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B.Tech. III Year I Semester

S.No.	Category	Title	L	T	P	C
1	Professional Core	Analog & Digital IC Applications	3	0	0	3
2	Professional Core	Digital communications	3	0	0	3
3	Professional Core	Microprocessors & Microcontrollers	3	0	0	3
4	Professional Elective - I	1. Digital System Design through HDL 2. Digital Signal Processing 3. Electronic Measurements and Instrumentation 4. Quantum Computing	3	0	0	3
5	Open Elective-I	1. Artificial Intelligence 2. Operating Systems 3. Object Oriented Programming Through Java	3	0	0	3
6	Professional Core	Analog & Digital IC Applications Lab	0	0	3	1.5
7	Professional Core	Analog and digital communications Lab	0	0	3	1.5
8	Skill Enhancement Course	Microprocessors & Microcontrollers Lab	0	1	2	2
9	Engineering Science	Digital Signal Processing Lab	0	0	2	1
10	Evaluation of Community Service Internship		-	-	-	2
Total			**15**	**1**	**10**	**23**

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B.Tech. III Year II Semester

S.No.	Category	Title	L	T	P	C
1	Professional Core	Antennas & Wave Propagation	3	0	0	3
2	Professional Core	VLSI Design	3	0	0	3
3	Professional Core	Data Communication & Networks	3	0	0	3
4	Professional Elective–II	1. Optical Communications 2. Microwave Engineering 3. Smart and Wireless Instrumentation	3	0	0	3
5	Professional Elective–III	1. Bio Medical Instrumentation 2. Embedded Systems 3. Analog IC Design	3	0	0	3
6	Open Elective – II	1. Computer Organization & Architecture 2. Database Management Systems 3. Mobile Application Development	3	0	0	3
7	Professional Core	VLSI Design Lab	0	0	3	1.5
8	Professional Core	Data Communication & Networks Lab	0	0	3	1.5
9	Skill Enhancement course	Antennas & Wave Propagation Lab	0	1	2	2
10	Audit Course	Research methodology and IPR	2	0	0	-
Total			**20**	**1**	**08**	**23**
Mandatory Industry Internship of 08 weeks duration during summer vacation						

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List of open elective courses offered by department of ECE:

Pool 1 : Open Elective 1

1. Artificial Intelligence
2. Operating System
3. Oop's through Java

Pool 2: Open Elective 2

1. Computer Organization & Architecture
2. Database Management Systems
3. Mobile Application Development

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

Course Outcomes:

CO1: Apply the operational principles and characteristics of op-amps to design and analyzeanalog 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, DC and AC Characteristics, features of 741 Op-Amp, Modes of Operation-Inverting, Non-Inverting, Differential, Instrumentation Amplifier, ACAmplifier, Differentiatorsand Integrators, Comparators, SchmittTrigger, Introduction to Voltage Regulators, Features of 723 Regulator, Three Terminal Voltage Regulators.

UNIT-II

Op-Amp, IC-555 & IC565 Applications: Introduction to Active Filters, Characteristics of Bandpass, Bandreject 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, LED & LCD Decoders with Drivers, Encoders, Priority Encoders, Multiplexers, De-multiplexers, Priority Generators/Checkers, Parallel Binary Adder/Subtractor, Magnitude Comparators.

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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.

Memories - ROM Architecture, Types of ROMS & Applications, RAM Architecture, Static & Dynamic RAMs.

TEXT BOOKS:

1. RamakanthA.Gayakwad-Op-Amps&LinearICs,PHI,2003.
2. FloydandJain-DigitalFundamentals,8th Ed.,PearsonEducation,2005.
3.

REFERENCE BOOKS:

1. D. Roy Chowdhury–Linear Integrated Circuits, New Age International (p) Ltd, 2nd Ed.,2003.
2. John.F. Wakerly–Digital Design Principles and Practices,3rd Ed.,Pearson,,2009.
3. Salivahana-Linear Integrated Circuits and Applications,TMH,2008.
4. WilliamD.Stanley-OperationalAmplifierswithLinearIntegratedCircuits,4th Ed.,Pearson Education India, 2009

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

Course Outcomes:

- To Describe basic components of Digital Communication Systems and to determine the performance of different pulse digital modulation techniques
- To determine the performance of digital modulation techniques for the generation and digital representation of the signals.
- To design optimum receiver for Digital Modulation techniques and to determine the probability of error for various digital modulation schemes
- To compute and analyze error detecting and error correction codes block codes, cyclic codes.
- 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,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, calculation of error probability of ASK, BPSK, BFSK, QPSK.

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

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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, Turbo Codes.

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.

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III Year I Semester	MICROPROCESSORS AND MICROCONTROLLERS	L	T	P	C
		3	0	0	3

Course Outcomes:

- To introduce fundamental architectural concepts of microprocessors and microcontrollers.
- To impart knowledge on addressing modes and instruction set of 8085, 8086 and 8051
- To introduce assembly language programming concepts
- To explain memory and I/O interfacing with 8086 and 8051
- To introduce16 bit and 32 bit microcontrollers.

Unit 1:
8-bit Microprocessor architecture and Programming : Introduction - Intel8085 Microprocessor Architecture – Pin Description - Addressing Modes –Instruction Set – Assembly Language Programming - Timing Diagrams.

Unit 2:
8086 Architecture : Main features, pin diagram/description, 8086 microprocessor family, internal architecture, bus interfacing unit, execution unit, 8086 system timing, minimum mode and maximum mode configuration.
8086 Programming: Program development steps, instructions, addressing modes, assembler directives, writing simple programs with an assembler, assembly language program development tools.

Unit 3:
Memory and Peripherals Interfacing: Interfacing Memory – Interfacing Peripherals – Interrupts – 8255 Programmable Peripheral Interface – 8251 Programmable Communication Interface – 8253 Programmable Interval Timer – 8259 Programmable Interrupt Controller.

Unit 4:
8-bit Micro Controller : Introduction – Architecture of 8051 Microcontroller – Memory Organization – Pin Diagram – Interrupts – Addressing Modes – 8051 Instruction – Assembly language Programming using 8051 Microcontroller, LCD & Keyboard Interfacing.

Unit 5:
ARM Architectures and Processors: introduction to CISC and RISC architectures, ARM Architecture, ARM Processors Families, Introduction to 16/32 bit processors, ARM7 architecture and organization, Thumb instructions, ARM Cortex-M3 Processor Functional Description.

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Text Books :

1. Ramesh S. Gaonkar, Microprocessor Architecture, Programming and Applications with 8085, Penram International Publications, Fifth Edition, 2008.
2. Krishna Kant, Microprocessors and Microcontrollers – Architectures, Programming and System Design 8085, 8086, 8051, 8096, PHI, Sixth Edition, 2010.
3. Soumitra Kumar Mandal, Microprocessors and Microcontrollers: Architecture, Programming and Interfacing Using 8085, 8086 and 8051, Tata McGraw Hill, Sixth Reprint, 2012.
4. 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.

Reference Books :

1. Doughlas V. Hall, Microprocessors and Interfacing, Programming and Hardware, Mc Graw Hill, 2012.
2. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, The 8051 Microcontroller and Embedded Systems: Using Assembly and C, Second Edition, Pearson Education, 2011.

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III Year -I Semester	DIGITAL SYSTEM DESIGN THROUGH HDL (PE-I)	L	T	P	C
		3	0	0	3

Course Outcomes:

- Understand the language constructs and programming fundamentals of Verilog HDL.
- Choose the suitable abstraction level for a particular digital design
- Construct Combinational and sequential circuits in different modelling styles using Verilog HDL
- Design and synthesize combinational and sequential logic circuits
- Analyze and Verify the functionality of digital circuits/systems using test benches.

UNIT-I: Introduction to Verilog HDL and Gate Level Modelling:
Verilog as HDL, Levels of Design Description Basics of Concepts of Verilog, Data Types, System Task, Compiler directives, modules and ports. AND Gate Primitive, Module Structure, Other Gate Primitives, Illustrative Examples, Tri-State Gates, Array of Instances of Primitives, Additional Examples, Design of Flipflops with Gate Primitives, Delay.

UNIT-II: Behavioural Modelling:
Introduction, structured processors, procedural assignments, timing controls, conditional statements, multi-way branching, loops, sequential and parallel blocks, generate blocks, Design of Decoders, Multiplexers, Flip-flops, Registers & Counters in Behavioral model.

UNIT-III: Modelling at Data flowLevel:
Introduction, Continuous Assignment Structures, Delays and Continuous Assignments, Assignment to Vectors, Operators, Design of Decoders, Multiplexers, Flip-flops, Registers & Counters in dataflow model, Switch Level Modelling: Introduction, Basic Transistor Switches, CMOS Switch, Bi-directional Gates, Time Delays with Switch Primitive delays.

UNIT-IV: FSM Design:
Functions,Tasks, User-defined,Primitives: Introduction, Function, Tasks, User-Defined Primitives (UDP), FSM Design (Moore and Mealy Machines), Encoding Style: From Binary to One Hot. Introduction to Synthesis, Synthesis of combinational logic, Synthesis of sequential logic with latches and flip-flops, Synthesis of Explicit and Implicit State Machines

UNIT-V: Components Test and Verification:
Test Bench – Combinational Circuits Testing, Sequential Circuits Testing, Test Bench Techniques, Design Verification, Assertion Verification.

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Text Books:

1. Samir Palnitkar, "Verilog HDL A Guide to Digital and Synthesis" ,2nd Edition, Pearson Education,2006.
2. Michael, D. Ciletti, "Advanced digital design with the Verilog HDL", Pearson Education India,2005.

Reference Books:

1. Padmanabhan, Tripura Sundari -Design through Verilog HDL, Wiley, 2016
2. S. Brown, Zvonko – Vranesic, Fundamentals of Digital Logic with Verilog Design, TMH, 3rdEdision 2014.
3. J. Bhasker, A Verilog HDL Primer 2nd edition, BS Publications, 2001.

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III Year - I Semester	DIGITAL SIGNAL PROCESSING (PE-I)	L	T	P	C
		3	0	0	3

Course Objectives:

- To describe discrete time signals and systems.
- To teach importance of FFT algorithm for computation of Discrete Fourier Transform.
- To expose various implementations of digital filter structures.
- To present FIR and IIR Filter design procedures.
- To outline need of Multi-rate Processing.

Course Outcomes:

- Formulate difference equations for the given discrete time systems
- Apply FFT algorithms for determining the DFT of a given signal
- Compare FIR and IIR filter structures
- Design digital filter (FIR & IIR) from the given specifications
- Outline the concept of multirate DSP and applications of DSP.

