B.TECH –ELECTRONICS AND COMMUNICATION ENGINEERING
(V23 – IIIrd YEAR COURSE STRUCTURE & SYLLABUS)

B.Tech. III Year I Semester

S. No.	Category	Subjects	Subject Codes	L	T	P	C
1	Professional Core	Analog & Digital IC Applications	V233110431	3	0	0	3
2	Professiona l Core	Digital communications	V233110432	3	0	0	3
3	Professiona l Core	Antennas and Wave Propagation	V233110433	3	0	0	3
4	Professiona l Elective - I	Electronic Measurements and Instrumentation	V233110434	3	0	0	3
5	Open Elective-I	Computer Organization and Architecture	V23131C352	3	0	0	3
6	Professional Core	Analog & Digital IC Applications Lab	V231310461	0	0	3	1.5
7	Professional Core	Analog and digital communications Lab	V231310462	0	0	3	1.5
8	Skill Enhancement course	Applications of Lab view for Instrumentation & Communications	V231310463	0	1	2	2
9	Engineering Science	Design of PCB & Antennas Lab	V231310464	0	0	2	1
10	Evaluation of Community Service Internship		V23131CC81	-	-	-	2
Total				**15**	**1**	**10**	**23**
MC	Minor Course (Student may select from the same specialized minors pool)			3	0	3	4.5
MC	Minor Course through SWAYAM / NPTEL (Minimum 12 Week, 3 credit course)			3	0	0	3
HC	Honors Course (Student may select from the same Honors pool)			3	0	0	3
HC	Honors Course (Student may select from the same Honors Pool)			3	3	0	3

B.TECH –ELECTRONICS AND COMMUNICATION ENGINEERING
(V23 – III[rd] YEAR COURSE STRUCTURE & SYLLABUS)

B.Tech. III Year II Semester

S.No.	Category	Subject	Subject Codes	L	T	P	C
1	Professional Core	VLSI Design	V231320431	3	0	0	3
2	Professional Core	Microprocessors & Microcontrollers	V231320432	3	0	0	3
3	Professional Core	Digital Signal Processing	V231320433	3	0	0	3
4	Professional Elective–II	Analog IC Design	V231320441	3	0	0	3
		Satellite Communication	V231320442				
		Smart and Wireless Instrumentation	V231320443				
		.Machine Learning	V231320444				
5	Professional Elective–III	Bio Medical Instrumentation	V231320445	3	0	0	3
		Microwave Engineering	V231320446				
		Embedded Systems	V231320447				
		Artificial Intelligence	V231320448				
6	Open Elective – II	Linear and Digital IC Applications	V231320451	3	0	0	3
		Principles of Communications	V231320452				
		Principles of Signal Processing	V231320453				
		Microprocessors & Microcontrollers	V231320454				
7	Professional Core	VLSI Design Lab	V231320461	0	0	3	1.5
8	Professional Core	Microprocessors & Microcontrollers Lab	V231320462	0	0	3	1.5
9	Skill Enhancement course	Machine Learning Lab	V231320463	0	1	2	2
10	Audit Course	Research methodology and IPR	V2313204C1	2	0	0	-
Total				**20**	**1**	**08**	**23**
Mandatory Industry Internship of 08 weeks duration during summer vacation							

B.TECH –ELECTRONICS AND COMMUNICATION ENGINEERING
(V23 – III[rd] YEAR COURSE STRUCTURE & SYLLABUS)

III Year-I Semester	ANALOG & DIGITAL IC APPLICATIONS (V231310431)	L	T	P	C
		3	0	0	3

Course Outcomes:

CO1: Apply the operational principles and characteristics of op-amps to design and analyze analog circuits such as amplifiers and active filters.(K3: Apply)

CO2: Design waveform generators and comparator circuits using op-amps for signal processing applications.(K4: Analyze)

CO3: Implement and troubleshoot combinational and sequential logic circuits using digital ICs.(K4: Analyze)

CO4: Compare different data conversion techniques (DAC and ADC) and implement digital-to-analog and analog-to-digital conversion circuits in real-time applications.

CO5: Design and interface digital systems using programmable logic devices like PLDs and FPGAs.(K4: Analyze)

UNIT–I

Operational Amplifier: Ideal and Practical Op-Amp, Op-Amp Characteristics, features of 741 Op-Amp, Modes of Operation-Inverting, Non-Inverting, Differential, Instrumentation Amplifier, AC Amplifier, Differentiators and Integrators, Comparators, Schmitt Trigger, Introduction to Voltage Regulators, Features of 723 Regulator.

UNIT-II

Op-Amp, IC-555 & IC565 Applications: Introduction to Active Filters, Characteristics of Band pass, Band reject and All Pass Filters, Analysis of 1st order LPF & HPF Butterworth Filters, Waveform Generators – Triangular, Sawtooth, Square Wave, IC555 Timer-Functional Diagram, Monostable and Astable Operations, Applications, IC565 PLL-Block Schematic, principle and Applications.

UNIT-III

Data Converters: Introduction, Basic DAC techniques, Different types of DACs-Weighted resistor DAC, R-2R ladder DAC, Inverted R-2R DAC, Different Types of ADCs – Parallel Comparator Type ADC, Counter Type ADC, Successive Approximation ADC and Dual Slope ADC, DAC and ADC Specifications.

UNIT-IV

Combinational Logic ICs: Specifications and Applications of TTL-74XX & CMOS 40XX Series ICs - Code Converters, Decoders, Encoders, Priority Encoders, Multiplexers, De-multiplexers, Priority Generators/Checkers, Parallel Binary Adder/Subtractor, Magnitude Comparators.

UNIT-V

Sequential Logic IC's and Memories: Familiarity with commonly available 74XX & CMOS40XX Series ICs - All Types of Flip-flops, Synchronous Counters, Decade Counters, Shift Registers.

TEXT BOOKS:

1. Ramakanth A.Gayakwad-Op-Amps&Linear ICs,PHI,2003.
2. FloydandJain-DigitalFundamentals,8thEd.,Pearson Education,2005.

REFERENCE BOOKS:

1. D.Roy Chowdhury–Linear Integrated Circuits, New Age International(p)

Ltd,2[nd]Ed.,2003.

2. John.F.Wakerly–DigitalDesignPrinciplesandPractices,3[rd]Ed.,Pearson,,2009.
3. Salivahana-Linear Integrated Circuitsand Applications,TMH,2008.
4. WilliamD.Stanley-OperationalAmplifierswithLinearIntegratedCircuits,4[th]Ed.,Pearson Education India, 2009

III Year-I Semester	DIGITAL COMMUNICATIONS (V231310431)	L	T	P	C
		3	0	0	3

Course Outcomes:

CO1:To Describe basic components of Digital Communication Systems and to determine the performance of different pulse digital modulation techniques

CO2:To determine the performance of digital modulation techniques for the generation and digital representation of the signals.

CO3:To design optimum receiver for Digital Modulation techniques and to determine the probability of error for various digital modulation schemes

CO4:To compute and analyze error detecting and error correction codes block codes, cyclic codes.

CO5:To compute and analyze convolution codes and Turbo codes.

UNIT I

PULSE DIGITAL MODULATION: Elements of digital communication systems, advantages of digital communication systems, Elements of PCM: Sampling, Quantization & Coding, Quantization error, Companding in PCM systems. Differential PCM systems (DPCM). Delta modulation, its draw backs, adaptive delta modulation, comparison of PCM and DM systems, noise in PCM and DM systems, Time division multiplexing, Frequency division multiplexing.

