithmetic Circuits – Half adders, Full adders, Half Subtractor, Full Subtractor, Code Converters: Binary to Gray code converters, Gray-to-binary Converter, BCD-to-excess-3 Code Converter, Excess-3 - to – BCD Code Converter, Parity Generator and Parity Checker, Look-ahead Carry Generator, BCD Adder, Magnitude Comparators, Encoders, Decoders: Different type of decoders, BCD-to-seven-segment decoder, Implementation of functions using decoder, Multiplexer, Implementation of functions using decoder, Demultiplexer, Analysis of combinational circuit, Realization of combinational circuit from verbal description

UNIT – V

Sequential circuits : Latches & Flip-flops, RS, JK, D and T flip-flops, and Synthesis of inputs, Race around problem, Master Slave flip flops, Edge Triggering and Level Triggering, Interconversion of flip-flops, Analysis of Sequential circuit on the basis of state equation, state table and state diagram.

Registers: Introduction of Registers, Shift Registers, Types of Shift Registers: SISO, SIPO, PISO, PIPO, Bidirectional Shift Registers, Ring Counter, Johnson Counter

Counters:Asynchronous (Ripple) Counters, Asynchronous Decade Counter, Asynchronous Binary Counters

UNIT – VI

Introduction of Synchronous(Clocked) Sequential Machines, Realization of Flow table from verbal description for designing of sequential circuit, Realization of synchronous sequential circuit using different flip flops, Sequence Detector, Designing of sequence detector using different flip flops., Mealy and Moore model Machines, Inter-conversion between Mealy and Moore machine**..**

Reference Books :

Digital Design III rd edition : M. Morris Mano.
Z. Kohavi (TMH), “Switching & Finite Automata Theroy”.

Course outcomes
On completion of this course the students will be,

1. Understand how digital and logic computing is built from the fundamentals of semiconductor electronics and learn the capability to use abstractions to analyze and design digital electronic circuits
2. Gain knowledge on the basic logics and techniques related with digital computing
3. Develop expertise to design and implement various complicated digital systems to be applicable for signal measurement and processing

SEMESTER – II

COURSE TITLE	COURSE CODE	CREDIT-4			THEORY PAPER
Microprocessors & Interfacing	**EL52101**	L	T	P	Max.Marks-100
		3	1	--	

Course Learning Objectives

- To teach the students to familiarize with microprocessor architecture and functioning.
- To train the students to program the microprocessor for any application.

Microprocessors, Microcomputers & Programming Languages: Evolutions of Microprocessors, Microcomputer System: Processor as CPU and its main units. Internal Architecture of 8085, P based system with bus architecture, Introduction to Computer Programming Languages.
The 8085 Programming Model: Functions of internal general purpose registers, Flag Register, PSW, Program Counter and Stack Pointer.

8085 Assembly Language Programming: Assembly Language, Assembler. Instruction, Data Format, and Storage. T-State, Machine Cycle & Instruction cycle.
Instruction Set: Over view and classification, Data Transfer, Arithmetic, Logical, Stack and Branch group of instructions, Addressing modes.
P Operations & Memory organization: P initiated, Internal, and Peripheral initiated operations. Memory organization: Memory organization, Memory maps & addresses assigning to a memory chip.

I/O Devices and Pinout diagram: I/O Ports, IN & OUT Instructions, Peripheral mapped & Memory mapped I/O techniques, Logic devices (Buffer, Decoder, Encoder, and D Latch), and Pinout diagram.
Bus Timings & Control Signals: Timing diagrams, Control signal generation, Functional block diagram of 8085 P.
Time delays, Subroutines and Interrupts: Counters and Time Delays, Stack and Subroutines, Code conversion and Interrupts.

Interfacing: Interfacing of ICs: 8255, 8279, 8253, 8257 and 8259 with 8085 P.
Interfacing with LCD, seven segment, temperature sensor, stepper motor .
Introduction to 8086 P architecture and programming concept

Text Books:
Microprocessor Architecture, Programming and Applications with 8085. : R. Gaonkar
Fundamentals of Microprocessors and Microcomputers : B. Ram

Reference books:
0000 to 8085 : Sridhar and Ghosh
Microprocessor & Interfacing : Douglas Hall

Course outcomes
On completion of this course the students will be,

1. Students completing this course will demonstrate competence and ability to design a stand-alone computing device for any non -real time applications.

