SCHEME & SYLLABUS

M.Sc. Electronics

BATCH 2017-2019

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 Batch 2017-19 (Scheme)

Semester I — 32 Credits

Sr. No.	Course Code	Course Name	Lecture (L) Hr	Tutorial (T) Hr	Practical (P) Hr	Credit
1	EL51101	Signal and System-I(Continous)	3	1	--	4
2	EL51102	Electromagnetic Theory	3	1	--	4
3	EL51103	Programming in C	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	Device and Circuit Lab/ Digital Design Lab	0	0	8	4
8	EL51301	Seminar	0	0	--	2
9	EL51401	Comprehensive Viva	--	--	--	4

Semester II — 32 Credits

Sr. No.	Course Code	Course Name	Lecture (L) Hr	Tutorial (T) Hr	Practical (P) Hr	Credit
1	EL52101	Microprocessor	3	1	--	4
2	EL52102	Analog Communication Systems	3	1	--	4
3	EL52103	Computer Networks	3	1	--	4
4	EL52104	Signals and Systems-II	3	1	--	4
5	EL52105	Object Oriented Programming(using JAVA)	3	1	--	4
6	EL52202	Microprocessor Lab	0	0	4	2
6	EL52204/02	MATLAB Lab / Analog Comm Lab	0	0	8	4
7	EL52205/	(a) JAVA Lab	0	0	4	2
8	EL52401	Comprehensive Viva	--	--	--	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	3	1	--	4
4	EL53106	CMOS Technology and VLSI Design	3	1	--	4
5	EL53105	VHDL	3	1	--	4
6	EL53206	CMOS Technology and VLSI Design Laboratory	0	0	4	2
7	EL53204	VHDL Laboratory	0	0	4	2
8	EL53203	Microprocontroller Laboratory	0	0	4	2
9	EL53401	Comprehensive Viva	--	--	--	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	-	-	-	26

Total — 106 credits

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

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

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

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 TITLE	COURSE CODE	CREDIT-4			THEORY PAPER
Analog Interface Electronics	**EL51104**	L	T	P	Max.Marks-100
		3	1	--	

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 – Differential amplifier and its DC & AC analysis , block diagram of OP- AMP , its parameters, frequency response , current mirror and current loading biasing ,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, filters: LPF, HPF, BPF and all pass filter.

Refereed Books :

1. Electronics Principle: A.P. Malvino
2. Applied Electronics: R.S. Sedha
3. Electronic Devices & Circuits: Boylstead

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

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".

SEMESTER – II

COURSE TITLE	COURSE CODE	CREDIT-4			THEORY PAPER
Microprocessors & Interfacing	**EL52104**	L	T	P	Max.Marks-100
		3	1	--	

Microprocessors, Microcomputers & Programming Languages: Evolutions of Microprocessors, Microcomputer System: Processor as CPU and its main units. Internal Architecture of 8085, µP 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.
µP Operations & Memory organization: µP 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 µP.
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 µP.
Interfacing with LCD, seven segment, temperature sensor, stepper motor .
Introduction to 8086 µP 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 TITLE	COURSE CODE	CREDIT-4			THEORY PAPER
Analog & Digital Communication	**EL52102**	L	T	P	Max.Marks-100
		3	1	--	

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

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 TITLE	COURSE CODE	CREDIT-4			THEORY PAPER
Digital Signal Processing	**EL52104**	L	T	P	Max.Marks-100
		3	1	--	

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

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

SEMESTER – III

COURSE TITLE	COURSE CODE	CREDIT-4			THEORY PAPER
Control System	**EL53103**	L	T	P	Max.Marks-100
		3	1	--	

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 TITLE	COURSE CODE	CREDIT-4			THEORY PAPER
Microwave Engineering	**EL53104**	L	T	P	Max.Marks-100
		3	1	--	

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

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, 8255, GSM Modem Interfacing, Stepper Motor, DC motor Keyboard, 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 TITLE	COURSE CODE	CREDIT-4			THEORY PAPER
VHDL	**EL53104**	L	T	P	Max.Marks-100
		3	1	--	

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

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 (SiO_2), 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.**

SEMESTER – IV

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