UNIT II

DIGITAL MODULATION TECHNIQUES: Introduction, ASK, FSK, PSK, DPSK, DEPSK, QPSK, M-ary PSK, ASK, FSK, similarity of BFSK and BPSK.

UNIT III

DATA TRANSMISSION: Base band signal receiver, probability of error, the optimum filter, matched filter, probability of error using matched filter, coherent reception, non-coherent detection of FSK.

UNIT IV

LINEAR BLOCK CODES: Introduction, Matrix description of Linear Block codes, Error detection and error correction capabilities of Linear block codes, Hamming codes, Binary cyclic codes, Algebraic structure, encoding, syndrome calculation, BCH codes

UNIT V

CONVOLUTION CODES: Introduction, encoding of convolution codes, time domain approach, transform domain approach. Graphical approach: state, tree and trellis diagram decoding using Viterbi algorithm.

TEXT BOOKS:

1. Digital communications - Simon Haykin, John Wiley, 2005
2. Principles of Communication Systems – H. Taub and D. Schilling, TMH, 2003
3. Digital Communications- J.Das, S.K.Mullick, P.K.Chatterjee, John willy & sons, 1986.

RERFERENCES:

1. Digital and Analog Communication Systems - Sam Shanmugam, John Wiley, 2005.
2. Digital Communications – John Proakis, TMH, 1983. Communication Systems Analog & Digital – Singh & Sapre, TMH, 2004
3. Modern Analog and Digital Communication – B.P.Lathi, Oxford reprint, 3rd edition, 2004.

III Year-I Semester	ANTENNAS AND WAVE PROPAGATION (V231310433)	L	T	P	C
		3	0	0	3

Course Outcomes:

CO1: Identify basic antenna parameters.

CO2:Quantify the fields radiated by various types of antennas

CO3:Design and analyze antenna arrays

CO4:Design and analyze wire antennas, loop antennas, reflector antennas, lens antennas, horn antennas and micro-strip antennas

CO5:Analyze antenna measurements to assess antenna's performance

UNIT-I:

ANTENNA FUNDAMENTALS: Introduction, Radiation Mechanism – Single Wire, 2-Wire, dipoles. Antenna Parameters - Radiation Patterns, Patterns in Principal Planes, Field Regions, Main Lobe and Side Lobes, Beam width, Radiation Intensity, Directivity, Antenna Efficiency, Gain, Beam Efficiency, Bandwidth, Polarization, Input Impedance, Beam Area and Resolution, Antenna Apertures, Aperture Efficiency, Effective Height, illustrated Problems.

UNIT-II:

THIN LINEAR WIRE ANTENNAS: Retarded Potentials, Radiation from Small Electric Dipole, Quarter wave Monopole and Half wave Dipole **Radiation Efficiency**, Beam width, Directivity, Effective Area and Effective Height. Natural current distributions, fields and patterns of Thin Linear Center-fed Antennas of different lengths, Radiation Resistance at a point which is not current maximum, Antenna Theorems – Applicability and Proofs for equivalence of directional characteristics, Loop Antennas: Small Loops - Field Components, Comparison of far fields of small loop and short dipole, Concept of short magnetic dipole, D and R_r relations for small loops

UNIT-III:

ANTENNA ARRAYS : 2 element arrays – different cases, Principle of Pattern Multiplication, N element Uniform Linear Arrays – Broadside, End-fire Arrays, EFA with Increased Directivity, Derivation of their characteristics and comparison; Concept of Scanning Arrays. Directivity Relations (no derivations), Related Problems. Binomial Arrays, Effects of Uniform and Non-uniform Amplitude Distributions, Design Relations Arrays with Parasitic Elements, Yagi-Uda Arrays, Folded Dipoles and their characteristics

UNIT-IV

BROADBAND ANTENNAS: Log periodic antenna, Basic principle, Helical Antennas – Significance, Geometry, basic properties; Design considerations for monofilar helical antennas in Axial Mode and Normal Modes (Qualitative Treatment).

UHF AND MICROWAVE ANTENNAS:

Horn Antennas – Types, Optimum Horns, Design Characteristics of Pyramidal Horns; **Paraboloidal Reflectors**: – Geometry, characteristics, types of feeds, F/D Ratio, Spill Over, Back Lobes, Aperture Blocking, Off-set Feeds, Case grain Feeds.

Microstrip Antennas-Introduction, Features, Advantages and Limitations, Rectangular Patch Antennas –Geometry and Parameters, Impact of different parameters on characteristics, illustrated Problems.

UNIT-V

ANTENNA MEASUREMENTS: FRIIS Transmission Equation, Patterns Required, Set Up, Distance Criterion, Directivity and Gain Measurements (Comparison, Absolute and 3-Antenna Methods).

WAVE PROPAGATION: TYPES of propagations. Sky Wave Propagation – Formation of Ionospheric Layers and their Characteristics, Mechanism of Reflection and Refraction, Critical Frequency, MUF and Skip Distance; Space Wave Propagation – Mechanism, LOS and Radio Horizon, Field strength equation, illustrated Problems.

TEXT BOOKS:

1. Antenna Theory: Analysis And Design- Constantine A. Balanis, 3rd Edition, A John Wiley & Sons, Inc., Publication
2. Antennas for All Applications – John D. Kraus and Ronald J. Marhefka, 3rd Edition, TMH, 2003.
3. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd Edition, 2000.

REFERENCES:

1. Antennas and Wave Propagation-G.S.N. Raju, Pearson publications, 2006.
2. Transmission and Propagation – E.V.D. Glazier and H.R.L. Lamont, The Services Text Book of Radio, vol. 5, Standard Publishers Distributors, Delhi.
3. Antennas – John D. Kraus, McGraw-Hill, 2nd Edition, 1988.

B.TECH –ELECTRIONICS AND COMMUNICATION ENGINEERING
(V23 – III[rd] YEAR COURSE STRUCTURE & SYLLABUS)

III Year I Semester	COMPUTER ORGANIZATION AND ARCHITECTURE (V23131C352)	L	T	P	C
		3	0	0	3

Course Outcomes:

CO1:Understand the representation of data, the register transfer language and Micro operations.

CO2:Know the basic computer organization and design, programming the basic computer and design the micro programmer control unit.

CO3:Know the development of central processing unit and explain various algorithms for computer arithmetic operations.

CO4:Interface various Peripheral devices and various data transfer operations.

CO5:Study the memory Hierarchy and different types of memories.

UNIT-1 :

Introduction: Digital Computers, Von Neumann computers, Basic organization of a computer, **Data Representation:** Data types, Complements, Fixed-point representation, Conversion of fractions, Floating-point representation.

Register Transfer and Micro operations: Register transfer language, Register transfer, Bus and Memory transfers, Arithmetic Micro operations, Logic Micro operations, Shift Micro operations, Arithmetic Logic Shift Unit

UNIT-2

Basic Computer Organization and Design: Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference instructions, Input-Output and Interrupt, Complete Computer Description, Design of Basic computer

Programming the Basic Computer: Introduction, Machine Language, Assembly language, The Assembler, Program Loops, Programming Arithmetic and Logic Operations

Micro programmed Control: Control Memory, Address Sequencing, Micro program Example, Design of Control Unit (**Preferably from Reference Book 2**)

UNIT-3

Central Processing Unit: Introduction, General Register Organization, Stack organization, Instruction Formats, Addressing Modes, Data transfer and Manipulation, Program Control, Reduced Instruction Set Computer

Computer Arithmetic: Introduction, Addition and Subtraction, Multiplication Algorithms, Division Algorithms, Floating-Point Arithmetic Operations, Decimal Arithmetic Unit, Decimal Arithmetic Operations.