COURSE TITLE	COURSE CODE	CREDIT-4			THEORY PAPER
Analog Communication	**EL52102**	L	T	P	Max.Marks-100
		3	1	--	

Course Learning Objectives

- To introduce the principles of analog and digital communication systems involving different modulation and demodulation schemes.

Communications: Random signals and noise: probability, random variables, probability density function, autocorrelation, power spectral density.

Analog communication systems: amplitude and angle modulation and demodulation systems, spectral analysis of these operations, Superheterodyne receivers; elements of hardware, realizations of analog communication systems; signal-to-noise ratio (SNR) calculations for amplitude modulation (AM) and frequency modulation (FM) for low noise conditions.

Digital communication systems: pulse code modulation (PCM), differential pulse code modulation (DPCM), digital modulation schemes: amplitude, phase and frequency shift keying schemes (ASK, PSK, FSK), matched filter receivers, bandwidth consideration and probability of error calculations for these schemes. Basics of TDMA, FDMA and CDMA and GSM. Fundamentals of information theory and channel capacity theorem. Introduction to Satellite Communication.

1. Required Text(s)

Modern Digital & Analog Comm. System : B.P.Lathi

2. Essential References

1. Principles of Communication Systems : Taub & Schilling
2. Electronic Communication Systems : Kennedy
3. Analog & Digital Communication : Schaum Series

Course outcomes

On completion of this course the students will be,

1. Develop an understanding of need for modulation and generation & detection of Analog modulation techniques.
2. Explore AM and FM Super heterodyne receiver working principle.
3. Discuss the techniques for generation and detection of pulse Analog modulation techniques
4. To understand the basic operation involved in PCM like sampling, quantization & encoding and are able to calculate and derive entropy and channel capacity.
5. To compare different communication system with various modulation techniques in the presence of noise by analytically.

COURSE TITLE	COURSE CODE	CREDIT-4			THEORY PAPER
Computer Networks	**EL52103**	L	T	P	Max.Marks-100
		3	1	--	

Course Learning Objectives

- To get an understanding on the fundamentals of networks and issues involved.
- To acquire an understanding on the set of rules and procedures that mediates the exchange of information between communicating devices.

UNIT - I

Introduction: Data, Information, Steps to convert data in to information.
Communication System: Elements of Communication System, networks: network criteria, physical topology, types of connection, categories of network , Protocols & Standards Connection Oriented and Connection less services.

UNIT - II

Network Model: layered tasks, OSI Reference Model, TCP/IP Model, addressing.
Network Devices: Repeaters, Hubs, Bridges, Switches, Routers, Gateway

UNIT - III

Physical Layer: Asynchronous and synchronous transmission, TDM, FDM, WDM,
transmission media: guided, unguided, Cross Cables and Straight Cable, switching techniques.

UNIT - IV

Data Link Layer: Introduction, Design Issues: Error Control: Parity Concept, Hamming Codes, CRC, Flow Control, Framing, Sliding Window Protocol. Data Link Layer Protocols. MAC Layer: ALOHA, CSMA, CSMA/CD, Contension free Protocols, IEEE 802 standards for LAN & MAN: 802.3, 802.4,802.5, 802.11.

UNIT - V

Network Layer: Design Issues, IP protocol:IPv4 & IPv6, classful and classless addressing Routing Algorithms: Optimizing Principle, Shortest Path Finding Algorithm., Flooding, Distance Vector Routing Algorithm, Link State Routing, Hierarchal Routing, Broadcast Routing, Congestion Control Algorithms.
Transport and Application Layer: TCP, UDP, DNS, e-mail, WWW.

Text Books: 1.Data communications and Networking : Behrouz A Forouzan.
2.. Computer Networks: A. S. Tenenbom

Course outcomes

At the end of the course student will be able

1. Compare and examine, OSI and TCP/IP protocol stacks
2. Categorize services offered by all layers in TCP/IP protocol stack
3. Analyze a network under congestion and propose solutions for reliable data transfer
4. Examine the protocols operating at different layers of TCP/IP model

COURSE TITLE	COURSE CODE	CREDIT-4			THEORY PAPER
Signals and Systems-Discrete	**EL52104**	L	T	P	Max.Marks-100
		3	1	--	

Course Learning Objectives

- To provide better understanding of discrete-time and digital signal in time and frequency domain
- To provide knowledge to analyse linear systems with difference equations
- To design and implement FIR and IIR filters with different structures.
- To introduce DSP processor and FFT processors.