UNIT - I

Introduction to discrete time signals and systems Introduction to digital signal processing, review of discrete-time signals and systems, analysis of discrete-time linear time invariant systems, frequency domain representation of discrete time signals and systems, analysis of linear time-invariant systems in the z-domain, pole-zero stability.

UNIT - II

Discrete Fourier Transform - Introduction, Discrete Fourier Series, properties of DFS, Discrete Fourier Transform, Inverse DFT,properties of DFT, Linear and Circular convolution, convolution using DFT.

Fast Fourier Transform = Introduction, Fast Fourier Transform, Radix-2 Decimation in time and Decimation in frequencyFFT, Inverse FFT (Radix-2).

UNIT - III

IIR Filters-Introduction to digital filters, Analog filter approximations – Butterworth and Chebyshev, Design of IIR Digital filters from analog filters by Impulse invariant and bilinear transformation methods, Frequency transformations, Basic structures of IIR Filters - Direct form-I, Direct form-II, Cascade form and Parallel form realizations.

UNIT - IV

FIR Filters-Introduction, Characteristics of FIR filters with linear phase, Frequency response of linear phase FIR filters, Design of FIR filters using Fourier series and windowing methods

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(Rectangular, Triangular, Raised Cosine, Hanging, Hamming, Blackman), Comparison of IIR & FIR filters,Basic structures of FIR Filters – Direct form, Cascade form, Linear phase realizations.

UNIT - V

Quantization Errors in Digital Signal Processing: Representation of numbers, Quantization of filter coefficients, Round-off Effects in digital filters.

Multirate Digital Signal Processing: Decimation, Interpolation, Sampling rate conversion by a rational factor; Frequency domain characterization of Interpolator and Decimator; Polyphase decomposition.

Textbooks:

1. John G. Proakis, Dimitris G. Manolakis, Digital Signal Processing, Principles, Algorithms, and Applications, Pearson Education, 2007.
2. A.V.Oppenheim and R.W. Schaffer, Discrete Time Signal Processing ,PHI.

References:

1. S.K.Mitra, Digital Signal Processing – A practical approach , 2nd Edition, Pearson Education, New Delhi, 2004.
2. MH Hayes, Digital Signal Processing, Schaum's Outline series, TATA Mc-Graw Hill, 2007.
3. Robert J. Schilling, Sandra L. Harris, Fundamentals of Digital Signal Processing using Matlab, Thomson, 2007.

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III Year-I Semester	ELECTRONIC MEASUREMENTS AND INSTRUMENTATION (PE-I)	L	T	P	C
		3	0	0	3

Course Outcomes:

- Understand the various Analog and Digital measuring Instruments
- Aware of the principles and operations of various oscilloscopes
- Learn measurements using various bridges
- Familiarize different Signal Generators and function generators
- Learn various transducers and Intelligent sensors

UNIT I

Measuring Instruments: Introduction, Errors in Measurement, Accuracy, Precision, Resolution and Significant figures, Basic PMMC Meter- construction and working, DC and AC Voltmeters- Multirange, Range extension, DC Ammeter, Multimeter for Voltage, Current and resistance measurements.

Digital Instruments: Digital Voltmeters – Introduction, DVM's based on V–T, V–F and Successive approximation principles, Resolution and sensitivity, General specifications, Digital Multimeters, Digital frequency meters, Digital measurement of time.

UNIT II

Oscilloscopes: Introduction, Block diagram of CRO, Basic principle of CRT, CRT Construction and features, vertical amplifiers, horizontal deflection system- sweep, trigger pulse, delay line, sync selector circuits. Dual beam and dual trace CROs, Sampling and Digital storage oscilloscopes.

UNIT III

Bridges: DC Bridges for Measurement of resistance - Wheat stone bridge, Kelvin's Bridge, AC Bridges for Measurement of inductance- Maxwell's bridge, Hay's Bridge, Anderson bridge, Measurement of capacitance - Schearing Bridge, Wien Bridge, Errors and precautions in using bridges.

UNIT IV

Signal Generators: Introduction, Fixed and variable AF oscillator, Standard signal generator, Laboratory type signal generator, AF sine and Square wave generator, Function generator, Square and Pulse generator, Sweep frequency generator.

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UNIT V

Transducers: Introduction, Types of Transducers, Electrical transducers, Selecting a transducer, Resistive transducer, Strain gauges, Piezoelectric transducer.

Intelligent Sensors: definition of intelligent instrumentation, types of instruments, Classification, Smart sensors, Cogent Sensors, Soft or Virtual sensors, Self-Adaptive Sensors, Self-Validating Sensors, Temperature Compensating Intelligent Sensors, Pressure Sensor, Indirect Sensing. (**Text Book 3**)

TEXT BOOKS

1. H. S. Kalsi, "Electronic Instrumentation", Third edition, Tata McGraw Hill, 2010.
2. A. D. Helfrick and W.D. Cooper, "Modern Electronic Instrumentation and Measurement Techniques", PHI, 6th Edition, 2010.
3. ManabendraBhuyan, —Intelligent Instrumentation: Principles and Applications CRC Press, 2011.

REFERENCE BOOKS

1. A.K. Sawhney, DhanpatRai& Co., "A course in Electrical and Electronic Measurements and Instrumentation", 9th Edition, 2010.
2. David A. Bell, "Electronic Instrumentation & Measurements", PHI, 2nd Edition, 2006.

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III Year-I Semester	QUANTUM COMPUTING(PE-I)	L	T	P	C
		3	0	0	3

Course Objectives:

The objectives of this course are to introduce the core concepts of quantum mechanics that underpin quantum computation, to understand quantum gates and circuits, and to explore major quantum algorithms such as Grover's and Shor's for real-world problem solving.

Course Outcomes:

After completing the course, you will be able to:

- Understand basic concepts of qubits, superposition, entanglement, and quantum measurements.
- Design and simulate quantum circuits using gates such as Hadamard, CNOT, and Toffoli.
- Implement and analyze simple quantum algorithms like Deutsch-Jozsa, Grover's, and Shor's.
- Apply quantum algorithms to problems in search, factorization, and optimization.
- Explore quantum programming platforms such as Qiskit for real-time circuit simulation.

UNIT - I

History of Quantum Computing: Importance of Mathematics, Physics and Biology. Introduction to Quantum Computing: Bits Vs Qubits, Classical Vs Quantum logical operations

UNIT - II

Background Mathematics: Basics of Linear Algebra, Hilbert space, Probabilities and measurements.

Background Physics: Paul's exclusion Principle, Superposition, Entanglement and super-symmetry, density operators and correlation, basics of quantum mechanics, Measurements in bases other than computational basis. Background Biology: Basic concepts of Genomics and Proteomics (Central Dogma)

UNIT - III

Qubit: Physical implementations of Qubit. Qubit as a quantum unit of information. The Bloch sphere Quantum Circuits: single qubit gates, multiple qubit gates, designing the quantum circuits. Bell states.

UNIT - IV

Quantum Algorithms: Classical computation on quantum computers. Relationship between quantum and classical complexity classes. Deutsch's algorithm, Deutsch's-Jozsa algorithm, Shor's factorization algorithm, Grover's search algorithm.

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UNIT - V

Noise and error correction: Graph states and codes, Quantum error correction, fault-tolerant computation. Quantum Information and Cryptography: Comparison between classical and quantum information theory. Quantum Cryptography, Quantum teleportation

Text Books:

1. Quantum Computation and Quantum Information, Nielsen M. A.,Cambridge
2. Programming Quantum Computers, Essential Algorithms and Code Samples, Eric R Johnson, Nic Harrigan, Mercedes Ginemo, Segovia, Oreilly

Reference Books:

1. Quantum Computing for Computer Scientists, Noson S. Yanofsk, Mirco A. Mannucci
2. Principles of Quantum Computation and Information,Benenti G., Casati G. and Strini G., Vol.I: Basic Concepts, Vol II
3. Basic Tools and Special Topics, World Scientific. Pittenger A. O., An Introduction to Quantum Computing Algorithms

Online Learning Resources:

- https://qiskit.org/learn
- https://swayam.gov.in/nd1_noc23_cs74
- https://nptel.ac.in/courses/106105216
- https://brilliant.org/courses/quantum-computing/

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III Year-I Semester	ARTIFICIAL INTELLIGENCE (OE-I)	L	T	P	C
		3	0	0	3

Course Objectives:

- This course is designed to:
- Introduce Artificial Intelligence
- Teach about the machine learning environment
- Present the searching Technique for Problem Solving
- Introduce Natural Language Processing and Robotics

Course Outcomes:

- After completion of the course, students will be able to
- Apply searching techniques for solving a problem
- Design Intelligent Agents
- Develop Natural Language Interface for Machines
- Design mini robots
- Summarize past, present and future of Artificial Intelligence

UNIT - I Introduction

Introduction: What is AI, Foundations of AI, History of AI, The State of Art.
Intelligent Agents: Agents and Environments, Good Behaviour: The Concept of Rationality, The Nature of Environments, The Structure of Agents.

UNIT - II Solving Problems by searching

Problem Solving Agents, Example problems, Searching for Solutions, Uninformed Search Strategies, Informed search strategies, Heuristic Functions, Beyond Classical Search: Local Search Algorithms and Optimization Problems, Local Search in Continues Spaces, Searching with Nondeterministic Actions, Searching with partial observations, online search agents and unknown environments.

UNIT - III Reinforcement Learning & Natural Language Processing

Reinforcement Learning: Introduction, Passive Reinforcement Learning, Active Reinforcement Learning, Generalization in Reinforcement Learning, Policy Search, applications of RL
Natural Language Processing: Language Models, Text Classification, Information Retrieval, Information Extraction.

UNIT - IV Natural Language for Communication

Natural Language for Communication: Phrase structure grammars, Syntactic Analysis, Augmented Grammars and semantic Interpretation, Machine Translation, Speech Recognition
Perception: Image Formation, Early Image Processing Operations, Object Recognition by appearance, Reconstructing the 3D World, Object Recognition from Structural information, Using Vision.

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UNIT - V Robotics

Robotics: Introduction, Robot Hardware, Robotic Perception, planning to move, planning uncertain movements, Moving, Robotic software architectures, application domains
Philosophical foundations: Weak AI, Strong AI, Ethics and Risks of AI, Agent Components, Agent Architectures, Are we going in the right direction, What if AI does succeed.

Textbooks:

1. Stuart J.Russell, Peter Norvig, "Artificial Intelligence A Modern Approach", 3rd Edition, Pearson Education, 2019.

Reference Books:

1. Nilsson, Nils J., and Nils Johan Nilsson. Artificial intelligence: a new synthesis. Morgan Kaufmann, 1998.
2. Johnson, Benny G., Fred Phillips, and Linda G. Chase. "An intelligent tutoring system for the accounting cycle: Enhancing textbook homework with artificial intelligence." Journal of Accounting Education 27.1 (2009): 30-39.