UNIT – 4

Input-Output organization : Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access (DMA), Input-Output Processor (IOP), Serial Communication.

UNIT– 5

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory, Memory Management Hardware.

Text Book

1. M.Morris Mano," Computer System Architecture," Pearson Publishers, Revised Third Edition

Reference Books

1. John P Hayes, "Computer Architecture and Organization,"Mc-Graw Hill Publishers, Third Edition
2. Carl Hamacher, "Computer Organization," Tata Mc-Graw Hill Publishers, Fifth Edition.

III Year I Semester	ELECTRONIC DEVICES AND CIRCUITS (V231310451)	L	T	P	C
		3	0	0	3

Course Outcomes:

CO1 : Apply the basic concepts of semiconductor physics

CO2 : Understand the formation of p-n junction and how it can be used as a p-n junction as diode in different modes of operation.

CO3 : Know the construction, working principle of rectifiers with and without filters with relevant expressions and necessary comparisons

CO4 : Understand the construction, principle of operation of transistors, BJT and FET with their V-I characteristics in different configurations.

CO5 : Know the need of transistor biasing, various biasing techniques for BJT and FET and stabilization concepts with necessary expressions.

UNIT-I:

Review of SemiConductor Physics: Continuity equation, law of junction, Fermi Dirac function, Fermi level in intrinsic and extrinsic Semiconductors

Junction Diode Characteristics : Energy band diagram of PN junction Diode, Open circuited p-n junction, Biased p-n junction, p-n junction diode, current components in PN junction Diode, diode equation, V-I Characteristics, temperature dependence on V-I characteristics, Diode resistance, Diode capacitance.

UNIT-II:

Special Semiconductor Devices: Zener Diode, Breakdown mechanisms, Zener diode applications, LED, Varactor Diode, Photodiode, Tunnel Diode,

Rectifiers and Filters: Basic Rectifier setup**,** half wave rectifier, full wave rectifier, bridge rectifier, derivations of characteristics of rectifiers, rectifier circuits-operation, input and output waveforms, Filters, Inductor filter(Series inductor), Capacitor filter(Stunt inductor), π-Filter, comparison of various filter circuits in terms of ripple factors.

UNIT- III: Transistor Characteristics:

BJT: Junction transistor, transistor current components, transistor equation, transistor configurations, transistor as an amplifier, characteristics of transistor in Common Base, Common Emitter and Common Collector configurations,

FET: FET types, construction, operation, characteristics.

UNIT- IV: Transistor Biasing and Thermal Stabilization : Need for biasing, operating point, load line analysis, BJT biasing- methods, basic stability, fixed bias, collector to base bias, self bias, Stabilization against variations in V_{BE}, Ic, and β, Stability factors, (S,S',S'').

UNIT- V: Small Signal Low Frequency Transistor Amplifier Models:
BJT: Two port network, Transistor hybrid model, determination of h-parameters, conversion of h-parameters, generalized analysis of transistor amplifier model using h-parameters, Analysis of CB, CE and CC amplifiers using exact and approximate analysis, Comparison of transistor amplifiers.

Text Books:

1. Electronic Devices and Circuits- J. Millman, C. Halkias, Tata Mc-Graw Hill, SecondEdition,2007
2. Electronic Devices and Circuits by David A. Bell, Oxford University Press
3. Electronics devices & circuit theory- Robert L.Boylestad and LouiNashelsky, Pearson/Prentice hall, tenth edition,2009

References:

1. Integrated Electronics-J. Millman, C. Halkias,Tata Mc-Graw Hill, Second Edition,2009
2. Electronic Devices and Circuits-K. Lal Kishore, BS Publications, Fourth Edition,2016.

III Year-I Semester	ANALOG AND DIGITAL IC APPLICATIONS LAB (V231310461)	L	T	P	C
		0	0	3	1.5

PART-A: (Minimum **SIX** Experiments to be conducted):

1. OP AMP Applications – Adder, Subtractor, Comparator Circuits.
2. Integrator and Differentiator Circuits using IC 741.
3. Active Filter Applications – LPF, HPF (first order)
4. Active Filter Applications – BPF, Band Reject (Wideband) and Notch Filters.
5. IC 741 Oscillator Circuits – Phase Shift and Wien Bridge Oscillators.
6. Function Generator using OP AMPs.
7. IC 555 Timer – Astable & Mono-stable Operation Circuit.
8. Schmitt Trigger Circuits – using IC 741 and IC 555.
9. IC 565 – PLL Applications.
10. IC 566 – VCO Applications.
11. 4 bit DAC using OP AMP.

Equipment required for Laboratories:
1. RPS
2. CRO
3. Function Generator
4. Multi Meters
5. IC Trainer Kits (Optional)
6. Bread Boards
7. Components:- IC741, IC555, IC565, IC1496, IC723, 7805, 7809, 7912 etc.
8. Analog IC Tester

PART-B: (Minimum **SIX** Experiments to be conducted):

The students are required to design and draw the internal structure of the following Digital Integrated Circuits and to develop HDL(VHDL, Verilog HDL) source code, perform simulation using relevant simulator and analyze the obtained simulation results using appropriate synthesizer. Further, it is required to verify the logic with necessary hardware.

List of Experiments:

1. Realization of Logic Gates
2. 3 to 8 Decoder- 74138
3. 8*1 Multiplexer-74151 and 2*1 De-multiplexer-74155
4. 4-Bit Comparator-7485.
5. D Flip-Flop- 7474
6. Decade Counter- 7490
7. Universal shift register-74194/195
8. RAM (16*4)-74189 (read and write operations)

Equipment Required:
1.Xilinix Vivado/Equivalent Standard IDE
2. Personal computer with necessary peripherals
3.Hardware kits- Various FPGA families.

III Year-I Semester	ANALOG AND DIGITAL COMMUNICATIONS LAB (V231310462)	L	T	P	C
		0	0	3	1.5

List of Experiments:

(Fourteen experiments to be done-**The students have to calculate the relevant parameters**)–

(a. Hardware, b. MATLAB Simulink c. MATLAB Communication toolbox)

Part-A

1. Amplitude Modulation-Modulation & Demodulation
2. AM-DSBSC-Modulation & Demodulation
3. Diode Detector
4. Pre-emphasis & De-emphasis
5. Frequency Modulation-Modulation & Demodulation
6. Verification of Sampling Theorem
7. Pulse Amplitude Modulation & Demodulation
8. PWM,PPM–Modulation & Demodulation

Part-B

1. Time division multiplexing.
2. Frequency Division Multiplexing
3. Pulse code modulation.
4. Differential pulse code modulation.
5. Delta modulation.
6. Frequency shift keying.
7. Phase shift keying.
8. Differential phase shift keying.
9. Companding
10. Source Encoder and Decoder
11. Linear Block Code-Encoder and Decoder and Binary Cyclic Code–Encoder and Decoder
12. Convolution Code–Encoder and Decoder

Note: All the above experiments are to be executed/completed using hardware boards and also to be simulated on Mat lab.