UNIT-I INTRODUCTION
Scope and Overview, Signals, Signal Processing, Classification of Signals, Advantages of Digital Signal Processing

UNIT-II DISCRETE SIGNALS
Operations on Discrete Signals, Decimation and Interpolation, Some Standard Discrete Signals, Discrete-Time Harmonics and Sinusoids, Sampling Theorem

UNIT-III TIME-DOMAIN ANALYSIS
Discrete-Time Systems, FIR and IIR Digital Filters, Solving Difference Equations, Zero-Input Response and Zero-State Response, System Representation in Various Forms, Moving Average Filters, Inverse Systems, Echo and Reverb, Discrete Convolution, Convolution Properties, Linearity, Shifting Invariance, Stability and Causality of LTI Systems, System Response to Periodic Inputs, Circular Convolution, Deconvolution, Discrete Correlation

UNIT-IV z-TRANSFORM ANALYSIS
Two-Sided and One-Sided z-Transform, Properties of z-Transform, Poles, Zeros, z-Plane & ROC, Transfer Function, Transfer Function Realization, Causality and Stability of LTI Systems, Inverse z- Transform, System Analysis using z-Transform.

UNIT-V FREQUENCY DOMAIN ANALYSIS
The DTFT form and z-Transform, The DTFT of Discrete-Time Periodic Signals, Properties of DTFT, The Inverse DTFT, The Frequency Response, System Analysis using the DTFT, Linear Phase System Analysis

UNIT-VI DISCRETE FOURIER TRANSFORMS AND FAST FOURIER TRANSFORMS
Introduction to DFT, Efficient computation of DFT Properties of DFT, FFT algorithms – Radix-2 FFT algorithm, Decimation in Time, Decimation in Frequency algorithms.

UNIT VII DIGITAL FILTER DESIGN
Structure of IIR, System Design of Discrete time IIR Filter from Continuous Time Filter, IIR Filter Design by Impulse Invariance, Bilinear Transformation, Approximation Derivatives, Design Recipe of IIR Filter.
Symmetric & Antisymmteric FIR filters, Linear Phase Filter, Windowing Technique, Rectangular, Kaiser Windows, Frequency Sampling Techniques, Applications.

Text Books:
Ashok Ambardar, Digital Signal Processing: A Modern Introduction, CENGAGE Learning, 2007
(2) Schaum's Outline of Digital Signal Processing, McGraw-Hill, First Edition, 1998

Reference Book:
John G. Proakis & Dimitris G. Manolakis, *Digital Signal Processing: Principles, Algorithms, and Applications*, Third Edition, Pearson Publicati

Course outcomes
On completion of this course the students will be,

1. To analyse the signals in both time and frequency domain
2. To design FIR and IIR filters for signal pre-processing
3. To implement and realize the filters using different structures.
4. Explain the selection of DSP processor for signal processing applications
5.

COURSE TITLE	COURSE CODE	CREDIT-4			THEORY PAPER
JAVA Programming	**EL52105**	L	T	P	Max.Marks-100
		3	1	--	

Course Learning Objectives

- Develop a greater understanding of the issues involved in programming language design and implementation
- Develop an in-depth understanding of functional, logic, and object-oriented programming paradigms
- Understand design/implementation issues involved with variable allocation and binding, control flow, types, subroutines, parameter passing
- Develop an understanding of the compilation process

Object Oriented Analysis: Review of object oriented concepts, potential benefits and drawbacks of object oriented. Compare object oriented paradigm with structural/procedural paradigm. What is class, how to Identify them, relationship among objects, relationship among classes.

Introduction to JAVA: Features of Java, How to write simple Java programs, Understanding CLASSPATH, Java keywords, Lexical issues, Comments,Reserved Keywords, Identifiers, Literals, Operators, Separators, Variables, Naming Conventions, Data Type- Numeric types, Integers, Floating point numbers, Casting characters, Boolean, Simple
type, Arrays, Multiple dimensional arrays, Type conversion & casting, Operators, Control Statements, Selection Statements, Iteration Statements.