Online Learning Resources:

http://peterindia.net/AILinks.html
http://nptel.ac.in/courses/106106139/
https://nptel.ac.in/courses/106/105/106105152

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III Year-I Semester	OPERATING SYSTEMS (OE-I)	L	T	P	C
		3	0	0	3

Course Objectives:

- Understand basic concepts and functions of operating systems
- Understand the processes, threads and scheduling algorithms.
- Expose the students with different techniques of handling deadlocks
- Provide good insight on various memory management techniques
- Explore the concept of file-system and its implementation issues

Course Outcomes:

- Demonstrate and understand of computer systems and operating systems functions
- Distinguish between process and thread and classify scheduling algorithms
- Solve synchronization and deadlock problems
- Compare various memory management schemes
- Explain file systems concepts and i/o management

UNIT I Introduction to Computer and Operating system
Computer Types, Functional Units, Basic Operational Concepts, Number Representation and Arithmetic Operations, Character Representation, Performance, Historical Perspective, Memory Locations and Addresses, Memory operations, Instructions and Instruction Sequencing, Addressing modes , Architecture Operating System Structure, Operations Process, Memory, Storage Management, Protection and Security Computing Environments

UNIT II Process, Threads and Scheduling
Process Concept Scheduling Operations on Processes Cooperating Processes Inter-Process Communication Threads - Multithreading Models -Thread Libraries- Threading Issues – Scheduling Criteria Scheduling Algorithms Algorithm Evaluation.

UNIT III Process Synchronization and Deadlocks
The Critical-Section Problem Synchronization Hardware Mutex Locks -Semaphores Classic Problems of Synchronization Critical Regions Monitors Deadlocks System Model Deadlock Characterization Methods for Handling Deadlocks Deadlock Prevention Deadlock Avoidance Deadlock Detection Recovery from Deadlock.

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UNIT IV Memory Management

Introduction - Swapping Contiguous Memory Allocation Paging Segmentation- Structure of the Page Table - Virtual Memory- Background Demand Paging Copy on Write Page Replacement Allocation of Frames Thrashing.

UNIT V Input/ Output and Files

Overview of Mass Storage Structure - Disk Structure - Disk Scheduling and Management-File System Interface File Concept - Access Methods -Directory and Disk Structure- Directory Implementation -Allocation Methods- I/O Systems I/O Hardware- Application I/O Interface - Kernel I/O Subsystem.

Textbooks:

1. Carl Hamacher, ZvonkoVranesic, SafwatZaky and NaraigManjikian, Computer Organization and Embedded Systems, Sixth Edition, Tata McGraw Hill, 2012.
2. Abraham Silberschatz, Peter B. Galvin and Greg Gagne, Operating Systems Concepts, Ninth Edition, Wiley,2012.

Reference Books:

1. William Stallings, Operating Systems: Internals and Design Principles, Ninth Edition, Prentice-Hall, 2018.
2. Andrew Tanenbaum, Modern Operating Systems, Third Edition, Prentice Hall, 2009.

Online Learning Resources:

https://nptel.ac.in/courses/106/106/106106144/
http://peterindia.net/OperatingSystems.html

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B.TECH–ELECTRONICS AND COMMUNICATION ENGINEERING
(R23 – III YEAR COURSE STRUCTURE & SYLLABUS)

III Year-I Semester	OBJECT ORIENTED PROGRAMMING THROUGH JAVA (OE-I)	**L**	**T**	**P**	**C**
		3	0	0	3

Course Objectives:

- To understand object oriented concepts and problem solving techniques
- To obtain knowledge about the principles of inheritance and polymorphism
- To implement the concept of packages, interfaces, exception handling and concurrency mechanism.
- To design the GUIs using applets and swing controls.
- To understand the Java Database Connectivity Architecture

Course Outcomes (CO):

- After completion of the course, students will be able to
- Solve real-world problems using OOP techniques.
- Apply code reusability through inheritance, packages and interfaces
- Solve problems using java collection framework and I/O classes.
- Develop applications by using parallel streams for better performance.
- Develop applets for web applications.
- Build GUIs and handle events generated by user interactions.
- Use the JDBC API to access the database

UNIT - I Introduction

Introduction: Introduction to Object Oriented Programming, The History and Evolution of Java, Introduction to Classes, Objects, Methods, Constructors, this keyword, Garbage Collection, Data Types, Variables, Type Conversion and Casting, Arrays, Operators, Control Statements, Method Overloading, Constructor Overloading, Parameter Passing, Recursion, String Class and String handling methods

.

UNIT - II Inheritance, Packages, Interfaces

Inheritance: Basics, Using Super, Creating Multilevel hierarchy, Method overriding, Dynamic Method Dispatch, Using Abstract classes, Using final with inheritance, Object class,
Packages: Basics, Finding packages and CLASSPATH, Access Protection, Importing packages.
Interfaces: Definition, Implementing Interfaces, Extending Interfaces, Nested Interfaces, Applying Interfaces, Variables in Interfaces.

UNIT - III Exception handling, Stream based I/O (java.io)

Exception handling - Fundamentals, Exception types, Uncaught exceptions, using try and catch, multiple catch clauses, nested try statements, throw, throws and finally, built-in exceptions, creating own exception subclasses.

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Stream based I/O (java.io) – The Stream classes-Byte streams and Character streams, Reading console Input and Writing Console Output, File class, Reading and Writing Files, Random access file operations, The Console class, Serialization, Enumerations, Autoboxing, Generics.

UNIT - IV Multithreading, The Collections Framework (java.util)

Multithreading: The Java thread model, Creating threads, Thread priorities, Synchronizing threads, Interthread communication.

The Collections Framework (java.util): Collections overview, Collection Interfaces, The Collection classes - Array List, Linked List, Hash Set, Tree Set, Priority Queue, Array Deque. Hashtable, Properties, Stack, Vector, String Tokenizer, Bit Set, Date, Calendar, Random, Formatter, Scanner.

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UNIT - V Applet, GUI Programming with Swings, Accessing Databases with JDBC

Applet: Basics, Architecture, Applet Skeleton, requesting repainting, using the status window, passing parameters to applets

GUI Programming with Swings – The origin and design philosophy of swing, components and containers, layout managers, event handling, using a push button, j text field, j label and image icon, the swing buttons, j text field, j scroll pane, j list, j combo box, trees, j table, An overview of j menu bar, j menu and j menu item, creating a main menu, show message dialog, show confirm dialog, show input dialog, show option dialog, j dialog, create a modeless dialog.

Accessing Databases with JDBC:

Types of Drivers, JDBC Architecture, JDBC classes and Interfaces, Basic steps in developing JDBC applications, Creating a new database and table with JDBC.

Textbooks:

1.Java The complete reference, 9th edition, Herbert Schildt, McGraw Hill Education (India) Pvt. Ltd.

2.Java How to Program, 10th Edition, Paul Dietel, Harvey Dietel, Pearson Education.

Reference Books:

1.Understanding Object-Oriented Programming with Java, updated edition, T. Budd, Pearson Education.

2.Core Java Volume – 1 Fundamentals, Cay S. Horstmann, Pearson Education.

3.Java Programming for core and advanced learners, Sagayaraj, Dennis, Karthik andGajalakshmi, University Press

4. Introduction to Java programming, Y. Daniel Liang, Pearson Education.

Online Learning Resources:

https://www.w3schools.com/java/java_oo

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III Year-I Semester	ANALOG AND DIGITAL IC APPLICATIONS LAB	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.

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

List of Experiments:
(Fourteen experimentstobedone-**Thestudentshavetocalculatetherelevantparameters**)–
(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-Encode rand 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. Multimeters and other meters

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III Year-I Semester	MICROPROCESSORS & MICROCONTROLLERS LAB	L	T	P	C
		0	1	2	2

List of Experiments:

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

1. Programs for 8-bit and 16 –bit arithmetic-addition operations (using Various Addressing Modes).
2. Programs for 8-bit and 16 –bit arithmetic-subtraction operations (using Various Addressing Modes).
3. Programs for 8-bit and 16 –bit arithmetic-multiplication operations (using Various Addressing Modes).
4. Programs for 8-bit and 16 –bit arithmetic-division operations (using Various Addressing Modes).
5. Programs for 8-bit and 16 –bit Addition of an array of numbers with overflow detection operations (using Various Addressing Modes).
6. Program for sorting an array.
7. Program for finding Smallest & Largest number.
8. Program for Factorial of given n-numbers.
9. Interfacing ADC to 8086
10. Interfacing DAC to 8086.
11. Interfacing Seven-Segment display to 8086
12. Keyboard interface with 8086

PART-B: (Minimum of 2 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. Stepper motor control with 8051

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PART-C (Minimum of 5 Experiments has to be performed) Conduct the following experiments using ARM CORTEX M4 (STMF407VET6) PROCESSOR USING KEIL MDK ARM

1. Interfacing of 8 Bit LED
2. Interfacing of 16X2 LCD (8 Bit).
3. Interfacing of 16X2 LCD (4 Bit).
4. Interfacing of 16X2 LCD & Keypad.
5. Interfacing of 7-Segment Display & Keypad
6. Interfacing of Relay Buzzer & LED's.
7. Interfacing of Internal ADC.
8. Interfacing of Internal DAC.
9. Interfacing of Internal RTC.
10. Interfacing of UART.
11. Interfacing of Data Flash (AR45BDXX)

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 M4
14. KEIL MDKARM, Digital Multi-meters

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III Year-I Semester	DIGITAL SIGNAL PROCESSING LAB	L	T	P	C
		0	0	2	1

Course Outcomes:

- Implement various DSP Algorithms using software packages.
- Implement DSP algorithms with Digital Signal Processor.
- Analyze and observe magnitude and phase characteristics (Frequency response Characteristics) of digital IIR-Butterworth, Chebyshev filters.
- Analyze and observe magnitude and phase characteristics (Frequency response Characteristics) of digital FIR filters using window techniques.
- Analyze digital filters using Software Tools.

The Programs shall be implemented in Software (Using MATLAB / Lab View / C Programming/ Equivalent) and Hardware (Using TI / Analog Devices / Motorola / Equivalent DSP processors).