Equipment &

Software required:

Software:

i) Computer Systems with latest specifications
ii) Connected in LAN(Optional)
iii) Operating system(Windows/Linux software)
iv) Simulations software(Simulink &MATLAB)

Equipment:

1. RPS -0 –30V
2. CRO -0–20MHz.
3. Function Generators -0–1MHz
4. Components and Breadboards
5. Multi meters and other meters

III Year-I Semester	APPLICATIONS OF LAB VIEW FOR INSTRUMENTATION & COMMUNICATIONS (V231310463)	L	T	P	C
		0	1	2	2

Course Outcomes:

- **CO1** : Develop loops, case structures, arrays, and clusters.
- **CO2** : Realize real time applications using NI DAQ hardware
- **CO3** : Implement Coding techniques using LabVIEW
- **CO4** : Design automation and process control application
- **CO5** : Apply LabVIEW for data processing applications

Unit I:

Introduction to LabVIEW & Virtual Instrumentation: Overview of LabVIEW: Graphical programming paradigm, LabVIEW Environment: Front panel, block diagram, data flow programming, Creating simple Virtual Instruments (VIs), Debugging and troubleshooting techniques, Implementing loops, case structures, arrays, and clusters.

Unit II:

Data Acquisition & Signal Processing: Interfacing sensors (temperature, pressure, light, etc.) with LabVIEW, Real-time data acquisition using NI DAQ hardware, Signal generation: Sine, Square, Triangular waves, Fourier Transform (FFT) for frequency analysis, Filtering techniques: Low-pass, High-pass, Band-pass filters.

Unit III:

Communication System Implementation: AM and FM Modulation/Demodulation using LabVIEW, Simulation of Digital Modulation Schemes (ASK, PSK, FSK), Eye diagrams and constellation plots for digital signals, Error detection and correction: Parity, CRC, Hamming Code.

Unit IV: Instrumentation & Automation Applications:

Real-time data logging and file handling (Excel/CSV), PID Controller Design for automation and process control, Motor speed control using LabVIEW and DAQ, Signal visualization and user interface design.

Unit V: Advanced Applications:

Image Processing using LabVIEW, Wireless communication using Bluetooth & Wi-Fi in LabVIEW, IoT Integration-Cloud-based monitoring and remote data access, Project-based learning-

Textbooks & References

1. R. W. Larsen, LabVIEW for Engineers, 1st ed., Prentice Hall, 2011.
2. G. W. Johnson and R. Jennings, LabVIEW Graphical Programming, 4th ed., McGraw-Hill, 2017.
3. National Instruments, "LabVIEW Tutorials & Documentation," Available: https://www.ni.com.J. Jerome, Virtual Instrumentation Using LabVIEW, 1st ed., PHI Learning Pvt.,

III Year-I Semester	DESIGN OF PCB & ANTENNAS LAB (V231310464)	L	T	P	C
		0	0	2	1

Merits of PCB Machine:

1. CNC based for Better Accuracy and results.
2. Etching, Engraving and Drilling can be done with same Machine
3. Maintenance free machine compared to chemical method.
4. Compatible with multiple software Gerber / G code.
5. Reduction of time and Inventory.
6. Height mapping for bed level and depth sensing.
7. Surface mapping of bed
8. Power Optimized system ability to run on ups systems unlike other Machines.
9. High precision lead screw
10. 5umeter resolution, 0.001 repeatability, 2 layer with FR4
11. Scalability from a single prototype to a batch of 10-50 PCBs.

Scope of learning:

1. In house PCB proto type manufacturing process.
2. How to convert simulation results into real time Electronic boards/ Projects.
3. Designing according to project requirements.
4. Along with PCB other Multi materials support carbon fiber sheets, Drone frames, Engraved
5. Acrylic sheets. Engraving on aluminium.
6. Latest multi domain projects extension 3D printing and Additive Manufacturing.
7. Exposure to design the proto type products.

ANTENNAS LAB:

List of experiments: (Any Ten experiments using any simulation software)

1. Generation of EM-Wave
2. Impedance Matching using Smith Chart
3. Calculation of phase and group velocity calculation
4. Plot of Radiation pattern of dipole antenna
5. Plot of Radiation pattern of monopole antenna
6. Plot of Radiation pattern of Uniform Linear Array
7. Measurement of radiation pattern of all wired and aperture antennas
8. Measurement of radiation pattern of planar antennas
9. Measurement of radiation pattern of reflector antennas
10. Measurement of radiation pattern of array antennas
11. Analysis of co-polarization and cross polarization
12. Performance analysis of Yagi -Uda antenna
13. Performance analysis of Helix antenna
14. Radio wave propagation path loss calculations

B.TECH –ELECTRIONICS AND COMMUNICATION ENGINEERING
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III Year-I Semester INTERNSHIP	EVALUATION OF COMMUNITY SERVICE INTERNSHIP **(V23131CC81)**	**L**	**T**	**P**	**C**
		--	**--**	**--**	**2**

III Year II Semester	VLSI DESIGN (V231320431)	L	T	P	C
		3	0	0	3

Course Outcomes:

CO1:Demonstrate a clear understanding of CMOS fabrication flow and technology scaling.

CO2:Design MOSFET based logic circuit.

CO3:Design basic building blocks in Analog IC design.

CO4:Design various CMOS logic circuits for design of Combinational logic circuits.

CO5:Analyze the behavior of static and dynamic logic circuits

UNIT-I:

INTRODUCTION AND BASIC ELECTRICAL PROPERTIES OF MOS CIRCUITS: VLSI Design Flow, Introduction to IC technology, Fabrication process: nMOS, pMOS and CMOS. I_{ds} versus V_{ds} Relationships, Aspects of MOS transistor Threshold Voltage, MOS transistor Trans, Output Conductance and Figure of Merit. nMOS Inverter, Pull-up to Pull-down Ratio for nMOS inverter driven by another nMOS inverter, and through one or more pass transistors. Alternative forms of pull-up, The CMOS Inverter, Latch-up in CMOS circuits, Bi-CMOS Inverter, Comparison between CMOS and BiCMOS technology, MOS Layers, Stick Diagrams, Design Rules and Layout, Layout Diagrams for MOS circuits

UNIT-II:

BASIC CIRCUIT CONCEPTS: Sheet Resistance, Sheet Resistance concept applied to MOS transistors and Inverters, Area Capacitance of Layers, Standard unit of capacitance, some area Capacitance Calculations, The Delay Unit, Inverter Delays, driving large capacitive loads, Propagation Delays, Wiring Capacitances, Choice of layers.

SCALING OF MOS CIRCUITS: Scaling models and scaling factors, Scaling factors for device parameters, Limitations of scaling, Limits due to sub threshold currents, Limits on logic levels and supply voltage due to noise and current density.

UNIT-III:

BASIC BUILDING BLOCKS OF ANALOG IC DESIGN: Regions of operation of MOSFET, Modelling of transistor, body bias effect, biasing styles, single stage amplifier with resistive load, single stage amplifier with diode connected load, Common Source amplifier, Common Drain amplifier, Common Gate amplifier, current sources and sinks.