Introducing Class: Class fundamentals, Declaring objects, new and dot operator, this keyword, Introducing methods, Constructors, Garbage collection, Overloading methods and constructor, Nested and Inner class.

Inheritance: Extending classes, Access modifiers, Keywords- super, final, static, finalize method, Method overriding, Dynamic Method Dispatch, Abstract classes, The Object class and Class class.

Packages and Interfaces: Defining a package, Access Protection in packages, importing packages, Access protection, Defining an Interface, Implementing Interfaces, Applying interfaces, Variables in interfaces, Achieving multiple inheritances through interfaces.

String Handling: String Class, String constructors, Special string operations, Character extracting, String comparison, Searching strings, Modifying a string, Strings buffer, Different string methods.

Exception Handling: Fundamentals, Exception types, try and catch, Multiple catch clauses, nested try statements, Throw, throws and finally, Exception subclasses, Creating own exception classes.

Multithreading: Thread basics, Creating and running a thread, The thread life cycle, Thread priorities,

REFERENCES
1.Herbert Schildt , "Java : The Complete Reference", 7th Edition, Tata McGraw – Hill Education
2. Gready Booch , "Object-Oriented Analysis and Design with Applications", 3rd Edition
3.David Flanagan, "Java in a Nutshell", 3rd Edition, O'Reilly Med

Course outcomes
On completion of this course the students will be,

1. Use the characteristics of an object-oriented programming language in a program.
2. Use the basic object-oriented design principles in computer problem solving.
3. Use the basic principles of software engineering in managing complex software project.
4. Program with advanced features of the JAVA programming language.

SEMESTER – III

COURSE TITLE	COURSE CODE	CREDIT-4			THEORY PAPER
Control Systems	**EL53101**	L	T	P	Max.Marks-100
		3	1	--	

Course Learning Objectives

- To equip the students with the fundamental concepts in control systems.
- To introduce the concept of feedback control system.

Basic control system component block diagrammatic description, reduction of block diagrams.
Open Loop & Close loop (feedback) systems, Effect of feedback on stability and sensitivity, special properties of Linear time invariant (LTI) systems: transfer functions, impulse response, poles, zeros, their significance, stability analysis of the system, signal flow graphs and their use in determining transfer function of systems
Transient and steady state analysis of LTI system and frequency response analysis.
Concepts of gain and phase margins Approximation of transient response from close loop frequency response.
Tools and technique for LTI control systems analysis: rool loci, bode, Nyquist, RH Criteria.
Control system Compensators: Elements of lead & leg compensation, Elements of PID control, steate variable representation and solution of atete equations of LTI control systems.

Referred books:
Control Systems Engg: Nagartah and Gopal
Modern Control Engg: Ogata

Course outcomes
Upon completion of the course, the students will be able to

1. Understand the concepts of closed loop control systems.
2. Analyse the stability of closed loop systems.
3. Apply the control techniques to any electrical systems.
4. Compute and assess system stability.

COURSE TITLE	COURSE CODE	CREDIT-4			THEORY PAPER
Microwave Communication	**EL53102**	L	T	P	Max.Marks-100
		3	1	--	

Course Learning Objectives

- To expose students to the complete fundamentals and essential feature of waveguides, resonators and microwave components and also able to give an introduction to microwave integrated circuit design.
- To impart knowledge on basics of antenna theory and to analyze and design a start of art antenna for wireless communications.

Transmission Lines : Basic Theory, characteristic Impedance , impedance transformation , standing wave, smith chart, Impedance matching.
Wave Guides : Basics of Wave Guides, modes in rectangular wave guides; boundary conditions, cutoff frequencies,.
Microwave Components – T, Magic – T, Tuner, Circulator, Isolator, Direction Couplers, Sources- Multi cavity Klystron, Reflex Klystron, Principle of operation of Magnetron and TWT, Solid state Microwave devices; Basic Theory of Gunn, GaAs FET, Crystal detector and PIN diode for detection of microwaves.
Antennas : Elements of antenna theory ; Dipole antennas; antenna arrays; radiation pattern.