List of Experiments:

1. Generate the following standard discrete time signals.
i) Unit Impulse ii) Unit step iii) Ramp iv) Exponential v) Sawtooth
2. Generate sum of two sinusoidal signals and find the frequency response (magnitude and phase).
3. Implement and verify linear and circular convolution between two given signals.
4. Implement and verify autocorrelation for the given sequence and cross correlation between two given signals.
5. Compute and implement the N-point DFT of a given sequence and compute the power density spectrum of the sequence.
6. Implement and verify N-point DIT-FFT of a given sequence and find the frequency response (magnitude and phase).
7. Implement and verify N-point IFFT of a given sequence.
8. Design IIR Butterworth filter and compare their performances with different orders (Low Pass Filter /High Pass Filter)
9. Design IIR Chebyshev filter and compare their performances with different orders (Low Pass Filter /High Pass Filter).
10. Design FIR filter (Low Pass Filter /High Pass Filter) using windowing technique.
i. Using rectangular window
ii. Using hamming window
iii. Using Kaiser window
11. Design and verify Filter (IIR and FIR) frequency response by using Filter design and Analysis Tool.
12. Compute the Decimation and Interpolation for the given signal.
13. Real time implementation of an audio signal using a digital signal processor.

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14. Compute the correlation coefficient for the two given audio signals of same length using a digital signal processor.

Note: Any TWELVE of the experiments are to be conducted. References:

1. Digital Signal Processing: Alon V. Oppenhelm, PHI
2. Digital Signal processing(II-Edition): S.K. Mitra, TMH

Online Learning Resources/Virtual Labs:

1. http://vlabs.iitkgp.ac.in/dsp/#

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COMMUNITY SERVICE PROJECT

.....Experiential learning through community engagement

Introduction

- Community Service Project is an experiential learning strategy that integrates meaningful community service with instruction, participation, learning and community development
- Community Service Project involves students in community development and service activities and applies the experience to personal and academic development.
- Community Service Project is meant to link the community with the college for mutual benefit. The community will be benefited with the focused contribution of the college students for the village/ local development. The college finds an opportunity to develop social sensibility and responsibility among students and also emerge as a socially responsible institution.

Objective

Community Service Project should be an integral part of the curriculum, as an alternative to the 2 months of Summer Internships / Apprenticeships / On the Job Training, whenever there is an exigency when students cannot pursue their summer internships. The specific objectives are;

- To sensitize the students to the living conditions of the people who are around them,
- To help students to realize the stark realities of the society.
- To bring about an attitudinal change in the students and help them to develop societal consciousness, sensibility, responsibility and accountability
- To make students aware of their inner strength and help them to find new /out of box solutions to the social problems.
- To make students socially responsible citizens who are sensitive to the needs of the disadvantaged sections.
- To help students to initiate developmental activities in the community in coordination with public and government authorities.
- To develop a holistic life perspective among the students by making them study culture, traditions, habits, lifestyles, resource utilization, wastages and its management, social problems, public administration system and the roles and responsibilities of different persons across different social systems.

Implementation of Community Service Project

- Every student should put in a 6 weeksfor the Community Service Project during the summer vacation.
- Each class/section should be assigned with a mentor.
- Specific Departments could concentrate on their major areas of concern. For example, Dept. of Computer Science can take up activities related to Computer Literacy to different sections of people like - youth, women, house-wives, etc
- A log book has to be maintained by each of the student, where the activities undertaken/involved to be recorded.

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- The logbook has to be countersigned by the concerned mentor/faculty incharge.
- Evaluation to be done based on the active participation of the student and grade could be awarded by the mentor/faculty member.
- The final evaluation to be reflected in the grade memo of the student.
- The Community Service Project should be different from the regular programmes of NSS/NCC/Green Corps/Red Ribbon Club, etc.
- Minor project report should be submitted by each student. An internal Viva shall also be conducted by a committee constituted by the principal of the college.
- Award of marks shall be made as per the guidelines of Internship/apprentice/ on the job training

Procedure

- A group of students or even a single student could be assigned for a particular habitation or village or municipal ward, as far as possible, in the near vicinity of their place of stay, so as to enable them to commute from their residence and return back by evening or so.
- The Community Service Project is a twofold one –
  - First, the student/s could conduct a survey of the habitation, if necessary, in terms of their own domain or subject area. Or it can even be a general survey, incorporating all the different areas. A common survey format could be designed. This should not be viewed as a duplication of work by the Village or Ward volunteers, rather, it could be another primary source of data.
  - Secondly, the student/s could take up a social activity, concerning their domain or subject area. The different areas, could be like –
    - Agriculture
    - Health
    - Marketing and Cooperation
    - Animal Husbandry
    - Horticulture
    - Fisheries
    - Sericulture
    - Revenue and Survey
    - Natural Disaster Management
    - Irrigation
    - Law & Order
    - Excise and Prohibition
    - Mines and Geology
    - Energy
    - Internet
    - Free Electricity
    - Drinking Water

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EXPECTED OUTCOMES

BENEFITS OF COMMUNITY SERVICE PROJECT TO STUDENTS

Learning Outcomes

- Positive impact on students' academic learning
- Improves students' ability to apply what they have learned in "the real world"
- Positive impact on academic outcomes such as demonstrated complexity of understanding, problem analysis, problem-solving, critical thinking, and cognitive development
- Improved ability to understand complexity and ambiguity

Personal Outcomes

- Greater sense of personal efficacy, personal identity, spiritual growth, and moral development
- Greater interpersonal development, particularly the ability to work well with others, and build leadership and communication skills

Social Outcomes

- Reduced stereotypes and greater inter-cultural understanding
- Improved social responsibility and citizenship skills
- Greater involvement in community service after graduation

Career Development

- Connections with professionals and community members for learning and career opportunities
- Greater academic learning, leadership skills, and personal efficacy can lead to greater opportunity

Relationship with the Institution

- Stronger relationships with faculty
- Greater satisfaction with college
- Improved graduation rates

BENEFITS OF COMMUNITY SERVICE PROJECT TO FACULTY MEMBERS

- Satisfaction with the quality of student learning
- New avenues for research and publication via new relationships between faculty and community
- Providing networking opportunities with engaged faculty in other disciplines or institutions
- A stronger commitment to one's research

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BENEFITS OF COMMUNITY SERVICE PROJECT TO COLLEGES AND UNIVERSITIES

- Improved institutional commitment
- Improved student retention
- Enhanced community relations

BENEFITS OF COMMUNITY SERVICE PROJECT TO COMMUNITY

- Satisfaction with student participation
- Valuable human resources needed to achieve community goals
- New energy, enthusiasm and perspectives applied to community work
- Enhanced community-university relations.

SUGGESTIVE LIST OF PROGRAMMES UNDER COMMUNITY SERVICE PROJECT

The following the recommended list of projects for Engineering students. The lists are not exhaustive and open for additions, deletions and modifications. Colleges are expected to focus on specific local issues for this kind of projects. The students are expected to carry out these projects with involvement, commitment, responsibility and accountability. The mentors of a group of students should take the responsibility of motivating, facilitating, and guiding the students. They have to interact with local leadership and people and appraise the objectives and benefits of this kind of projects. The project reports shall be placed in the college website for reference. Systematic, Factual, methodical and honest reporting shall be ensured.

For Engineering Students

1. Water facilities and drinking water availability
2. Health and hygiene
3. Stress levels and coping mechanisms
4. Health intervention programmes
5. Horticulture
6. Herbal plants
7. Botanical survey
8. Zoological survey
9. Marine products
10. Aqua culture
11. Inland fisheries
12. Animals and species
13. Nutrition
14. Traditional health care methods

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15. Food habits
16. Air pollution
17. Water pollution
18. Plantation
19. Soil protection
20. Renewable energy
21. Plant diseases
22. Yoga awareness and practice
23. Health care awareness programmes and their impact
24. Use of chemicals on fruits and vegetables
25. Organic farming
26. Crop rotation
27. Floury culture
28. Access to safe drinking water
29. Geographical survey
30. Geological survey
31. Sericulture
32. Study of species
33. Food adulteration
34. Incidence of Diabetes and other chronic diseases
35. Human genetics
36. Blood groups and blood levels
37. Internet Usage in Villages
38. Android Phone usage by different people
39. Utilization of free electricity to farmers and related issues
40. Gender ration in schooling level- observation.

Complimenting the community service project the students may be involved to take up some awareness campaigns on social issues/special groups. The suggested list of programmes are;

Programmes for School Children

1. Reading Skill Programme (Reading Competition)
2. Preparation of Study Materials for the next class.
3. Personality / Leadership Development
4. Career Guidance for X class students

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5. Screening Documentary and other educational films
6. Awareness Programme on Good Touch and Bad Touch (Sexual abuse)
7. Awareness Programme on Socially relevant themes.

Programmes for Women Empowerment

1. Government Guidelines and Policy Guidelines
2. Women's' Rights
3. Domestic Violence
4. Prevention and Control of Cancer
5. Promotion of Social Entrepreneurship

General Camps

1. General Medical camps
2. Eye Camps
3. Dental Camps
4. Importance of protected drinking water
5. ODF awareness camp
6. Swatch Bharath
7. AIDS awareness camp
8. Anti Plastic Awareness
9. Programmes on Environment
10. Health and Hygiene
11. Hand wash programmes
12. Commemoration and Celebration of important days

Programmes for Youth Empowerment

1. Leadership
2. Anti-alcoholism and Drug addiction
3. Anti-tobacco
4. Awareness on Competitive Examinations
5. Personality Development

Common Programmes

1. Awareness on RTI
2. Health intervention programmes
3. Yoga

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4. Tree plantation
5. Programmes in consonance with the Govt. Departments like –

i. Agriculture
ii. Health
iii. Marketing and Cooperation
iv. Animal Husbandry
v. Horticulture
vi. Fisheries
vii. Sericulture
viii. Revenue and Survey
ix. Natural Disaster Management
x. Irrigation
xi. Law & Order
xii. Excise and Prohibition
xiii. Mines and Geology
xiv. Energy

Role of Students:

- Students may not have the expertise to conduct all the programmes on their own. The students then can play a facilitator role.
- For conducting special camps like Health related, they will be coordinating with the Governmental agencies.
- As and when required the College faculty themselves act as Resource Persons.
- Students can work in close association with Non-Governmental Organizations like Lions Club, Rotary Club, etc or with any NGO actively working in that habitation.
- And also with the Governmental Departments. If the programme is rolled out, the District Administration could be roped in for the successful deployment of the programme.
- An in-house training and induction programme could be arranged for the faculty and participating students, to expose them to the methodology of Service Learning.

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Duration: 8 weeks

1. Preliminary Survey (One Week)

- A preliminary survey including the socio-economic conditions of the allotted habitation to be conducted.
- A survey form based on the type of habitation to be prepared before visiting the habitation with the help of social sciences faculty. (However, a template could be designed for different habitations, rural/urban.
- The Governmental agencies, like revenue administration, corporation and municipal authorities and village secreteriats could be aligned for the survey.