UNIT-IV:

CMOS COMBINATIONAL AND SEQUENTIAL LOGIC CIRCUIT DESIGN:

Static CMOS Design: Complementary CMOS, Rationed Logic, Pass-Transistor Logic, design of Half adder, full adder, multiplexer, decoder.**Dynamic CMOS Design:** Dynamic Logic-Basic Principles, Speed and Power Dissipation of Dynamic Logic, Issues in Dynamic Design, Cascading Dynamic Gates, Design examples of sequential circuits: Cross coupled NAND and NOR flipflops, D flipflop, SR JK flip flop, SR Master Slave flip flop.

UNIT-V:

FPGA DESIGN: FPGA design flow, Basic FPGA architecture, FPGA Technologies, Introduction to FPGA Families.

INTRODUCTION TO ADVANCED TECHNOLOGIES: Giga-scale dilemma, Short channel effects, High–k, Metal Gate Technology, FinFET, TFET.

TEXTBOOKS:

1. Essentials of VLSI Circuits and Systems - Kamran Eshraghian, Douglas and A. Pucknell
2. And Sholeh Eshraghian, Prentice-Hall of India Private Limited, 2005 Edition.
3. Design of Analog CMOS Integrated Circuits by Behzad Razavi, McGraw Hill, 2003
4. Digital Integrated Circuits, Jan M. Rabaey, Anantha Chandrakasan and Borivoje Nikolic, 2nd edition,2016.

REFERENCES:

1. “Introduction to VLSI Circuits and Systems”, John P. Uyemura, John Wiley & Sons, reprint 2009.
2. Integrated Nanoelectronics: Nanoscale CMOS, Post-CMOS and Allied Nanotechnologies Vinod Kumar Khanna, Springer India, 1st edition, 2016.
3. FinFETs and other multi-gate transistors, ColingeJP, Editor New York, Springer,2008.

III Year II Semester	MICROPROCESSOR AND MICROCONTROLLERS (V231320432)	L	T	P	C
		3	0	0	3

Course Outcomes:

CO1 : Understand the architecture of 8086 and its operation.

CO2 : Develop the students to compose the assembly language program for 8086

CO3 : Applying 8086 processor to interface with necessary peripherals.

CO4 : Understand the architecture of 8051 and interfacing with necessary peripherals

CO5 : Understand the introductory concepts of advanced processors, viz., ARM processors.

Unit -I

Introduction: Basic Microprocessor architecture, Harvard and Von Neumann architectures with examples, Microprocessor Unit versus Microcontroller Unit, History and classifications of Microprocessor and Microcontroller.

8086 Architecture: register organization, internal architecture of 8086, pin description of 8086, minimum mode and maximum mode of 8086 operation and timing diagrams.

Unit -II

8086 Programming: instruction set, addressing modes, assembler directives, programming with an assembler, writing simple programs with an assembler, stack and stack structure, interrupts and interrupt service routines 8086 system.

Unit -III

8086 Interfacing: Semiconductor memories interfacing (RAM, ROM), Intel 8255 programmable peripheral interface, Interfacing switches and LEDS, Interfacing seven segment displays, Intel 8251 USART architecture and interfacing, Intel 8237a DMA controller, stepper motor, A/D and D/A converters, Need for 8259 programmable interrupt controllers.

Unit -IV

Intel 8051 MICROCONTROLLER and Interfacing

Architecture, Hardware concepts, Input/output ports and circuits, external memory, counters/timers, serial data input/output, interrupts. Assembly language programming: Instructions, addressing modes, simple programs. Interfacing to 8051: A/D and D/A Convertors, Stepper motor interface, keyboard, LCD Interfacing, Traffic light control.

Unit -V

ARM Architectures and Processors:

Introduction to CISC and RISC architectures, ARM Architecture, ARM Processors Families, ARM Cortex-M Series Family, ARM Cortex-M3 Processor Functional Description, Instruction set summary, System address map, write buffer, bit-banding. Programmers Model – Modes of operation and execution, stack pointer, exceptions and interrupt handling.

ARM Cortext-M3 programming – Software delay, Programming techniques, Loops, Stack and Stack

pointer, subroutines and parameter passing, parallel I/O, Nested Vectored Interrupt Controller– functional description and NVIC programmers' model.

TEXTBOOKS:

1. Advanced microprocessors and peripherals by K. M. Bhurchandi, A. K. Ray 3e
2. The 8051 Microcontrollers and Embedded systems Using Assembly and C, Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D.McKinlay; Pearson 2-Edition,2011.
3. TheDefinitiveGuidetoARMCortex-M3andCortex-M4ProcessorsbyJosephYiu.,Newnes Third edition.

REFERENCEBOOKS:

1. Embedded Systems Fundamentals with Arm Cortex-M based Microcontrollers: A Practical Approach in English, by Dr. Alexander G. Dean, Published by Arm EducationMedia,2017.
2. Cortex-M3TechnicalReference Manual.

III Year II Semester	DIGITAL SIGNAL PROCESSING (V231320433)	L	T	P	C
		3	0	0	3

Course Outcomes:

- **CO1 :** Understand the concepts of discrete signals and discrete systems with its characteristics
- **CO2 :** Calculate z-Transform, Fourier Transform, Discrete Fourier Transform of discrete signals.
- **CO3 :** Understand the algorithms for the efficient computation of DFT coefficients of signals
- **CO4 :** Design the FIR and IIR filters.
- **CO5 :** Know the architectures of various DSP processors and its addressing modes, assembly language instructions.

UNIT-1:

Introduction: Signals, Systems, and Signal Processing, Classification of Signals, The Concept of Frequency in Continuous Time and Discrete Time Signals

Discrete Time Signals and Systems: Discrete Time Signals, Discrete Time Systems, Analysis of Discrete Time Linear Time Invariant Systems, Discrete Time Systems Described by Difference Equations, Implementation of Discrete Time Systems, Correlation of Discrete Time Signals.

Frequency Analysis of Signals: Frequency Analysis of Continuous Time Signals, Frequency Analysis of Discrete Time Signals, Frequency Domain and Time Domain Signal Properties, Properties of the Fourier Transform for Discrete Time Signals. **Frequency Domain Analysis of LTI Systems:** Frequency domain characteristics of LTI systems, Frequency response of LTI systems.

UNIT-2:

The z-Transform and Its Applications to the Analysis of LTI Systems: The z-Transform, Properties, Rational z Transforms, Inversion of the z-Transform, Analysis of Linear Time Invariant Systems in the z-Domain, The One sided z-Transform. (**Review only for entirez – Transform topic**).

The Discrete Fourier Transform: Its Properties and Applications: Frequency Domain Sampling: The Discrete Fourier Transform, Properties of the DFT, Linear Filtering Methods Based on the DFT, Frequency Analysis of Signals Using DFT

UNIT-3:

Efficient Computation of the DFT: Fast Fourier Transform Algorithms: Direct Computation of the DFT, Radix-2 FFT Algorithms.

Implementation of Discrete Time Systems: Structures for the Realization of Discrete Time Systems, **Structures for FIR Systems**: Direct Form Structure, Cascade Form Structures, Frequency Sampling Structures.

Structures for IIR Systems: Discrete Form Structures, Signal Flow Graphs and Transposed Structures, Cascade Form Structures, Parallel Form Structures.

UNIT-4:

Design of Digital Filters: General Considerations: Causality and Its Implications, Characteristics of Practical Frequency Selective Filters.

Design of FIR Filters: Symmetric and Antisymmetric FIR Filters, Design of Linear Phase FIR Filters Using Windows, Design of Linear Phase FIR Filters by the Frequency Sampling Method.