Referred books:
Network Lines and Fields : John. D. Ryder
Microwaves : Liao

Course outcomes
On completion of this course the students will be,

1. Classify the Guided Wave solutions -TE, TM, and TEM.
2. Analyze and design rectangular waveguides and understand the propagation of electromagnetic waves.
3. Evaluate the resonance frequency of cavity Resonators and the associated modal field.
4. Analyze the transmission lines and their parameters using the Smith Chart.
5. Apply the knowledge to understand various planar transmission lines.
6. Distinguish the receiving antennas from transmitting antennas, analyze and justify their characteristics.
7. Distinguish primary from secondary antennas and analyze their characteristics by applying optics and acoustics principles.

COURSE TITLE	COURSE CODE	CREDIT-4			THEORY PAPER
Microcontroller & Interfacing	**EL53103**	L	T	P	Max.Marks-100
		3	1	--	

Course Learning Objectives

- To teach the students to familiarize with Microcontroller architecture and functioning.
- To train the students to program the Microcontroller for any application.
- To train the students to interface the Microcontroller with sensors and actuators.
- To train the students for designing the Microcontroller based application.

Microprocessor Vs microcontroller, Embedded System, Computer Architectures: RISC/CISC and Harvard/Princeton Architectures. The 8051 Microcontroller, Criteria for choosing a microcontroller, 8051 Family members & block diagram. The 8051 Assembly Language Programming: 8051internal registers, Structure of Assembly Language, Program Counter & ROM Space, Data types & Directives, PSW, Register Banks & Stack. JMP, LOOP & CALL Instructions: Looping, Conditional & unconditional jump, LCALL, ACALL, PUSH, POP instructions & Subroutines. Time Delay Generation & Calculation. I/O Port Programming: Pin description, I/O Ports, Bit addressability & Read-modify-write feature. Addressing Modes: Addressing modes, Indexed addressing & Look up tables, SFR registers and their addresses. Arithmetic & Logical Instructions: Addition, subtraction, BCD numbers and DA A instruction, multiplication and division, signed number and overflow problem in arithmetic operations. Logic & Compare Instructions, Rotate & Swap Instructions, BCD & ASCII conversion programs. Single Bit Instructions: Single bit instructions, Registers & bit addressability, Bit addressable RAM, Reading input pins Vs. Port Latch. 8051Timer /Counter Programming: Timer Registers, TMOD Register, Timer mode 1, mode 2, mode 3 programming. Counter Programming. Boot loader with 8051.
8051 Serial Communication: Basics of serial communication, Asynchronous serial communication & data framing, RS 232 standards, MAX 232. Baud rate selection & T1 register, SBUF, SCON Registers, and Serial port Programming to transmit & receive data serially. 8051 Interrupts Programming: interrupt latency, context switching, 8051 interrupts, IVT for 8051, IE register, TCON register and Timer Interrupts, External H/W Interrupts Programming. Serial Port Interrupts Programming, Interrupt Priority upon reset and IP register.

Real World Interfacing: LED, Seven segment, Switches, LCD, LED array, ADC, temperature Sensors, , Stepper Motor, DC motor , and Keypad

Working with microcontroller development tools compiler and assembler (Keil.), simulator (proteus), burner.

Reference Books:

1. 8051 Microcontroller and Embedded Systems : M.A. Mazidi & J. G. Mazidi. Pearson Education
2. Microcontrollers: Architecture, Programming & System Design: Rajkama Pearson Education
3. 8051 Microcontrollers Arch., Programming & Applications: K. J. Ayala Penram International

Course outcomes

On completion of this course the students will be,

1. Students are able to program and interface the microcontroller with peripherals.
2. Students completing this course will demonstrate competence and ability to design a stand-alone computing device for real time applications.

COURSE TITLE	COURSE CODE	CREDIT-4			THEORY PAPER
Wireless Communication	EL53104	L	T	P	Max.Marks-100
		3	1	--	

Course Learning Objectives

- To get an understanding of mobile radio communication principles, types and to study the recent trends adopted in cellular and wireless systems and standards**.**

Unit-I

Wireless Communication:-

Introduction, **History of wireless** communication, Wireless services, Requirements in wireless communication. Wireless Transmission :-Frequencies for radio transmission, signal, antennas. Signal propagation: path loss of radio signal , additional signal propagation effects, multi-path propagation. Spread spectrum: DSSS, FHSS.