2. Community Awareness Campaigns (One Week)

Based on the survey and the specific requirements of the habitation, different awareness campaigns and programmes to be conducted, spread over two weeks of time. The list of activities suggested could be taken into consideration.

3. Community Immersion Programme (Three Weeks)

Along with the Community Awareness Programmes, the student batch can also work with any one of the below listed governmental agencies and work in tandem with them. This community involvement programme will involve the students in exposing themselves to the experiential learning about the community and its dynamics. Programmes could be in consonance with the Govt. Departments.

4. Community Exit Report (One Week)

- During the last week of the Community Service Project, a detailed report of the outcome of the 8 weeks work to be drafted and a copy shall be submitted to the local administration. This report will be a basis for the next batch of students visiting that particular habitation. The same report submitted to the teacher-mentor will be evaluated by the mentor and suitable marks are awarded for onward submission to the University.

- Throughout the Community Service Project, a daily log-book need to be maintained by the students batch, which should be countersigned by the governmental agency representative and the teacher-mentor, who is required to periodically visit the students and guide them.

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III Year-II Semester	ANTENNAS AND WAVE PROPAGATION	L	T	P	C
		3	0	0	3

Course Outcomes:

- Identify basic antenna parameters.
- Quantify the fields radiated by various types of antennas
- Design and analyze antenna arrays
- Design and analyze wire antennas, loop antennas, reflector antennas, lens antennas, horn antennas and micro-strip antennas
- Analyze antenna measurements to assess antenna's performance.

UNIT-I:

ANTENNA FUNDAMENTALS: Introduction, Antenna Parameters - Radiation Patterns, Patterns in Principal Planes, Field Regions, Main Lobe and Side Lobes, Beamwidth, 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:

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, Design Relations Arrays with Parasitic Elements, Yagi-Uda Arrays, Folded Dipoles and their characteristics, Illustrated Problems.

UNIT-III:

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

Horn Antennas – Types, Optimum Horns, Design Characteristics of Pyramidal Horns;

UNIT-IV:

UHF AND MICROWAVE ANTENNAS:

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.

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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

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 andWave 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, StandardPublishers Distributors, Delhi.
3. Antennas – John D. Kraus, McGraw-Hill, 2nd Edition, 1988.

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KRISHNA UNIVERSITY
COLLEGE OF ENGINEERING & TECHNOLOGY
B.TECH–ELECTRONICS AND COMMUNICATION ENGINEERING
(R23 – III YEAR COURSE STRUCTURE & SYLLABUS)

III Year- II Semester	VLSI DESIGN	L	T	P	C
		3	0	0	3

Course Outcomes:

- Demonstrate a clear understanding of CMOS fabrication flow and technology scaling.
- Design MOSFET based logic circuit.
- Design basic building blocks in Analog IC design.
- Design various CMOS logic circuits for design of Combinational logic circuits.
- Analyze the behavior of static and dynamic logic circuits

UNIT-I:

INTRODUCTION TO MOS CIRCUITS: VLSI Design Flow, Introduction to IC technology, Fabrication process: nMOS, pMOS and CMOS.

Basic Electrical Properties of MOS and BiCMOS Circuits: 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,

UNIT-II:

MOS AND BICMOS CIRCUIT DESIGN PROCESSES:

MOS Layers, Stick Diagrams, Design Rules and Layout, Layout Diagrams for MOS circuits.

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, Propagation Delays, Wiring Capacitances, Choice of layers.

UNIT-III:

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-IV:

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.

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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, Metal Gate Technology, FinFET, TFET.

TEXTBOOKS:

1. Essentials of VLSI Circuits and Systems - Kamran Eshraghian, Douglas and A. Pucknell
2. And SholehEshraghian, Prentice-Hall of India Private Limited, 2005 Edition.
3. Design of Analog CMOS Integrated Circuits by BehzadRazavi, McGraw Hill, 2003
4. Digital Integrated Circuits, Jan M. Rabaey, AnanthaChandrakasan 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.

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B.TECH–ELECTRONICS AND COMMUNICATION ENGINEERING
(R23 – III YEAR COURSE STRUCTURE & SYLLABUS)

III Year - II Semester	DATA COMMUNICATION & NETWORKS	L	T	P	C
		3	0	0	3

Course Objectives:
To provide a solid conceptual understanding of the fundamentals of data communications and computer networks.

Course Outcomes:
- Understand the basics of data communication, networking, internet and their importance.
- Analyze the services and features of various protocol layers in data networks.
- Differentiate wired and wireless computer networks
- Analyse TCP/IP and their protocols.
- Recognize the different internet devices and their functions.

UNIT – I
Data Communications: Components, protocols and standards, Network and Protocol Architecture, ReferenceModel ISO-OSI, TCP/IP-Overview,topology, transmission mode, digital signals, digital to digital encoding,digital data transmission, DTE-DCE interface, interface standards, modems, cable modem, transmission mediaguided and unguided, transmission impairment, Performance, wavelength and Shannon capacity. Review ofError Detection and Correction codes.Switching: Circuit switching (space-division, time division and space-time division), packet switching (virtualcircuit and Datagram approach), message switching

UNIT – II
Data Link Layer: Design issues, Data Link Control and Protocols: Flow and Error Control, Stop-and-waitARQ. Sliding window protocol, Go-Back-N ARQ, Selective Repeat ARQ, HDLC, Point-to –Point Access: PPPPoint –to- Point Protocol, PPP Stack

UNIT – III
Medium Access Sub layer: Channel allocation problem, Controlled Access, Channelization, multiple accessprotocols, IEEE standard 802.3 & 802.11 for LANS and WLAN, high-speed LANs, Token ring, Token Bus,FDDI based LAN, Network Devices-repeaters, hubs, switches bridges.

UNIT – IV
Network Layer: Design issues, Routing algorithms, Congestion control algorithms,Host to Host Delivery: Internetworking, addressing and routing, IP addressing (class full & Classless), Subnet,Network Layer Protocols: ARP, IPV4, ICMP, IPV6 ad ICMPV6.

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UNIT – V

Transport Layer: Process to Process Delivery: UDP; TCP, congestion control and Quality of service.

Application Layer: Client Server Model, Socket Interface, Domain Name System (DNS): Electronic Mail(SMTP), file transfer (FTP), HTTP and WWW.

Textbooks:

1. S. Tannenbum, D. Wetherall, —Computer Networks‖, Prentice Hall, Pearson, 5thEd
2. Behrouz A. Forouzan, —Data Communications and Networking‖, Tata McGraw-Hill, 4th Ed

References:

1. Fred Halsall, —Computer Networks‖, Addison – Wesley Pub. Co. 1996.
2. Larry L, Peterson and Bruce S. Davie, —Computer Networks: A system Approach‖, Elsevier, 4thEd
3. Tomasi, —Introduction To Data Communications & Networking‖, Pearson 7th impression 2011
4. William Stallings, —Data and Computer Communications‖, Prentice Hall, Imprint of Pearson, 9thEd.

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B.TECH–ELECTRONICS AND COMMUNICATION ENGINEERING
(R23 – III YEAR COURSE STRUCTURE & SYLLABUS)

III Year-II Semester	OPTICAL COMMUNICATIONS (PE-II)	L	T	P	C
		3	0	0	3

Course Outcomes:

- Choose necessary components required in modern optical communications systems.
- Design and build optical fiber experiments in the laboratory, and learn how to calculate electromagnetic modes in waveguides, the amount of light lost going through an optical system, dispersion of optical fibers.
- Use different types of photo detectors and optical test equipment to analyze optical fiber and light wave systems.
- Choose the optical cables for better communication with minimum losses
- Design, build, and demonstrate optical fiber experiments in the laboratory.

UNITI

Overview of optical fiber communication - Historical development, The general system, advantages of optical fiber communications. Optical fiber wave guides-Introduction, Ray theory transmission, Total Internal Reflection, Acceptance angle, Numerical Aperture, Skew rays, Cylindrical fibers- Modes, V-number, Mode coupling, StepIndexfibers,GradedIndexfibers,Singlemodefibers-Cutoffwavelength,ModeFieldDiameter,EffectiveRefractiveIndex, Related problems.

UNIT - II

Fiber materials:- Glass, Halide, Active glass, Chalgenide glass, Plastic optical fibers. Signal distortion in optical fibers-Attenuation, Absorption, Scattering and Bending losses, Core and Cladding losses, Information capacity determination, Group delay, Types of Dispersion:- Material dispersion, Wave-guide dispersion, Polarization-Mode dispersion, Intermodal dispersion, Pulse broadening in Graded index fiber, Related problems.

UNIT - III

Optical fiber Connectors-Connector types, Single mode fiber connectors, Connector return loss, Fiber Splicing-Splicing techniques, Splicing single mode fibers, Fiber alignment and joint loss-Multimode fiber joints, single mode fiber joints.

UNIT - IV

Optical sources-LEDs, Structures, Materials, Quantum efficiency, Power, Modulation, Power bandwidth product. Injection Laser Diodes- Modes, Threshold conditions, External quantum

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efficiency, Laser diode rate equations, Resonant frequencies, Reliability of LED&ILD, Optical detectors- Physical principles of PIN and APD, Detector responsetime, Comparison of Photo detectors, Related problems.

UNIT - V

Source to fiber power launching - Output patterns, Power coupling, Power launching, Equilibrium Numerical Aperture, Laser diode to fiber coupling, Optical receiver operation-Fundamental receiver operation, Digital signal transmission, error sources, Receiver configuration, Digital receiver performance, Probability of Error, Quantum limit, Analog receivers. Optical system design - Point-to- point links- Component choice and considerations, Linkpowerbudget,Risetimebudgetwithexamples,LinecodinginOpticallinks,WDM,Necessity,Principles,Measurementof Attenuation and Dispersion, Eye pattern.

TEXTBOOKS:

1. Optical Fiber Communications–Gerd Keiser, Mc Graw- ill International edition, 3rdEdition, 2000.
2. Fiber Optic Communications– Joseph C.Palais, 4thEdition, Pearson Education, 2004.

RERFERENCES:

1. Fiber Optic Communications–D.K.Mynbaev, S.C. Gupta and Lowell L. Scheiner, Pearson Education, 2005.
2. Text Book on Optical Fiber Communication and itsApplications–S.C.Gupta,PHI,2005.
3. Fiber Optic Communication Systems–Govind P. Agarwal , John Wiley, 3rdEdiition, 2004.