Design of IIR Filters From Analog Filters: IIR Filter Design by Approximation of Derivatives, IIR

UNIT-5:

Introduction to programmable DSPs: Multiplier and Multiplier Accumulator, Modified bus structures and memory access schemes in P-DSPs ,Multiple Access Memory, Multiported memory, VLIW architecture, Pipelining, Special addressing modes, On-Chip Peripherals.

Architecture of TMS320C5X: Introduction, Bus Structure, Central Arithmetic Logic Unit, Auxiliary Register ALU, Index Register, Auxiliary Register Compare Register, Block Move Address Register, Block Repeat Registers, Parallel Logic Unit, Memory mapped registers, program controller, some flags in the status registers, On- chip memory, On-chip peripherals.TMS320C5X Assembly Language Instructions.

TEXT BOOKS:

1. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, DimitrisG.M
4[th] Edition, Pearson Education, 2007.
2. Digital Signal Processors – Architecture, Programming and Applications,,B.Venkataramani, M.Bhaskar, TATA McGraw Hill, 2002

Filter Design by Impulse Invariance, IIR Filter Design by the Bilinear Transformation.

Frequency Transformations: Frequency Transformations in the Analog Domain, Frequency Transformations in the Digital Domain.

Reference Books:

1. Discrete Time Signal Processing – A.V.Oppenheim and R.W. Schaffer, 3[rd] Edition, Pearson, 2014.
2. Digital Signal Processing-P. Ramesh Babu, 5[th] Edition, SCITECHPublishers.

III Year II Semester	MACHINE LEARNING(PE-2) (V231320444)	L	T	P	C
		3	0	0	3

Course Outcomes:

CO1:Define machine learning and its different types and understand their applications.
CO2:Explain the various techniques involved in pre-processing of data for Data Analysis
CO3:Apply various supervised learning algorithms including decision trees and k-nearest neighbours (k-NN) etc.
CO4:Implement unsupervised learning techniques, viz., K-means clustering etc.
CO5:Learn about various performance metrics and explore them in various applications of implementing Machine learning Algorithms.

UNIT-I: Introduction to Machine Learning:

What is Machine Learning?, Traditional programming approach vs Machine learning approach, History and Evolution of Machine Learning, **Paradigms for ML** - Supervised ML, Unsupervised ML, Reinforcement ML, **Datatypes in ML** - Quantitative data (Continuous, Discrete), Qualitative data (Structured, Semi structured, Unstructured), Nominal data, Ordinal data, Interval data, Ratio data, Stages involved in Machine Learning, Main challenges of ML, Applications of Machine Learning, **IDE's for ML Programming** - Jupyter Notebook, Spyder, PyCharm, Google Colab, R Studio, VS Code, **Basic packages to deal with ML** - Numpy, Scipy, Pandas, Scikit-learn, Matplotlib, Seaborn, **Programming Languages for Machine Learning** - Python, Java, R, JavaScript, C++

UNIT - II: Explorative Data Analysis (EDA):

What is EDA? Why EDA is important?, **Types of EDA** - Univariate Analysis, Bivariate Analysis, Multivariate Analysis, **Data Cleaning** - Data Acquisition,Analyzing the data Dealing with duplicate data, Dealing with missing values, Dealing with outliers **Scaling and Transformations** - Feature Scaling and Transformation, Univariate nonlinear Transformations, **Dimensionality Reduction** - Principal Component Analysis (PCA),**Feature Engineering** - Handling Categorical attributes (One-Hot-Encoding), **Feature Expansion** - Interactions and Polynomials, **Automatic Feature Selection** - Univariate Statistics, Model-Based Feature Selection, Iterative Feature Selection

UNIT-III: Supervised Machine Learning:

What is Supervised Machine Learning?, General architecture of Supervised ML, **Types of Supervised ML** - Classification and Regression, **Different Classification Algorithms** - K-Nearest Neighbor (KNN) Classifier, Linear Models, Logistic Regression, Naive Bayes Classifiers, Decision Tree Classifier, **Ensemble learning and Decision Trees** - Random Forests, AdaBoost, Gradient Boosting, Stacking, Support Vector Classifier (SVC)Neural Networks, **Different Regression Algorithms** - K-Neighbors Regressor, Linear Regression, Ridge Regression, Support Vector Regressor (SVR), Decision Tree Regressor, Random Forest Regressor

UNIT-IV: Unsupervised Machine Learning –

What is Unsupervised Machine Learning?, General architecture of Unsupervised Machine Learning, Challenges in Unsupervised ML, **Clustering** - Introduction to Clustering, Soft clustering vs Hard Clustering, K-Means Clustering algorithm, Centroid-based clustering algorithm, Divisive Clustering and Agglomerative Clustering, DBSCAN

UNIT V- Model Evaluation metrics, Fine tuning the model and Visualizations -
Evaluation Metrics for Classification - Confusion Matrices, Accuracy, Precision, Recall, F1-Score, Precision-recall curves, ROC (Receiver Operating Characteristics) curves, Confusion Matrix, **Evaluation Metrics for Regression** - R^2, Mean Squared Error (MSE), Mean Absolute Error (MAE), Root Mean Squared Error (RMSE), **Evaluation Metrics for clustering** - Adjusted Random Index (ARI), Normalized Mutual Information (NMI), **Cross Validation -** Cross-Validation in scikit-learn, benefits of cross-validation, stratified k-fold cross validation, **Grid Search**- Simple Grid search, Grid search with cross validation, Randomized search, **Visualization** - Univariate Analysis (Bar plot, Box plot, Count plot, Density plot, Histogram, Pieplot), Bivariate Analysis (Pair plot, Scatter plot, Bar plot, Stacked barplot, Multivariate Analysis (Heat Maps)

Text Books:

1. "Introduction to Machine Learning with Python", Andreas C.Muller&Sarah Guido, O'Reilly Publications
2. "Hands-on Machine Learning with Scikit-Learn, Keras& TensorFlow", Aurelien Geron, O'Reilly Publications
1. "Machine Learning Theory and Practice", M N Murthy, V S Ananthanarayana, Universities Press (India), 2024

Reference Books:

1. "Machine Learning", Tom M. Mitchell, McGraw-Hill Publication, 2017
2. "Machine Learning in Action",Peter Harrington, DreamTech
3. "Introduction to Data Mining", Pang-Ning Tan, Michel Stenbach, Vipin Kumar, 7th Edition, 2019.

III Year II Semester	EMBEDDED SYSTEMS (PE-3) (V231320447)	L	T	P	C
		3	0	0	3

Course Outcomes:

CO1 : Know basics of embedded system, classification, memories, different communication interface and what embedded firmware is and its role in embedded system, different system components.

CO2 : Distinguish all communication devices in embedded system, other peripheral device.

CO3 : DistinguishconceptsofCversusembeddedCandcompilerversuscross-compiler.

CO4 : Choose an operating system, and learn how to choose an RTOS

Unit-I:

Introduction: Embedded System-Definition, History, Classification, application areas and purpose of embedded systems, The typical embedded system-Core of the embedded system, Memory, Sensors and Actuators, Communication Interface, Embedded firmware, PCB and passive components. Characteristics, Quality attributes of an Embedded systems, Application-specific and Domain-Specific examples of an embedded system, Main processing elements of embedded system, hardware and software partitions.

Unit-II:

Embedded Hardware Design: Analog and digital electronic components, I/O types and examples, Serial communication devices, Parallel device ports, Wireless devices, Timer and counting devices, Watch dog timer, Real time clock.