Unit-II

Global System for Mobile Communications (GSM) & (ISDN):-

Introduction of GSM and history, GSM service and feature, GSM system architecture, GSM radio sub system, GSM channel type :-GSM traffic channel and GSM control channel, example of GSM call, Frame structure for GSM, Signal processing in GSM, Protocols, Localization and Calling, Handover. Security: Authentication , Encryption. Integrated service digital network (ISDN).

Unit-III

Wireless networking :-Introduction to wireless network, Difference between wireless and fixed telephone network:-Public Switched Telephone Network (PSTN),Limitation in wireless network. Development of wireless network: First generation wireless network, Second generation wireless network & Third generation wireless network.

Unit IV

Orthogonal frequency division multiplexing (OFDM):- Introduction, advantages & disadvantages of OFDM transmission scheme , Multiple Access techniques: FDMA,TDMA,CDMA, OFDM system Model: serial to parallel conversion, modulation of data, inverse Fourier transform, OFDM versus single carrier transmission. Code division multiple access (CDMA) :-

Introduction basic principal of spread spectrum, direct sequence spread spectrum, frequency hopped spread spectrum, time hopped spread spectrum, CDMA system overview.

Unit V

Wireless LAN and Bluetooth :- introduction version of WLAN, the benefits of WLAN, Introduction, Bluetooth ,Bluetooth v/s infrared, Bluetooth vs 802.11,Bluetooth features ,Bluetooth technology, Bluetooth application, types of link, comparison of various technology, Bluetooth network topology, Bluetooth stack ,packet data unit, data packet format, operating modes, Establishing network connection, Bluetooth profile, Bluetooth security.

Unit VI

Introduction to 4G technology and Multiantenna system:- introduction evaluation of 4G technology smart antenna switched beam antenna, adoptive antenna,4G tools and techniques, advance technology physical layer enhancement.

Multiantenna system:- Smart antennas , multiple input multiple output system (MIMO): Introduction, Model of MIMO system, MIMO system Channel Capacity.

References:

1.Theodore S. Rappaport:wireless communication , pearson.
2. Jochen Schilling: mobile Communication Systems, pearson.
3. Upena Dalal: Wireless Communication, Oxford University Press.
4. P. M. Chidambara Nathan: Wireless Communication, PHI Learning

Course outcomes

On completion of this course the students will be,

1. Apply the knowledge of basic communication systems and its principles.
2. Describe the cellular concept and analyze capacity improvement Techniques.
3. Mathematically analyze mobile radio propagation mechanisms.
4. Summarize diversity reception techniques.
5. Design Base Station (BS) parameters and analyze the antenna configurations.
6. Analyze and examine the multiple access techniques and its application.

7. Assess the latest wireless technologies. Explain and compare the techniques for chip level and board level testing

COURSE TITLE	COURSE CODE	CREDIT-4			THEORY PAPER
VHDL	**EL53105**	L	T	P	Max.Marks-100
		3	1	--	

Course Learning Objectives

- To prepare the student to be an entry-level industrial standard VHDL programmer.
- To give the student an understanding of issues and tools related to ASIC/FPGA design and implementation.
- To give the student an understanding of basics of System on Chip and Platform based design.
- To give the student an understanding of High performance algorithms

Introduction to VHDL, History, Capabilities, Hardware Abstraction. VHDL Basic Terminology, Entity Declaration, Architecture Body, Configuration Declaration, Package Declaration, Package Body, Model Analysis, Simulation.
Basic Language Elements: Identifiers, Data Objects, Data Types, Operators.
Modeling Style: Behavioral Modeling, Data Flow Modeling, Structural Modeling, Mixed modeling, Generics & Configuration
Subprograms & Overloading, Packages and Libraries, Model Simulation: Simulation,

Referred Books:

1. A VHDL Primer: J.Bhaskar, III Edition, Pearson Education Asia (TEXT)
2. VHDL: Douglas Perry, III Edition, Tata McGraw Hill

Course outcomes

On completion of this course the students will be,

1. Explain the algorithms used for ASIC construction
2. Design synthesizable Verilog and VHDL code.
3. Explain the difference between Verilog and system Verilog and are able to write system Verilog code.
4. Model Analog and Mixed signal blocks using Verilog A and Verilog AMS understand Full Custom Design Flow and Tool used
5. Understand Semicustom Design Flow and Tool used - from RTL to GDS and Logical to Physical Implementation

COURSE TITLE	COURSE CODE	CREDIT-4			THEORY PAPER
CMOS Technology & VLSI Design	**EL53106**	L	T	P	Max.Marks-100
		3	1	--	

Course Learning Objectives

- To introduce various aspects of CMOS & VLSI circuits and their design including testing**.**
- To expose the students to the low voltage device modeling, low voltage, low power VLSI CMOS circuit design.