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B.TECH–ELECTRONICS AND COMMUNICATION ENGINEERING
(R23 – III YEAR COURSE STRUCTURE & SYLLABUS)

III Year II Semester	MICROWAVE ENGINEERING (PE-II)	L	T	P	C
		3	0	0	3

Course Outcomes:

- Design different mode sin waveguide structures
- Calculate S-matrix for various waveguide components and splitting the microwave energy in a desired direction
- Distinguish between Microwave tubes and Solid State Devices, calculation of efficiency of devices.
- Measure various microwave parameters using a Micro wave test bench

UNIT-I

MICROWAVE TRANSMISSION LINES: Introduction, Microwave Spectrum and Bands, Applications of Microwaves. Rectangular Waveguides – TE/TM mode analysis, Expressions for Fields, Characteristic Equation and Cut-off Frequencies, Filter Characteristics, Dominant and Degenerate Modes, Sketches of TE and TM mode fields in the cross-section, Mode Characteristics – Phase and Group Velocities, Wavelengths and Impedance Relations; Power Transmission and Power Losses in Rectangular Guide. Related Problems.MICROSTRIP LINES– Introduction, Zo Relations, Effective Dielectric Constant, Losses, Q factor.

UNIT II

MICROWAVE TUBES : Limitations and Losses of conventional tubes at microwave frequencies. Microwave tubes – O type and M type classifications. O-type tubes : 2 Cavity Klystrons – Structure, Reentrant Cavities, Velocity Modulation Process and Applegate Diagram, Bunching Process and Small Signal Theory – Expressions for o/p Power and Efficiency. Reflex Klystrons – Structure, Applegate Diagram and Principle of working, Mathematical Theory of Bunching, Power Output, Efficiency, Electronic Admittance; Oscillating Modes and o/p Characteristics, Electronic and Mechanical Tuning.Applications.

UNIT-III

HELIX TWTS: Significance, Types and Characteristics of Slow Wave Structures; Structure of TWT and Amplification Process (qualitative treatment), Suppression of Oscillations, Nature of the four Propagation Constants, Gain Considerations(qualitative treatment).**M-type Tubes** Introduction, Cross-field effects, Magnetrons – Different Types, 8-Cavity Cylindrical Travelling Wave Magnetron – Hull Cut-off and Hartree Conditions, Modes of Resonance and PI-Mode Operation, Separation of PI-Mode, o/p characteristics.

UNIT-IV

WAVEGUIDE COMPONENTS AND APPLICATIONS : Coupling Mechanisms – Probe, Loop, Aperture types. Waveguide Discontinuities – Waveguide irises, Tuning Screws and Posts, Matched Loads. Waveguide Attenuators – Resistive Card, Rotary Vane types; Waveguide Phase

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Shifters – Dielectric, Rotary Vane types, Scattering Matrix– Significance, Formulation and Properties, S-Matrix Calculations for – 2,3,4 port Junctions: E-plane and H-plane Tees, Magic Tee, Hybrid Ring; Directional Couplers – 2Hole, Bethe Hole types,S-Matrix Calculations Ferrite Components– Faraday Rotation, Gyrator, Isolator, Circulator, Related Problems.

UNIT-V

MICROWAVE SOLID STATE DEVICES: Introduction, Classification, Applications. TEDs – Introduction, Gunn Diode – Principle, RWH Theory, Characteristics, Basic Modes of Operation, Oscillation Modes

MICROWAVE MEASUREMENTS: Description of Microwave Bench – Different Blocks and their Features, Precautions; Microwave Power Measurement – Bolometer Method. Measurement of Attenuation, Frequency, Q- factor, Phase shift, VSWR, Impedance Measurement

TEXT BOOKS:

1. Foundations for Microwave Engineering – R.E. Collin, IEEE Press, John Wiley, 2nd Edition, 2002.
2. Microwave Engineering- Annapurna Das and SisirK.Das, Mc Graw Hill Education, 3rd Edition.

REFERENCES:

1. Microwave Devices and Circuits – Samuel Y. Liao, PHI, 3rd Edition,1994.
2. Microwave Engineering – G S N Raju , I K International
3. Microwave and Radar Engineering-M.Kulkarni, Umesh Publications, 3rd Edition.

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B.TECH–ELECTRONICS AND COMMUNICATION ENGINEERING
(R23 – III YEAR COURSE STRUCTURE & SYLLABUS)

III Year - II Semester	SMART AND WIRELESS INSTRUMENTATION (PE-II)	L	T	P	C
		3	0	0	3

Course Outcomes:

- Analyze Smart and Wireless Instrumentation with respect to various performance parameters.
- Design and develop Applications using WSN (Wireless sensor Network).
- Demonstration of various Node architectures.
- Demonstration of Fundamentals of wireless digital communication
- Analyze the power sources, Demonstrate an ability to design strategies as per needs anc specifications

UNIT – 1: Introduction:
Smart Instrumentation(Materials, automation systems, ensign and Sensors, Sensor Classifications, Wireless Sensor Networks, History of Wireless Sensor networks (WSN), Communication in a WSN, important design constraints of a WSN like Energy, Self Management, Wireless Networking, Decentralized Management, Design Constraints, Security etc.

UNIT – 2: Node architecture: The sensing subsystem, Analog to Digital converter, the processor subsystem, architectural overview, microcontroller, digital signal processor, application specific integrated circuit, field programmable gate array (FPGA), comparison, communication interfaces, serial peripheral interface, inter integrated circuit, the IMote node architecture, The XYZ node architecture, the Hog throb node architecture.

UNIT – 3: Fundamentals of Wireless Digital Communication: Basic components, source encoding, the efficiency of a source encoder, pulse code modulation and delta modulation, channel encoding, types of channels, information transmission over a channel, error recognition and correction, modulation, modulation types, quadratic amplitude modulation, signal propagation.

UNIT – 4: Frequency of Wireless Communication: Development of Wireless Sensor Network based on Microcontroller and communication device-Zigbee Communication device. Power sources- Energy Harvesting Solar and Lead acid batteries-RF Energy /Harvesting-Energy Harvesting from vibration Thermal Energy Harvesting-Energy Management Techniques Calculation for Battery Selection.

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UNIT – 5: Applications:

Structural health monitoring - sensing seismic events, single damage detection using natural frequencies, multiple damage detection using natural frequencies, multiple damage detection using mode shapes, coherence, piezoelectric effect, traffic control, health care - available sensors, pipeline monitoring, precision agriculture, active volcano, underground mining.

Text Books:

1. Fundamentals of wireless sensor networks : theory and practice - Waltenegus Dargie, Christian Poellabauer, A John Wiley and Sons, Ltd., Publication.
2. Smart Sensors, Measurement and Instrumentation, Subhas Chandra Mukhopadhyay, Springer Heidelberg, New York, Dordrecht London, 2013.
3. Wireless Sensors and Instruments: Networks, Design and Applications, HalitEren, CRC Press, Taylor and Francis Group, 2006.

Reference Books:

1. Uvais Qidwai, Smart Instrumentation: A data flow approach to Interfacing", Chapman & Hall; 1st Edn, December 2013.
2. Wireless Sensor Networks: Architectures and Protocols, Edgar H. Callaway Jr. and Ed gar H. Callaway.

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B.TECH–ELECTRONICS AND COMMUNICATION ENGINEERING
(R23 – III YEAR COURSE STRUCTURE & SYLLABUS)

III Year - II Semester	BIO MEDICAL INSTRUMENTATION (PE-III)	L	T	P	C
		3	0	0	3

Course Outcomes:

- Demonstrate a foundational understanding of the anatomy and physiology of the human body.
- Apply knowledge of different techniques used for measuring various physiological parameters.
- Explain modern imaging techniques employed in medical diagnosis and identify the diverse therapeutic equipment utilized in the biomedical field.
- Understand and apply bio-telemetry principles for transmitting bioelectrical variables.
- Analyze patient safety measures and evaluate recent advancements in the medical field.

UNIT – 1:Introduction: Factors to be considered in the design of medical instrumentation systems, Basic objectives of medical instrumentation system, Physiological systems of human body, Sources of Bioelectric potentials: Resisting and Action Potentials, Propagation of Action Potentials, The Bioelectric Potentials. Electrodes: Electrode theory, Bio Potential Electrodes, Biochemical Transducers, Introduction to bio-medical signals.

UNIT – 2: The Cardiovascular System: The Heart and Cardiovascular System, The Heart, Blood Pressure, Characteristics of Blood Flow, Heart Sounds, Cardio Vascular Measurements, Electrocardiography, Measurement of Blood Pressure, Measurement of Blood Flow and Cardiac output, Plethysmography, Measurement of Heart Sounds, Event detection, PQRS & T-Waves in ECG, the first & second Heart beats, ECG rhythm analysis, the di-crotic notch in the carotidpulse detection of events and waves, analysis of exercise ECG, analysis of event related potentials, correlation analysis of EEG channels, correlation of muscular contraction.

UNIT – 3: Patient Care & Monitory and Measurements in Respiratory System: The elements of Intensive Care Monitory, Diagnosis, Calibration and reparability of Patient Monitoring equipment, other instrumentation for monitoring patients, pace makers, defibrillators,
The physiology of respiratory system, tests and instrumentation for mechanics of breathing, respiratory theory equipment, analysis of respiration.

UNIT – 4: Bio telemetry and Instrumentation for the Clinical Laboratory, Introduction to bio telemetry, Physiological parameters adaptable to bio telemetry, the components of bio telemetry system, implantable units, applications of telemetry in patient care – The blood, tests on blood cells, chemical test, automation of chemical tests.

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UNIT – 5: X-ray and radioisotope instrumentation and electrical safety of medical equipment: Generation of Ionizing radiation, instrumentation for diagnostic X-rays, special techniques, instrumentation for the medical use of radioisotopes, radiation therapy - Physiological effects of electrical current, shock Hazards from electrical equipment, Methods of accident prevention ,Modern Imaging Systems: Tomography, Magnetic Resonance Imaging System, Ultrasonic Imaging System, Medical Thermography.

Text Books:

1. Biomedical Instrumentation and Measurements C.Cromwell,F.J.Weibell,E.A.Pfeiffer – Pearson education.
2. Biomedical Signal Analysis – Rangaraj, M. Rangayya – Wiley Inter Science – JohnWilley& Sons Inc.

Reference Books:

1. Hand Book of Bio-Medical Instrumentation – R.S. Khandpur, TMH.
2. Introduction to Bio-Medical Engineering – Domach, Pearson.
3. Introduction to Bio-Medical Equipment Technology – Cart, Pearson.