Unit-III:

Embedded Firmware Design: Embedded Firmware design approaches, Embedded Firmware development languages, ISR concept, Interrupt sources, Interrupt servicing mechanism, Multiple interrupts, DMA, Device driver programming, Concepts of C versus Embedded C and Compiler versus Cross-compiler.

Unit-IV:

Real Time Operating System: Operating system basics, Types of operating systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Threads, Processes and Scheduling, Task Scheduling, Communication, Synchronization, Device Drivers, How to choose an RTOS. Electronics and Communication Engineering.

Hardware Software Co-Design: Fundamental Issues in Hardware Software Co-Design, Computational models in embedded design, Hardware software Trade-offs, Integration of Hard ware and Firm ware, ICE.

Unit-V:

Embedded System Development: The integrated development environment, Types of files generated on cross-compilation, Dissembler/De-compiler, Simulators, Emulators and Debugging, Target hardware debugging, Boundary Scan, Embedded Software development process and tools.

Embedded System Implementation And Testing: The main software utility tool, CAD and the hardware, Translation tools-Pre-processors, Interpreters, Compilers and Linkers, Debugging tools, Quality assurance and testing of the design, Testing on hostmachine, Simulators, Laboratory Tools. Test and evolution of an embedded systems (Build in selftest etc).

Case study-typical embedded system design flow with an example.

Text Books:

1. Embedded Systems Architecture By Tammy Noergaard, Elsevier Publications,2005
2. Embedded System Design, Frank Vahid,Tony Givargis, John Wiley Publications.

References:

1. Embedding system building blocks By Labrosse,CMP publishers.

III Year II Semester	PRINCIPLES OF COMMUNICATIONS(OE-2) (V231320452)	L	T	P	C
		3	0	0	3

Course Outcomes:

CO1 : Analyze the performance of analog modulation schemes in time and frequency domains. Analyze the performance of angle modulated signals.

CO2 : Characterize analog signals in time domain as random processes and noise

CO3 : Characterize the influence of channel on analog modulated signals

CO4 : Determine the performance of analog communication systems in terms of SNR

CO5 : Analyze pulse amplitude modulation, pulse position modulation, pulse code modulation and TDM systems.

UNIT1 : Basic tools for communication, Fourier Series/Transform, Properties, Autocorrelation, Energy Spectral Density, Parsevals Relation, Amplitude Modulation (AM), Spectrum of AM, Envelope Detection, Power Efficiency, Modulation Index.

UNIT2 : Double Sideband Suppressed Carrier (DSB-SC) Modulation, Demodulation, Costas Receiver, Single Sideband Modulation (SSB), Hilbert Transform, Complex Pre-envelope/ Envelope, Demodulation of SSB, Vestigial Sideband Modulation (VSB)

UNIT 3 : Angle Modulation, Frequency Modulation (FM), Phase Modulation (PM), Modulation Index, Instantaneous Frequency, Spectrum of FM Signals, Carsons Rule for FM Bandwidth, Narrowband FM Generation, Wideband FM Generation via Indirect Method, FM Demodulation

UNIT 4 : Introduction to Sampling, Spectrum of Sampled Signal, Aliasing, Nyquist Criterion, Signal Reconstruction from Sampled Signal, Pulse Amplitude Modulation**,** Quantization, Uniform Quantizers – Midrise and Midtread, Quantization noise, , Non uniform Quantizers, Delta Modulation, Differential Pulse Code Modulation (DPCM)

UNIT 5: : Basics of Probability, Conditional Probability, MAP Principle, Random Variables, Probability Density Functions, Applications in Wireless Channels, Basics of Random Processes ,Gaussian Random Process, Noise.

TEXTBOOKS:

1. Simon Haykin, Communications Systems, 4th Edition. John Wiley and Sons, Inc
2. Fundamentals of Wireless Communication by David Tse

III Year II Semester	VLSI DESIGN LAB(V231320461)	L	T	P	C
		0	0	3	1.5

Laboratory Objective

The objective of this laboratory course is to enable students to design, simulate, and implement CMOS-based digital and analog circuits using industry-standard Electronic Design Automation (EDA) tools. Students are expected to develop a comprehensive understanding of schematic capture, layout design, and verification methodologies as per current CMOS technology standards.

List of Experiments:

Students shall design the schematic diagrams using CMOS logic, generate corresponding layout diagrams, and perform simulation and analysis using the latest CMOS process technology with the aid of **professional-grade EDA tools (Cadence/Synopsys/Mentor Graphics/Tanner/Microwind or any Industry Standard EDA Tools)**.

The following experiments shall be carried out:

1. Design and implementation of an inverter
2. Design and implementation of universal gates
3. Design and implementation of full adder
4. Design and implementation of full Subtractor
5. Design and implementation of RS-latch
6. Design and implementation of D-latch
7. Design and implementation asynchronous counter
8. Design and Implementation of static RAM cell
9. Design and Implementation of differential amplifier
10. Design and Implementation of ring oscillator

Equipment Required:

1. Cadence/Synopsys/Mentor Graphics/Tanner/Microwind or any Industry Standard EDA Tools
2. Personal computer with necessary peripherals.

B.TECH –ELECTRIONICS AND COMMUNICATION ENGINEERING
(V23 – III[rd] YEAR COURSE STRUCTURE & SYLLABUS)

III Year- II Semester	MICROPROCESSOR AND MICROCONTROLLERS LAB (V231320462)	L	T	P	C
		0	0	3	1.5

List of Experiments:

PART- A: (Minimum of 5 Experiments has to be performed) 8086 Assembly Language Programming and Interfacing

1. Programs for 16 -bit arithmetic operations (using Various Addressing Modes).
   a. Addition and subtraction of n-BCD numbers.
   b. Multiplication and Division operations.
   c. Addition of an array of numbers with overflow detection.
2. Program for sorting an array.
3. Program for Factorial of given n-numbers.
4. Interfacing ADC to8086
5. Interfacing DAC to8086.
6. Interfacing stepper motor to8086.
7. Interfacing Seven-Segment display to 8086
8. Keyboard interface with 8086

PART-B: (Minimum of 5 Experiments has to be performed) 8051 Assembly Language Programming and Interfacing

1. Finding number of 1's and number of 0's in a given 8-bit number
2. Average of n-numbers.
3. Program and verify Timer/ Counter in8051.
4. Interfacing Traffic Light Controller to8051.
5. UART operation in8051
6. Interfacing LCD to8051.
7. Interfacing temperature sensor (LM 35) with 8051
8. Stepper motor control with 8051

PART-C (Minimum of 2 Experiments has to be performed) Conduct the following experiments using ARM CORTEX M3 PROCESSOR USING KEIL MDK ARM

1. Write an assembly program to multiply of 2 16-bit binary numbers.
2. Write an assembly program to find the sum of first 10 integers numbers.
3. Write a program to toggle LED every second using timer interrupt.
4. PWM signal generation
5. Analog signal measurement (ADC)
6. Interfacing with serial communication (UART)

Equipment Required:

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. 8086 Microprocessor kits
4. 8051 microcontroller kits
5. ADC module, DAC module
6. Stepper motor module
7. Key board module

8. LED, 7-SegemtUnits, LCD display modules
9. Temperature sensor module
10. Digital Multimeters
11. ROM/RAM Interface module
12. Bread Board etc.
13. ARM CORTEX M3
14. KEIL MDKARM, Digital Multi-meters