Unit-I Introduction

CMOS Logic: Inverter, NAND Gate, Combinational Logic, NOR Gate, Compound Gates, Pass Transistors and Transmission Gates, Tristates, Multiplexers, Latches and Flip-Flops, CMOS Fabrication and Layout: Inverter Crosssection, Fabrication Process, Layout Design rules, Gate Layout, Stick Diagrams. VLSI Design Flow.

MOS Transistor Theory: Ideal I-V Characteristics, C-V Characteristics: MOS Capacitance Models, MOS Gate Capacitance Model, MOS Diffusion Capacitance Model.

Non ideal I-V Effects: Velocity Saturation and Mobility Degradation, Channel Length Modulation, Body Effect, Subthreshold Conduction, Junction Leakage, Tunneling, Temp. and Geometry Dependence. DC Transfer characteristics: Complementary CMOS Inverter DC Characteristics, Beta Ratio Effects, Noise Margin, Ratioed Inverter Transfer Function, Pass Transistor DC Characteristics, Tristate Inverter, Switch- Level RC Delay Models.

Unit -II CMOS Processing Technology

CMOS Technologies: Background, Wafer Formation, Photolithography, Well and Channel Formation, Silicon Dioxide (SiO2), Isolation, Gate Oxide, Gate and Source/Drain Formation, Contacts and Metallization, Passivation, Metrology.

Layout Design Rules: Design Rules Background, Scribe Line and Other Structures, MOSIS Scalable CMOS Design Rules, Micron Design Rules.

CMOS Process Enhancements: Transistors, Interconnect, Circuit Elements, Beyond Conventional CMOS.

Unit -III Circuit Characterization and Performance Estimation

Delay Estimation: RC Delay Models, Linear Delay Model, Logical Effort, Parasitic Delay. Logical Effort and Transistor

Sizing: Delay in a Logic Gate, Delay in Multistage Logic Networks, choosing the Best Number of Stages.

Power Dissipation: Static Dissipation, Dynamic Dissipation, Low-Power Design.

Interconnect: Resistance, Capacitance, Delay, Crosstalk. Design Margin: Supply Voltage, Temperature, Process Variation, Design Corners. Reliability, Scaling.

Unit -IV Analog CircuitsMOS Small-signal Model, Common Source Amplifier, The CMOS Inverter as an Amplifier, Current Mirrors, Differential Pairs,

References:

1. Neil H.E. Weste, David Harris, Ayan Banerjee: CMOS VLSI Design, Third Edition, Pearson Education.

2. Neil H.E. Weste, Kamran Eshraghian: Principle of CMOS VLSI Design, Pearson Education.

3. J. P. Uyemura: Chip Design for Submicron VLSI, Cengage Learning.

4. Philip E. Allen and Douglas R Holberg: CMOS Analog Circuit Design, Oxford

5. Carver Mead and Lynn Conway: Introduction to VLSI systems, BS Publication

6. J. P. Uyemura: Introduction to VLSI Circuits and Systems, Wiley.

Course outcomes

On completion of this course the students will be,

1. Acquire the knowledge about various CMOS fabrication process and its modeling.
2. Infer about the second order effects of MOS transistor characteristics.
3. Analyze and implement various CMOS static logic circuits and CMOS dynamic logic circuits.
4. Learn the design techniques low voltage and low power CMOS circuits for various applications..
5. Describe the techniques used for VLSI fabrication, design of CMOS logic circuits, switches and memory
6. Describe the techniques used the design of CMOS logic circuits, switches and memory in VLSI
7. Generalize the design techniques and analyze the characteristics of VLSI circuits such as area, speed and power dissipation
8. Explain and compare the architectures for FPGA, PAL and PLDs and evaluate their characteristics such as area, power dissipation and reliability

SEMESTER – IV

COURSE TITLE	COURSE CODE	CREDIT-4			THEORY PAPER
Major Project Phase Viva Voce	**EL54501**	L	T	P	
		-	-	-	