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(R23 – III YEAR COURSE STRUCTURE & SYLLABUS)

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

Course Outcomes:

- Know basics of embedded system, classification, memories, different communication interface and what embedded firmware is and its role in embedded system, different system components.
- Distinguish all communication devices in embedded system, other peripheral device.
- DistinguishconceptsofCversusembeddedCandcompilerversuscross-compiler.
- Choose an operating system, and learn how to choose an RTOS

UNIT - I INTRODUCTION TO EMBEDDED SYSTEMS

History of embedded systems, Classification of embedded systems based on generation and complexity, Purpose of embedded systems, The embedded system design process-requirements, specification, architecture design, designing hardware and software, components, system integration, Applications of embedded systems, and characteristics of embedded systems.

UNIT - II TYPICAL EMBEDDED SYSTEM

Core of the embedded system-general purpose and domain specific processors, ASICs, PLDs, COTs; Memory-ROM, RAM, memory according to the type of interface, memory shadowing, memory selection for embedded systems, Sensors, actuators, I/O components: seven segment LED, relay, piezo buzzer, push button switch, other sub-systems: reset circuit, brownout protection circuit, oscillator circuit real time clock, watch dog timer.

UNIT - III COMMUNICATION INTERFACE

Onboard communication interfaces-I2C, SPI, CAN, parallel interface; External communication interfaces-RS232 and RS485, USB, infrared, Bluetooth, Wi-Fi, ZigBee, GPRS, GSM.

UNIT - IV EMBEDDED FIRMWARE DESIGN AND DEVELOPMENT

Embedded firmware design approaches-super loop based approach, operating system based approach; embedded firmware development languages-assembly language based development, high level language based development.

UNIT - V RTOS BASED EMBEDDED SYSTEM DESIGN

Operating system basics, types of operating systems, tasks, process and threads, multiprocessing and multitasking, task scheduling: non-pre-emptive and pre-emptive scheduling; task communication-shared memory, message passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/ Synchronization Issues, Task Synchronization Techniques

Textbooks:

1. Introduction to Embedded Systems - Shibu KV, Mc Graw Hill Education.
2. Computers as Components –Wayne Wolf, Morgan Kaufmann (second edition).

References:

1. Embedded System Design -frank vahid, tony grivargis, john Wiley.
2. Embedded Systems- An integrated approach - Lyla b das, Pearson education 2012.
3. Embedded Systems – Raj Kamal, TMH

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III Year -II Semester	ANALOG IC DESIGN (PE-III)	L	T	P	C
		3	0	0	3

Course Outcomes:

- Understand the concepts of MOS Devices and Modeling.
- Design and analyze any Analog Circuits in real time applications.
- Extend the Analog Circuit Design to Different Applications in Real Time.
- Understand of Open-Loop Comparators and Different Types of Oscillators

UNIT -I:

MOS Devices and Modelling: The MOS Transistor, Passive Components- Capacitor & Resistor, Integrated circuit Layout, CMOS Device Modelling - Simple MOS Large-Signal Model, Other Model Parameters, Small-Signal Model for the MOS Transistor, Computer Simulation Models, Sub-threshold MOS Model.

UNIT -II:

Analog CMOS Sub-Circuits:

MOS Switch, MOS Diode, MOS Active Resistor, Current Sinks and Sources, Current Mirrors-Current mirror with Beta Helper, Degeneration, Cascode current Mirror and Wilson Current Mirror, Current and Voltage References, Band gap Reference.

UNIT -III: CMOS Amplifiers:

Inverters, Differential Amplifiers, Cascode Amplifiers, Current Amplifiers, Output Amplifiers, High Gain Amplifiers Architectures. CMOS Operational Amplifiers: Design of CMOS Op Amps, Compensation of Op Amps, Design of Two-Stage Op Amps, Power- Supply Rejection Ratio of Two-Stage Op Amps, Cascode Op Amps, Measurement Techniques of OP Amp.

UNIT -IV:

Comparators: Characterization of Comparator, Two-Stage, Open-Loop Comparators, Other Open-Loop Comparators, Improving the Performance of Open-Loop Comparators, Discrete-Time Comparators.

UNIT -V:

Oscillators & Phase-Locked Loops: General Considerations, Ring Oscillators, LC Oscillators, Voltage Controlled Oscillators. Simple PLL, Charge Pump PLLs, Non-Ideal Effects in PLLs, Delay Locked Loops, Applications.

TEXT BOOKS:

1. Design of Analog CMOS Integrated Circuits- BehzadRazavi, TMH Edition,SecondEdition.
2. CMOS Analog Circuit Design - Philip E. Allen and Douglas R. Holberg, Oxford University Press, International Second Edition/Indian Edition,2010.

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REFERENCES:

1. Analysis and Design of Analog Integrated Circuits- Paul R. Gray, Paul J. Hurst, S. Lewis and R. G. Meyer, Wiley India, Fifth Edition,2010.
2. Analog Integrated Circuit Design- David A.Johns, Ken Martin, Wiley Student Edn,2013.

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(R23 – III YEAR COURSE STRUCTURE & SYLLABUS)

III Year - II Semester	COMPUTER ORGANIZATION AND ARCHITECTURE (OE-II)	L	T	P	C
		3	0	0	3

Course Outcomes:

- Understand the representation of data, the register transfer language and Microoperations.
- Know the basic computer organization and design, programming the basic computer and design.
- Know the development of central processing unit and explain various algorithms for computer arithmetic operations.
- Interface various Peripheral devices and various data transfer operations.
- 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 Microoperations: Register transfer language, Register transfer, Bus and Memory transfers, Arithmetic Microoperations, Logic Microoperations, Shift Microoperations, 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.
Central Processing Unit: Introduction, General Register Organization, Stack organization, Instruction Formats, Addressing Modes, Data transfer and Manipulation, Program Control.

UNIT-3
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).

UNIT– 5
Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory, Memory Management Hardware.

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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.

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III Year- II Semester	DATABASE MANAGEMENT SYSTEMS (OE-II)	L	T	P	C
		3	0	0	3

Course Objectives:

This course is designed to:

- Train students in the fundamental concepts of Database Management Systems (DBMS), including database modeling and design, SQL, PL/SQL, and system implementation techniques.
- Enable students to create Entity-Relationship (ER) diagrams tailored to customized applications.
- Introduce effective strategies for query optimization
- Provide in-depth knowledge of concurrency control techniques in databases.
- Demonstrate the internal organization and architecture of databases.

Course Outcomes (CO):

- Upon successful completion of the course, students will be able to
- Design a database schema for real-world information systems.
- Define and manage transactions that preserve database integrity.
- Create and manage tables within a relational database.
- Apply normalization techniques to organize data and minimize redundancy.
- Formulate and execute SQL queries to retrieve specific information from the database

UNIT - I :

Introduction, Introduction to Relational Model Introduction: Database systems applications, Purpose of Database Systems, view of Data, Database Languages, Relational Databases, Database Design, Data Storage and Querying, Transaction Management, Database Architecture, Data Mining and Information Retrieval, Specialty Databases, Database users and Administrators, Introduction to Relational Model: Structure of Relational Databases, Database Schema, Keys, Schema Diagrams, Relational Query Languages, Relational Operations.

UNIT - II :

Introduction to SQL, Advanced SQL Introduction to SQL: Overview of the SQL Query Language, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Null Values, Aggregate Functions, Nested Sub-queries, Modification of the Database. Intermediate SQL: Joint Expressions, Views, Transactions, Integrity Constraints, SQL Data types and schemas, Authorization. Advanced SQL: Accessing SQL from a Programming

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Language, Functions and Procedures, Triggers, Recursive Queries, OLAP, Formal relational query languages

UNIT – III:

Database Design and the E-R Model, Relational Database Design Database Design and the E-R Model: Overview of the Design Process, The Entity-Relationship Model, Constraints, Removing Redundant Attributes in Entity Sets, Entity-Relationship Diagrams, Reduction to Relational Schemas, Entity-Relationship Design Issues. Relational Database Design: Features of Good Relational Designs, Atomic Domains and First Normal Form, Decomposition Using Functional Dependencies, Functional-Dependency Theory, Algorithms for Decomposition, Decomposition Using Multivalued Dependencies, More Normal Forms.

UNIT - IV :

Query Processing, Query optimization Query Processing: Overview, Measures of Query cost, Selection operation, sorting, Join Operation, other operations, Evaluation of Expressions. Query optimization: Overview, Transformation of Relational Expressions, Estimating statistics of Expression results, Choice of Evaluation Plans, Materialized views, Advanced Topics in Query Optimization.

UNIT – V:

Transaction Management, Concurrency Control, Recovery System Transaction Management: Transactions: Concept, A Simple Transactional Model, Storage Structures, Transaction Atomicity and Durability, Transaction Isolation, Serializability, Isolation and Atomicity, Transaction Isolation Levels, Implementation of Isolation Levels, Transactions as SQL Statements. Concurrency Control: Lock-based Protocols, Deadlock Handling, Multiple granularity, Timestamp-based Protocols, and Validation-based Protocols. Recovery System: Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, Buffer Management, Failure with Loss of Nonvolatile Storage, Early Lock Release and Logical Undo Operations.

Textbooks:

1. A.Silberschatz, H.F.Korth, S.Sudarshan, "Database System Concepts",6/e, TMH 2019

Reference Books:

1. Database Management System, 6/e RamezElmasri, Shamkant B. Navathe, PEA
2. Database Principles Fundamentals of Design Implementation and Management, Carlos Coronel, Steven Morris, Peter Robb, Cengage Learning.
3. Database Management Systems, 3/e, Raghurama Krishnan, Johannes Gehrke,TMH Online Learning
   Resources: https://onlinecourses.nptel.ac.in/noc21_cs04/preview

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KRISHNA UNIVERSITY
COLLEGE OF ENGINEERING & TECHNOLOGY
B.TECH–ELECTRONICS AND COMMUNICATION ENGINEERING
(R23 – III YEAR COURSE STRUCTURE & SYLLABUS)

III Year-II Semester	MOBILE APPLICATION DEVELOPMENT (OE-II)	L	T	P	C
		3	0	0	3

Course Objectives:

- Facilitate students to understand android SDK.
- Help students to gain a basic understanding of Android application development.
- Inculcate working knowledge of Android Studio development tool.

Course Outcomes:

- Identify various concepts of mobile programming that make it unique from programming for other platforms.
- Evaluate mobile applications on their design pros and cons.
- Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces.
- Develop mobile applications for the Android operating system that use basic and advanced phone features.
- Demonstrate the deployment of applications to the Android marketplace for distribution.

UNIT I **Introduction and Mobile User Interface Design**

Introduction to Android: The Android Platform, Android SDK, Android Studio Installation, Android Installation, building you First Android application, Understanding Anatomy of Android Application, Android Manifest file.

UNIT II **Activities, Intents and Android User Interface**

Android Application Design Essentials: Anatomy of an Android applications, Android terminologies, Application Context, Activities, Services, Intents, Receiving and Broadcasting, Intents, Android Manifest File and its common settings, Using Intent Filter, Permissions.