III Year II Semester	MACHINE LEARNING LAB (V231320463)	L	T	P	C
		0	1	2	2

Course Outcomes:

CO1:Understand the need for simulation/implementation for the verification of mathematical functions
CO2:Understand the main features of the SCILAB program development environment to enable their usage in the higher learning.
CO3:Implement simple mathematical functions/equations in numerical computing environment such as SCILAB
CO4:Interpret and visualize simple mathematical functions and operations thereon using plots/display
CO5:Analyze the program for correctness and determine/estimate/predict the output and verify it under simulation environment using SCILAB tools & Develop graphs by running Scilab programs

UNIT-1:
The Fundamentals of Machine Learning, Learning from experience, Machine learning tasks, Training data and test data, Performance measures, bias, and variance, An introduction to scikit-learn ,Installing scikit-learn **,Installing scikit-learn on Windows, Installing scikit-learn on Linux ,Installing scikit-learn on OS X, Verifying the installation,** Installing pandas and matplotlib
Linear Regression: Simple linear regression, **Evaluating the fitness of a model with a cost function ,Solving ordinary least squares for simple linear regression,** Evaluating the model, Multiple linear regression, Polynomial regression, Regularization, Applying linear regression, **Exploring the data, Fitting and evaluating the model,** Fitting models with gradient descent

UNIT -2:
Extracting features from categorical variables, Extracting features from text, The bag-of-words representation, Stop-word filtering, Stemming and lemmatization, Extending bag-of-words with TF-IDF weights, Space-efficient feature vectorizing with the hashing trick, Extracting features from images, Extracting features from pixel intensities, Extracting points of interest as features ,SIFT and SURF, Data standardization
Binary classification with logistic regression, Spam filtering, Binary classification performance metrics, Accuracy, Precision and recall ,Calculating the F1 measure, ROCAUC, Tuning models with grid search, Multi-class classification, Multi-class classification performance metrics, Multi-label classification and problem transformation**,** Multi-label classification performance metrics.

UNIT -3:
Decision trees ,Training decision trees, Selecting the questions, Information gain, Giniimpurity, Decision trees with scikit-learn, Treeensembles, The advantages and disadvantages of decision trees.Clustering with the K-Means algorithm, Localoptima, The elbow method, Evaluating clusters, Image quantization, Clustering to learn features

UNIT -4:
An overview of PCA ,Performing Principal Component Analysis, Variance, Covariance, and Covariance Matrices, Eigenvectors and eigen values, Dimensionality reduction with Principal Component Analysis ,Using PCA to visualize high-dimensional data, Face recognition with PCA

UNIT -5:

Kernels and the kernel trick, Maximum margin classification and support vectors, Classifying characters in scikit-learn, Classifying handwritten digits, Classifying characters in natural images Nonlinear decision boundaries, Feed forward and feedback artificial neural networks, Multi layer perceptron, Minimizing the cost function, Forward propagation, Back propagation, Approximating XOR with Multilayer perceptron, Classifying handwritten digits

TEXT BOOKS

1. Mastering Machine Learning with scikit-learn, Gavin Hackeling,Packt Publishing

REFERENCE BOOKS

1. Hands-On Machine Learning with Scikit-Learn and TensorFlow, Aurélien Géron

III Year II Semester	RESEARCH METHODOLOGY AND IPR (V2313204C1)	L	T	P	C
		2	0	0	0

Course Outcomes:

CO1:Understand research problem formulation.

CO2:Analyze research related information, Follow research ethics

CO3:Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.

CO4:Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.

CO5:Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

Unit 1 :
Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem, Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations.

Unit 2:
Effective literature studies approaches, analysis Plagiarism, Research ethics, Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee.

Unit 3:
Nature of Intellectual Property: Patents, Designs, Trademarks and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

Unit 4:
Patent Rights: Scope of Patent Rights, Licensing and transfer of technology, Patent information and databases, Geographical Indications.

Unit 5:
New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc, Traditional knowledge Case Studies, IPR and IITs

TEXT BOOKS
1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science& engineering students'".
2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"

REFERENCE BOOKS

1. Ranjit Kumar, 2nd Edition , "Research Methodology: A Step by Step Guide for beginners"
2. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd,2007.
3. Mayall , "Industrial Design", McGraw Hill,1992.

B.TECH –ELECTRIONICS AND COMMUNICATION ENGINEERING
(V23 – III[rd] YEAR COURSE STRUCTURE & SYLLABUS)

HONORS:

The following points may be considered to choose appropriate theory and laboratories to obtain B.Tech (Honors).

- The Student has to opt for any of the Six subjects / Five Theory and Two laboratories with the approval of the University BoS Chairman.
- Further, if any of these subjects are opted as Open Electives or Program Electives then such Subjects should not be considered to obtain the B.Tech (Honors).
- The Student can opt for the NPTEL/SWAYAM online Courses with 12 weeks/16 weeks duration and also with Proctored Examinations.
- Further, the student has to take permission for such NPTEL/SWAYAM Courses from the University BoS Chairman.
- In addition to the program elective given in Regular Courses &Structure, the following subjects are also included, that can be opted for B.Tech (Honors)
- In case of Laboratories, student may opt for virtual Laboratories only with the permission from chairman BoS.
- It is recommended to choose the laboratories along with pre-requisite theory subjects is mandatory

S.No.	SUBJECT	L-T-P	CREDITS
1	Advanced Communications	3-0-0	3
2	EMI/EMC	3-0-0	3
3	VLSI Signal Processing	3-0-0	3
4	CMOS Mixed Signal Design	3-0-0	3
5	Adaptive Signal Processing	3-0-0	3
6	RTOS	3-0-0	3
7	PC based Data Acquisition Systems	3-0-0	3
8	Digital Control Systems	3-0-0	3
9	Microstrip Antennas	3-0-0	3
10	Image & Video Processing	3-0-0	3
1	Advanced Communications Lab	0-0-3	1.5
2	CMOS Mixed Signal Design Lab	0-0-3	1.5
3	RTOS Lab	0-0-3	1.5
4	Digital Control Systems Lab	0-0-3	1.5
5	Antennas and Microwave Lab	0-0-3	1.5
6	Image & Video Processing Lab	0-0-3	1.5
Student shall take up at least TWO NPTEL/SWAYAM of 12-week duration for 3 credits.			

MINOR:

Student can choose any SIX Theory or any FIVE theory and TWO Laboratories in the list given below which are not chosen as Open electives/in Regular Courses, are to be considered for Minor Degree. Prior Approval BoS Chairman is required

S.No.	SUBJECT	L-T-P	CREDITS
1	Electronics Devices and Basic Circuits	3-0-0	3
2	Digital Electronics	3-0-0	3
3	Principles of Communication	3-0-0	3
4	Signal Analysis	3-0-0	3
5	Microcontrollers and Applications	3-0-0	3
6	Embedded System Design	3-0-0	3
7	Internet of things	3-0-0	3
8	Digital Signal Processing	3-0-0	3
9	Electronics Devices and Basic Circuits LAB	0-0-3	1.5
10	Digital Electronics LAB	0-0-3	1.5
11	Internet of things LAB	0-0-3	1.5
12	Digital Signal Processing LAB	0-0-3	1.5
Student shall take up at least ONE NPTEL/SWAYAM of 12-week duration for 3 credits.			