UNIT III **Advanced User Interface and Data Persistence**

Android User Interface Design Essentials: User Interface Screen elements, Designing User Interfaces with Layouts, Drawing and Working with Animation.

UNIT IV **Android Services, Publishing Android Applications**

Testing Android applications, Publishing Android application, Using Android preferences, Managing Application resources in a hierarchy, working with different types of resources.

UNIT V **Android Databases**

Using Common Android APIs: Using Android Data and Storage APIs, managing data using SQLite, Sharing Data between Applications with Content Providers, Using Android Networking APIs, Using Android Web APIs, Using Android Telephony APIs, Deploying

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Android Application to the World.

Textbooks:

1. Lauren Darcey and Shane Conder, "Android Wireless Application Development", Pearson Education, 2nd ed. (2011).
2. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development," Wiley India, FirstEdition,2012.

Reference Books:

1. Reto Meier, "Professional Android 2 Application Development", Wiley India Pvt Ltd
2. Mark L Murphy, "Beginning Android", Wiley India Pvt Ltd
3. Android Application Development All in one for Dummies by Barry Burd, Edition: I

Online Learning Resources:

1. https://developer.android.com/

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III Year- II Semester	VLSI DESIGN LAB	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

PART (A): FPGA Level Implementation (Any Ten Experiments)

Note1: The students need to develop VHDL/Verilog Source code, perform simulation using relevant simulator and analyze the obtained simulation results using necessary Synthesizer.

Note2: Design and Implementation of the following using any of the behavioural, data flow and structural modelling

1. Realization of Basic Logic gates.
2. Realization of Universal Logic gates.
3. Half Adder and Full Adder
4. 4-bit ripple carry adder
5. 16:1mux
6. 1:16 De-mux through 1:4 De-mux
7. 8:3 Encoder
8. 3:8 Decoder realization through 2:4 decoder
9. 8-bit parity generator and checker
10. Flip-Flops (SR, D)
11. 8-bit synchronous up-down counter
12. 4-bit sequence detector through Mealy state machines.
13. 4-bit sequence detector through Moore state machines.

EDA Tools/Hardware Required:

1. EDA Tool that supports FPGA programming including Xilinx Vivado/Altera (Intel)/ Cypress/Equivalent Industry standard tool along with corresponding FPGA hardware.
2. Desktop computer with appropriate Operating System that supports the EDA tools.

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III Year- II Semester	DATA COMMUNICATION & NETWORKS LAB	L	T	P	C
		0	0	3	1.5

Course Objectives:
To introduce Computer Network laboratory and familiarize with the tools by simulating various aspects of networking.

Course Outcomes:
- Familiarize with the network simulation tools
- Usage of the network simulators to study the various aspects that effect network performance

List of Experiments:
Introduction to Computer Network laboratory
Introduction to Discrete Event Simulation
Discrete Event Simulation Tools - ns2/ns3, Omnet++

Usage of the tool ns2/ns3 to:
1. Simulate telnet and ftp between N sources - N sinks (N = 1, 2, 3).
Evaluate the effect of increasing data rate on congestion.
2. Simulating the effect of queueing disciplines on network performance - Random Early Detection/Weighted RED / Adaptive RED (This can be used as a lead up to DiffServ / IntServ later).
3. Simulate http, ftp and DBMS access in networks
4. Effect of VLAN on network performance –i) multiple VLANs and single router ii) multiple VLANs
with separate multiple routers
5. Implementation of IP address configuration.
6. To create scenario and study the performance of network with CSMA / CA protocol and compare with
CSMA/CD protocols.
7. Implementation of a routing algorithm
8. Simulation of Congestion Control Algorithms
9. Simulating the effect of DiffServ / IntServ in routers on throughput enhancement.
10. Simulating the performance of wireless networks
11. Case Study I: Evaluating the effect of Network Components on Network Performance To Design and
Implement LAN With Various Topologies and To Evaluate Network Performance Parameters for
DBMS etc)

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12. Case Study II: Evaluating the effect of Network Components on Network Performance To Design and
Implement LAN Using Switch/Hub/Router As Interconnecting Devices For Two Different LANs and To Evaluate Network Performance Parameters.
NOTE: At least 10 Experiments out of the list must be done in the semester.

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III Year-II Semester	ANTENNAS & WAVE PROPAGATION LAB	L	T	P	C
		0	1	2	2

Course Objectives:

- To understand the working, different Antenna components and verify characteristics using Antenna setup.
- To study various antennas

Course Outcomes:

- At the end of this course, the students will be able to
- Understand the working, different Antenna components and sources in a Antenna bench
- Verify the characteristics of various Antenna components using microwave bench setup
- Design and study of various antennas
- Analyze performance characteristics of Antennas

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

Part-A Simulation Software

1. To analyze the characteristics of Simple Dipole λ/2
2. To analyze the of characteristics Simple Monopole λ/4 Antenna
3. To analyze the Reciprocity Theorem for Antennas
4. To study Folded Dipole λ /2 Antenna
5. Study of Yagi Uda 3 element Folded Dipole, 5 element folded dipole.
6. To analyze the characteristics of micro strip antennas
7. To analyze the Radiation pattern of Horn Antenna
8. To analyze the characteristics and radiation pattern of broad side and end fire arrays.

Part-B Hardware Trainer Kit

1.Study of Simple Dipole (λ/2) antenna
2.Study of Simple Dipole (λ/4 antenna
3.Study of Folded Dipole (λ/2 antenna
4.Study of Yagi-UDA 5 Element Simple dipole antenna
5.Study of Yagi -UDA 3 Element Folded dipole antenna
6.Study of (λ/2 Phase Array (End fire) antenna
7.Study of Broad Side Array antenna
8.Study of Slot antenna

NOTE: At least 5 Experiments from each section must be done in the semester.

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III Year- II Semester	RESEARCH METHODOLOGY AND IPR	L	T	P	C
		2	0	0	-

Course Outcomes:

- Understand research problem formulation.
- Analyze research related information, Follow research ethics
- Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
- 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.
- 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 - I :
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 - II:
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 - III:
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 - IV:
Patent Rights: Scope of Patent Rights, Licensing and transfer of technology, Patent information and databases, Geographical Indications.

Unit - V:
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.

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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. RanjitKumar, 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.

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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

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KRISHNA UNIVERSITY
MACHILIPATNAM – 521 004

Minutes of meeting of

Board of Studies (BOS) Members in Department of Electronics & Communication Engineering held on 01.07.2025 at 11:00 hrs at Department of Electronics & Communication Engineering, Krishna University

Members of the Board of Studies (BOS):

S.NO	Name of the Faculty	Signature
1	Prof. Y.K Sundara Krishna Head, Department of ECE, KRU	01/07/2025
2	Dr. R. Vijaya Kumari, Principal (i/c), KRUCET	
3	Dr. Y. Rama Krishna, HoD, SRGEC,	
4	Prof. B.T. Krishna Professor, Dept. of ECE JNTU-Kakinada	B.T. Krishna
5	Mr.P.Phani Kumar Senio rDGM,BEL, Machilipatnam	
6	Prof. V.V.K.D.V. Prasad, ECE, GEC	
7	Meritorious students – I	GADIDALA HYMA, L24ECE279007
	Meritorious students –II	VUTUKURI RAMALINGESWARI, L24ECE279021

Agenda:

1. To discuss and finalize R23 B.Tech Electronics & Communication Engineering III Year, V and VI Semester, Course structure, Syllabus and Model paper.
2. To prepare and recommend guidelines for summer internships modalities and incorporation of carrier counseling and guidance modules/sessions.
3. To discuss and finalize RUSA soft component (Seminars and Workshops).
4. Any other item with the permission of the chair.

Deliberations:

1. The following faculty members Mr.Ch.Vijaya Sekhar Babu, Mr.S.Rajeev & Mrs.K.Rojamani have attended the BoS meeting as invite members.

2. The committee members discussed in detail the III Year, V and VI Semester, Course structure, Syllabus and Model paper proposed for R23 B.Tech Electronics & Communication Engineering proposed by APSCHE.

3. The committee members decided to add certain important topics (ARM Processor) in the subject Microprocessors and Microcontrollers syllabus.

4. The committee members observed and decided to modify certain topics in Digital Signal Processing subject which are already covered in previous semester subject i.e. Signals and Systems.

5. The committee discussed the primary aim of the RUSA soft components, specifically focusing on enhancing academic quality, promoting research culture, and providing capacity-building opportunities through seminars and workshops. The importance of aligning the programs with RUSA guidelines and institutional goals was emphasized.

6. The department proposed the following workshops:
   - **Workshop on Antenna and Transmission Lines**: To provide hands-on experience and theoretical knowledge in electromagnetic field theory, antenna design, and RF transmission.
   - **Workshop on Internet of Things (IoT) & Embedded Systems**: Focused on integrating sensors, microcontrollers, and connectivity solutions, with applications in smart systems and automation & designed to cover the fundamentals of microcontrollers, real-time operating systems, and embedded C programming with lab-based learning.

7. The department proposed the following Seminars:
   - **Seminar on 5G Communication & Optical Communication**: Covering the architecture, technologies, and applications of 5G, including challenges and opportunities in India & focused on fiber-optic technology, components, and its role in modern communication networks.
   - **Seminar on VLSI (Very Large Scale Integration)**: Aimed at exploring IC design, fabrication techniques, and industry applications of VLSI.

Resolutions:

1. All the members unanimously approved the R23 III Year, V and VI Semester, Course structure, Syllabus and Model paper for B.Tech Electronics and Communication Engineering as enclosed in Annexure-I.

2. All members approved the R23 B.Tech Electronics and Communication Engineering for III Year, V and VI Semester course structure and syllabus proposed by APSCHE Incorporating the suggestions by the members.

3. Based on the discussions and deliberations, the following resolutions were unanimously passed regarding the organization of seminars and workshops under the RUSA Soft Component:

   - **Approval of Proposed Workshops:** The following workshops were approved in principle, subject to submission of detailed proposals:

     - **Workshop on Antenna and Transmission Lines**
     - **Workshop on Internet of Things (IoT) & Embedded Systems**

   These workshops aim to enhance practical knowledge and skills among students in core electronics and communication engineering domains. Industry experts or faculty from reputed technical institutes will be invited as resource persons.

   - **Approval of Proposed Seminars:** The following seminars were also approved:

     - **Seminar on 5G Communication & Optical Communication**
     - **Seminar on VLSI (Very Large Scale Integration)**

   These seminars are intended to expose students and faculty to cutting-edge technologies and recent advancements in communication and integrated circuit design.